July to September 2026
E-Journal
Volume I, Issue LV (55)

RNI No. – MPHIN/2013/60638
ISSN 2320-8767, E-ISSN 2394-3793
Scientific Journal Impact Factor- 8.054
ISO 9001:2015 - E2024049304
(Quality Management System)

Naveen Shodh Sansar

(An International Refereed/ Peer Review Research Journal)

नवीन शोध संसार

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Mob. 09617239102, **Email** : nssresearchjournal@gmail.com, **Website** www.nssresearchjournal.com

Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
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Index

01. Index 02
02. Regional Editor Board / Editorial Advisory Board 08/09
03. Referee Board 10
04. Spokesperson 12
05. Ecologies of Hunger and Human Survival: An Ecocritical Study of Climate Change and Nutritional Insecurity in The Grapes of Wrath (Shivashree Chail) 14
06. Medicinal application of bark and leaf of Rosewood (Dalbergia sissoo): A brief study (Dr. Akhilesh Chandra Verma) 21
07. Brand Affinity among Generation Z Consumers: A Pilot Study (Perugu Sai Vijetha, Pallavi Sajanapwar) 26
08. Stronger Than Stereotypes: Women Redefining Sports (Prof. Mamta) 30
09. Black Datura (*Datura metel*): A Brief Study of Its Leaves (Dr. Akhilesh Chandra Verma) 33
10. विपश्यना साधना और भावनात्मक समायोजन के बीच संबंध: एक मनोवैज्ञानिक विश्लेषण (डॉ. विनेता) 38
11. कुंतक तथा भोजकृत वक्रोत्तिजीवितम् (डॉ. पी.एस. बघेल) 42
12. भारतीय ज्ञान परंपरा एवं जैन दर्शन : एक अध्ययन (विरेन्द्र मुवेल) 44
13. आदिवासी समुदाय की पारंपरिक औषधीय पद्धतियाँ एवं भारतीय अर्थव्यवस्था पर उनका प्रभाव (डॉ. सुल्तान मोरे) 47
14. रानीखेत के प्रमुख पर्यटन स्थल एवं दर्शनीय स्थल (रानी का मैदान) का परिदृश्य (डॉ. लक्ष्मी देवी) 52
15. Measuring Consumer Acceptance and Patronage in the Sharing Economy: A Pilot Study (Sharvari Ratnakar, Pallavi Sajanapwar) 55
16. Phytochemical Profiling and Anti-Osteoarthritic Potential of Selected Indian Medicinal Plants: An In Vitro Evaluation (Dr. Ragini Sikarwar) 60
17. मध्यप्रदेश राज्य में जनजातियों के कल्याण में शासकीय योजनाओं का प्रभाव (जगदीश उइके) 66
18. Comparative Antimicrobial Activity of *In Vivo* and *In Vitro*-Derived Tissues of *Pterocarpus marsupium Roxb.* Against Selected Bacterial Pathogens (Dr. Garima Moitra) 71
19. 21वीं सदी में मध्य पूर्व एशिया में सऊदी अरब और ईरान के संबंध: प्रमुख महाशक्तियों, हॉर्मूज स्ट्रेट और इस्राइल के विशेष संदर्भ में (सुदीप बिड़ला, संदीप बिड़ला) 77
20. Comparative Evaluation of Free Radical Scavenging Activity of *Pterocarpus marsupium Roxb.* (Dr. Garima Moitra) 80
21. Tribal Resistance and Anti-Colonial Movements in Chhattisgarh: A Historical Study (Dr. Abhishek Verma) 85

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Ecologies of Hunger and Human Survival: An Ecocritical Study of Climate Change and Nutritional Insecurity in The Grapes of Wrath

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Abstract: Climate change and nutritional insecurity have become major concerns in the contemporary world. Environmental degradation, drought, soil erosion, and ecological imbalance have severely affected agricultural productivity and human survival across societies. Literature has always reflected the sufferings, struggles, and realities of human life, and many literary works portray the deep relationship between nature and human existence. John Steinbeck's The Grapes of Wrath is one such remarkable novel which presents the tragic consequences of ecological destruction and hunger upon poor agrarian communities during the Dust Bowl period of the 1930s in America. The novel depicts how environmental catastrophe compels people to leave their homeland and migrate in search of food, shelter, and survival. Steinbeck realistically portrays the pain, displacement, poverty, starvation, and exploitation faced by migrant laborers whose lives are shattered due to climatic and economic crisis. The novel further exposes the unequal distribution of food resources, capitalist exploitation, and the commodification of agricultural production where abundance exists alongside hunger and deprivation. Through the suffering of the Joad family and other displaced communities, Steinbeck presents the harsh realities of nutritional insecurity and ecological collapse. This paper attempts to analyze The Grapes of Wrath from an ecocritical perspective and examines how the novel foregrounds climate crisis, human displacement, hunger, and the fragility of survival in a rapidly deteriorating ecological world.
Keywords: Climate Change; Nutritional Insecurity, Environmental Degradation, Human Survival, Hunger, Food Security, Migration, Agrarian Crisis.

Introduction and Main Thrust: Climate change has emerged as one of the greatest challenges confronting human civilization in the modern age. It has not only altered the ecological balance of the planet but has also profoundly affected agriculture, food production, public health, migration, and the overall sustainability of human life. The increasing incidence of droughts, floods, rising temperatures, soil degradation, desertification, and erratic rainfall has disrupted agricultural systems throughout the world, thereby threatening nutritional security for millions of people. Consequently, climate change can no longer be understood merely as an environmental concern; rather, it has evolved into a multidimensional humanitarian crisis encompassing ecological, economic, social, and political dimensions. Among its most devastating consequences is the growing inability of vulnerable communities to secure adequate food for survival, resulting in hunger, malnutrition, forced migration, and the gradual erosion of human dignity. These concerns have increasingly attracted the attention of scholars belonging to diverse disciplines, including literary studies, where literature serves as a powerful medium for representing the lived realities of ecological crises and their human consequences.

Ecocriticism, as an important branch of literary criticism, examines the relationship between literature and the physical environment by exploring how literary texts represent ecological degradation, environmental ethics, and the interconnectedness of nature and humanity. John Steinbeck's The Grapes of Wrath occupies a significant position within this discourse because it presents one of the earliest literary explorations of environmental catastrophe and its direct impact upon food security and human survival. Set against the historical background of the Dust Bowl and the Great Depression during the 1930s, the novel portrays the tragic experiences of farming communities whose lives are shattered by prolonged drought, ecological destruction, displacement, poverty, and hunger. The present paper attempts to examine how Steinbeck transforms this historical catastrophe into a universal narrative of climate change and nutritional insecurity. It argues that the novel anticipates contemporary ecological debates by demonstrating that the destruction

of nature inevitably leads to the destruction of human livelihood, food systems, and social justice.The environmental catastrophe portrayed in The Grapes of Wrath gradually develops into a crisis of human displacement, demonstrating that ecological destruction rarely remains confined to the physical environment alone. Once the fertility of the land disappears, the possibility of sustaining human life upon it also diminishes. Steinbeck carefully illustrates that the failure of crops, the drying of the soil, and the relentless dust storms ultimately force thousands of farming families to abandon the homes where generations had lived with dignity and self-respect. Thus, the Dust Bowl does not merely destroy agricultural fields; it uproots an entire civilization that had grown around the land. The novel therefore anticipates one of the most significant concerns of the present century, namely climate-induced migration, where environmental degradation compels people to leave their native places in search of food, livelihood, and survival.

The history of the Dust Bowl remains one of the darkest chapters in the environmental history of the United States. The prolonged drought during the early 1930s, coupled with excessive ploughing and the overexploitation of fertile grasslands, transformed vast agricultural regions into barren landscapes. The fertile topsoil was carried away by violent winds, leaving behind fields that could no longer sustain cultivation. Thousands of tenant farmers found themselves incapable of producing even the minimum quantity of food necessary for survival. Consequently, the ecological crisis assumed the dimensions of a humanitarian disaster. Families that had cultivated the land for decades were suddenly deprived of both livelihood and nourishment. It is against this historical background that Steinbeck constructs the tragic experiences of the Joad family, thereby transforming a particular historical event into a universal narrative of environmental suffering and human resilience.The migration of the Joad family from Oklahoma to California occupies a central position within the novel because it symbolizes the desperate search for food, employment, and a dignified existence. Carrying only a few personal belongings upon an overloaded truck, they undertake a long and uncertain journey along Route 66 with the hope that California would provide opportunities denied to them by the devastated lands of Oklahoma. However, Steinbeck repeatedly reminds the reader that this migration is not born out of ambition or adventure but out of absolute necessity. Environmental destruction has deprived them of the basic means of survival, leaving migration as their only possible alternative. In this sense, the Joad family represents thousands of anonymous farming families whose displacement was determined not by personal choice but by ecological collapse.The journey itself becomes an extension of their suffering. Throughout their travel, the migrants encounter exhaustion, illness, uncertainty, and the constant fear of hunger. Food becomes increasingly scarce as the little savings carried by the families gradually disappear. The elderly, the women, and the children suffer the greatest hardships because inadequate nutrition weakens their physical strength and exposes them to disease. Steinbeck presents these experiences with remarkable realism, demonstrating that climate-induced migration inevitably produces nutritional insecurity. Once people lose access to their own agricultural land, they become dependent upon uncertain wages, temporary employment, and unpredictable food supplies. Thus, the destruction of ecology gradually transforms into the destruction of food security.Steinbeck also portrays the emotional consequences of displacement with profound sensitivity. The migrants do not merely leave behind their houses and farms; they are compelled to abandon memories, traditions, social relationships, and the emotional security associated with their homeland. Older members of the family repeatedly look back with grief towards the land that had nourished generations of their ancestors. Their separation from the soil signifies the loss of identity itself. The younger generation attempts to adjust to the changing circumstances, yet uncertainty overshadows every expectation of the future. Through these experiences, Steinbeck illustrates that environmental degradation affects not only material existence but also the psychological and cultural foundations of human life.

The climate-induced displacement portrayed in The Grapes of Wrath bears remarkable resemblance to the environmental crises confronting the contemporary world. Rising sea levels, prolonged droughts, desertification, floods, and extreme climatic events continue to displace millions of people across different regions of the globe. The expression “climate refugee,” widely employed in present environmental discourse, finds one of its earliest literary representations in Steinbeck’s migrant families. Long before climate change became an established field of academic inquiry, Steinbeck recognized that ecological imbalance possesses the power to transform self-reliant agricultural communities into displaced populations struggling for the most fundamental necessities of life. His vision therefore transcends the historical limits of the Dust Bowl and acquires universal significance.As the migrants finally approach California, they imagine that the fertile valleys overflowing with orchards and agricultural abundance would free them from the sufferings of hunger and deprivation. Nevertheless, the reality awaiting them proves far more complex and devastating than their expectations. The collapse of agriculture in Oklahoma has indeed ended their relationship with the land, but another crisis now begins to unfold, where the struggle for employment, fair wages, and adequate nourishment becomes inseparable from the larger question of human survival. It is at this stage that the novel shifts its attention from environmental displacement to the gradual collapse of agrarian livelihoods under the combined forces of ecological destruction and capitalist exploitation,

a dimension that further intensifies the crisis of nutritional insecurity and forms the next important concern of the present study.

The collapse of agrarian livelihoods occupies a significant place in The Grapes of Wrath because it reveals that environmental degradation extends far beyond the destruction of the physical landscape. The loss of fertile land inevitably results in the loss of employment, economic independence, and nutritional security. Steinbeck demonstrates that for the tenant farmers of Oklahoma, agriculture was not merely an occupation but a complete way of life. Their social identity, cultural traditions, economic stability, and emotional attachment were deeply rooted in the land they cultivated. Consequently, when prolonged drought and relentless dust storms rendered the fields barren, the farmers lost not only their crops but also the very foundation upon which their existence had been built. The ecological crisis therefore assumed the dimensions of an economic and humanitarian catastrophe, making hunger and poverty unavoidable consequences of environmental collapse.The livelihood of the Joad family depended entirely upon the productivity of their farmland. Like countless other tenant farmers, they cultivated crops not only to earn their living but also to provide food for their own families. The failure of agriculture immediately destroyed this self-sufficiency. Steinbeck repeatedly suggests that when the land ceases to produce, the farmer is deprived of both dignity and survival. The exhausted soil could no longer nourish the seeds entrusted to it, and the repeated failure of harvests gradually transformed hope into despair. Families that had once depended upon their own labour for sustenance suddenly found themselves without employment, without food, and without any certainty regarding the future. The intimate relationship between ecological stability and nutritional security thus becomes one of the central concerns of the novel.Steinbeck further intensifies this tragedy through his powerful portrayal of mechanized capitalism. The banks and large agricultural corporations seize the lands of the tenant farmers and replace human labour with tractors. The tractor appears in the novel almost as an inhuman mechanical force that destroys not only houses and fields but also centuries of rural tradition. The machine does not recognize memory, emotion, or belonging; it merely follows the logic of economic profit. Homes that had witnessed generations of family life are reduced to ruins within a matter of hours. In one of the most moving episodes, the displaced farmers stand helplessly as tractors level their homes and erase every visible trace of their existence.

Through such scenes Steinbeck criticizes an economic system that values machinery and profit above human life, thereby transforming environmental disaster into social injustice.The eviction of farming communities also creates a profound crisis of food security. Before their displacement, the tenant farmers possessed at least a limited degree of control over their food resources. They cultivated crops, maintained small livestock, and relied upon the mutual support of neighbouring families during difficult times. Although poverty existed, complete dependence upon external markets had not yet emerged. However, after losing their land, these families became entirely dependent upon uncertain wages and commercial food systems. Their ability to obtain food was no longer determined by agricultural production but by fluctuating labour opportunities and exploitative economic conditions. Steinbeck thereby exposes the fragile relationship between land ownership and nutritional security, illustrating that those who lose control over the means of food production inevitably become vulnerable to hunger and malnutrition.The arrival of the migrants in California does not bring the relief they had imagined. Instead, they encounter thousands of other displaced families competing for the same seasonal agricultural work. The excessive supply of labour enables employers to reduce wages to such an extent that even continuous physical labour fails to provide sufficient income for basic survival. Steinbeck repeatedly emphasizes the painful irony that those who harvest fruits, vegetables, and cotton remain incapable of purchasing adequate food for themselves. Their labour enriches landowners, yet their own children continue to suffer from hunger and weakness. The novel therefore exposes the contradiction inherent within an economic system where food is produced in abundance while the producers themselves remain nutritionally insecure.The decline of agrarian livelihoods also destroys the social cohesion that had once characterized rural communities. Mutual cooperation gradually gives way to competition because every family struggles for the limited employment available. The fear of unemployment compels workers to accept lower wages, longer working hours, and increasingly inhuman conditions. Steinbeck demonstrates that environmental degradation thus initiates a vicious cycle in which ecological collapse produces economic insecurity, economic insecurity intensifies social exploitation, and exploitation ultimately deepens nutritional deprivation. Hunger ceases to be merely the consequence of failed crops; it becomes the product of an unjust economic order that exploits human desperation.

The relevance of Steinbeck's observations extends far beyond the historical context of the Dust Bowl. Even in the contemporary world, climate change continues to threaten agricultural livelihoods through prolonged droughts, floods, rising temperatures, and declining soil fertility. Across Asia, Africa, and several developing regions, farming communities continue to experience indebtedness, crop failure, migration, and nutritional insecurity due to environmental instability.

Thus, The Grapes of Wrath anticipates many of the ecological and humanitarian challenges confronting the modern world. Steinbeck reminds his readers that the destruction of agriculture is never merely an economic loss;

it is the beginning of a much deeper crisis affecting food, health, dignity, and the very continuity of human civilization.However, the collapse of agrarian livelihoods represents only one dimension of the larger humanitarian tragedy portrayed in the novel. As unemployment increases and wages continue to decline, the migrant families gradually encounter the harsh realities of persistent hunger, starvation, and malnutrition. Steinbeck now shifts his attention from the destruction of livelihoods to the bodily and emotional consequences of nutritional insecurity, revealing how the absence of adequate food gradually undermines not only physical health but also hope, dignity, and the fundamental instinct for survival.The experience of hunger occupies a central position in The Grapes of Wrath because it represents the most immediate and painful consequence of environmental degradation and economic exploitation. Steinbeck demonstrates that climate-induced disasters do not merely destroy crops and livelihoods; they gradually deprive individuals of the most fundamental necessity of life—food. The migrants who leave Oklahoma in search of survival soon discover that displacement has not liberated them from suffering but has instead exposed them to another form of deprivation where every meal becomes uncertain. Hunger therefore emerges not as an isolated physical condition but as a social, economic, and moral crisis that gradually consumes the lives of the displaced farming communities. Steinbeck's portrayal of starvation transforms the novel into a powerful testimony of the intimate relationship between climate change, nutritional insecurity, and human survival.After abandoning their farms, the migrant families lose the ability to cultivate their own food. Earlier, despite poverty and economic hardship, the land had provided them with at least the possibility of subsistence. Their small harvests, livestock, and community support enabled them to survive difficult seasons. Once displaced, however, they become entirely dependent upon seasonal employment and uncertain wages. Throughout their journey to California, Steinbeck repeatedly describes families carefully rationing the little food they possess, fully aware that they have no certainty regarding their next meal. Bread, potatoes, beans, and whatever inexpensive provisions they can obtain become the principal means of survival. Such food may prevent immediate starvation, yet it remains grossly inadequate to satisfy the nutritional requirements of growing children, elderly people, and labourers engaged in physically demanding work.

Thus, environmental displacement gradually develops into a crisis of nutritional deprivation.The suffering of children occupies a particularly significant place within Steinbeck's narrative. Their weak bodies, exhausted faces, and silent endurance become symbols of a society that has failed to protect its most vulnerable members. Steinbeck repeatedly portrays children watching food with longing, waiting patiently while their parents struggle to provide even the smallest portions. The emotional intensity of these scenes lies not merely in the depiction of physical hunger but in the helplessness experienced by parents who are unable to fulfil their most basic responsibility of feeding their children. Ma Joad, with extraordinary courage and determination, constantly attempts to preserve the unity of the family despite diminishing food supplies. She often distributes food equally among family members, concealing her own anxieties behind an appearance of strength. Through her character, Steinbeck illustrates that maternal sacrifice becomes one of the few remaining forms of resistance against the destructive forces of poverty and hunger.The arrival of the migrants in California introduces another tragic irony that strengthens Steinbeck's critique of nutritional injustice. California is portrayed as a land blessed with fertile valleys, flourishing orchards, and abundant agricultural production. Fruits, vegetables, grapes, peaches, oranges, and cotton grow in remarkable quantities across the countryside. Yet those who harvest these crops remain themselves hungry. The migrants spend long hours working in the fields under difficult conditions, but their wages remain insufficient to purchase the very food they help produce.

Steinbeck thereby exposes one of the greatest contradictions within modern economic systems: abundance does not necessarily guarantee food security. The existence of food alone cannot eliminate hunger when access to that food is determined by wealth, ownership, and economic power. Nutritional insecurity therefore emerges not simply from environmental scarcity but from unequal social arrangements governing the distribution of resources.This contradiction reaches its most disturbing expression when Steinbeck describes the deliberate destruction of surplus agricultural produce. The novel records how oranges are sprayed with kerosene, potatoes are thrown into rivers, and fruits are destroyed to prevent falling market prices. These episodes constitute some of the most memorable passages in the novel because they reveal the moral bankruptcy of a society that permits edible food to be wasted while thousands of children and labourers suffer from starvation. Steinbeck condemns an economic order that places commercial profit above human life. Food, which should symbolize nourishment, compassion, and collective survival, is transformed into a commodity whose value is measured only by financial gain. The destruction of food amidst widespread hunger becomes a powerful symbol of social injustice and ethical failure.Steinbeck further demonstrates that hunger gradually erodes human dignity. Starvation compels individuals to accept humiliating conditions that they would otherwise reject. Migrants wait anxiously for temporary employment, tolerate insults from employers, endure degrading living conditions, and suppress their grievances because survival depends upon securing even the smallest amount of income. Parents silently reduce their own meals so that their children may

eat. Elderly members willingly sacrifice their portions, believing that younger generations possess a greater chance of survival. Such moments reveal that nutritional insecurity affects not only the body but also the emotional and psychological well-being of individuals. Hunger transforms ordinary acts of eating into painful reminders of inequality, vulnerability, and human dependence.The issues raised by Steinbeck continue to possess profound contemporary relevance. Despite remarkable technological progress and increasing global food production, millions of people across the world continue to experience hunger and malnutrition. Climate change has intensified droughts, floods, and agricultural instability, while poverty and unequal access to resources continue to prevent vulnerable communities from obtaining adequate nutrition. Steinbeck's observations therefore extend far beyond the historical circumstances of the 1930s. They compel readers to recognize that nutritional insecurity remains one of humanity's greatest challenges, demanding not only environmental conservation but also social justice and equitable access to food.As the novel progresses, Steinbeck deepens this criticism by exposing the capitalist structures that transform food into a market commodity and agricultural labour into a source of exploitation. The humanitarian crisis created by climate change is therefore intensified by economic systems that privilege profit over human welfare. It is this intersection of capitalism, labour exploitation, and food injustice that constitutes the next significant dimension of the present study and further reveals the ecological vision underlying The Grapes of Wrath.

The humanitarian crisis portrayed in The Grapes of Wrath cannot be understood solely through the lens of environmental degradation because Steinbeck repeatedly demonstrates that ecological disasters become far more destructive when combined with economic exploitation. While climate change and the Dust Bowl initiate the collapse of agricultural life, it is the capitalist structure of society that perpetuates hunger, inequality, and nutritional insecurity. Steinbeck suggests that nature alone is not responsible for human suffering; rather, social and economic institutions intensify the consequences of ecological crises by transforming food, labour, and even human existence into commodities governed by the logic of profit. Thus, the novel presents a comprehensive critique of a system in which economic interests triumph over humanitarian values.One of the most powerful dimensions of Steinbeck's social criticism is his portrayal of food as a commercial commodity rather than a universal human necessity. Throughout the novel, agricultural abundance exists alongside widespread starvation, creating one of the most disturbing paradoxes in modern literature. California's fertile valleys produce enormous quantities of fruits, vegetables, and grains capable of feeding thousands of people. Nevertheless, the migrant workers who cultivate and harvest these crops remain unable to secure sufficient food for themselves or their families. Steinbeck repeatedly emphasizes that hunger does not arise because food is unavailable but because access to food is controlled by economic power. Consequently, nutritional insecurity becomes a social injustice rather than merely an environmental consequence.The novelist presents this contradiction most forcefully through the deliberate destruction of surplus food. Fruits are burned, potatoes are discarded into rivers, and oranges are rendered inedible by the application of kerosene so that market prices may remain stable. These scenes represent not merely economic practices but moral tragedies. Steinbeck expresses profound indignation at a civilization capable of destroying nourishment while innocent children endure starvation. Such actions expose the ethical bankruptcy of a profit-oriented society in which commercial calculations assume greater importance than human survival. The destruction of food amidst widespread hunger becomes a symbol of the commodification of life itself, revealing the extent to which capitalism has alienated humanity from the principles of compassion and collective responsibility.Parallel to this commodification of food is the systematic exploitation of agricultural labour. The migrant workers arrive in California with the hope of rebuilding their lives through honest labour, yet they soon discover that their desperation has become an opportunity for exploitation. Landowners intentionally recruit far more workers than necessary, creating intense competition among the migrants. Since thousands of hungry families compete for limited employment, wages are continuously reduced. Steinbeck demonstrates that starvation itself becomes an instrument through which employers maintain economic control. A hungry worker cannot negotiate fair wages because survival demands immediate employment. Thus, climate-induced displacement produces a labour force whose vulnerability is exploited by those who possess economic power.The Joad family repeatedly encounters these harsh realities. Despite working tirelessly in orchards, cotton fields, and plantations, they remain incapable of earning enough to purchase adequate food. Their physical labour contributes directly to agricultural prosperity, yet they themselves continue to experience hunger and deprivation. Steinbeck thereby exposes one of the deepest contradictions within capitalist agriculture: those who produce food often become the very people most deprived of its benefits. The labourer's body becomes a productive instrument for generating wealth, while his own nutritional needs remain neglected. Such exploitation transforms environmental suffering into structural inequality.Steinbeck further illustrates that prolonged food insecurity gradually undermines human dignity. Individuals who once possessed independence, self-respect, and confidence become increasingly vulnerable to humiliation. Migrants patiently wait outside labour camps hoping to be selected for work, fully aware that rejection may condemn their families to another day without adequate food. Their dependence upon

employers erodes personal autonomy and weakens social solidarity. Yet Steinbeck refuses to portray the migrants merely as passive victims. Instead, he repeatedly emphasizes their extraordinary resilience, mutual cooperation, and enduring sense of humanity. Ma Joad emerges as the moral centre of the novel, preserving familial unity despite overwhelming hardship. Similarly, the philosophical reflections of Jim Casy encourage collective resistance against injustice, suggesting that human survival ultimately depends upon compassion, cooperation, and shared responsibility rather than individual competition.

The final chapters of the novel provide perhaps the most profound meditation upon human dignity amid nutritional insecurity. Rose of Sharon, who has herself endured immense personal suffering, performs the unforgettable act of nursing a starving stranger with her own breast milk. This concluding image transcends its immediate narrative context and acquires immense symbolic significance. Steinbeck suggests that when institutional systems fail to protect human life, compassion itself becomes the final source of nourishment. The act symbolizes the triumph of collective humanity over selfishness, transforming biological sustenance into a metaphor for social solidarity. It affirms that genuine survival depends not merely upon food but upon the willingness of individuals to recognize one another as members of a shared human community.Through these experiences, Steinbeck ultimately warns against the consequences of unsustainable human practices that disregard ecological balance and social justice. The Dust Bowl itself resulted not only from natural drought but also from excessive cultivation, irresponsible land use, and the relentless exploitation of natural resources. Likewise, the subsequent humanitarian crisis was intensified by economic systems that prioritized profit above environmental sustainability and human welfare. Decades before climate change emerged as a major global concern, Steinbeck recognized that the abuse of nature would inevitably produce hunger, displacement, inequality, and widespread human suffering. His novel therefore serves not only as a historical record of the Great Depression but also as a prophetic warning regarding the ecological future of humanity.The relationship between environmental degradation, nutritional insecurity, and human survival thus reaches its fullest expression in the concluding movement of the novel. Steinbeck finally demonstrates that although climate change may destroy landscapes and economic systems may exploit human vulnerability, the resilience of humanity continues to survive through compassion, collective consciousness, and an enduring commitment to social justice. These insights naturally lead to the concluding observations of the present study, wherein the ecological vision of The Grapes of Wrath is evaluated in relation to contemporary debates surrounding climate change, food security, and sustainable human existence.

The foregoing discussion clearly establishes that The Grapes of Wrath transcends the boundaries of a historical novel and emerges as a profound literary document that anticipates many of the ecological concerns confronting the contemporary world. Although Steinbeck wrote against the background of the Dust Bowl and the Great Depression, the environmental anxieties reflected in the novel possess remarkable relevance in the present era of global climate change. The ecological devastation witnessed in Oklahoma, the collapse of agricultural productivity, the displacement of farming communities, the exploitation of migrant labour, the unequal distribution of food resources, and the widespread prevalence of hunger collectively demonstrate that environmental degradation is never an isolated phenomenon. It gradually extends its influence into every sphere of human existence, threatening food security, economic stability, public health, and ultimately the continuity of civilized life itself.The novel repeatedly reminds its readers that climate change cannot be separated from questions of social justice and nutritional equity. Environmental disasters affect all sections of society; however, their consequences are borne most severely by those communities whose livelihoods depend directly upon natural resources. The tenant farmers portrayed by Steinbeck become victims not only of ecological collapse but also of an economic structure that converts human suffering into commercial opportunity. Their inability to secure adequate nourishment despite living amidst agricultural abundance exposes the moral contradictions inherent within systems governed exclusively by profit. Steinbeck therefore argues that hunger is not merely the result of nature's hostility but also the consequence of human indifference, unequal resource distribution, and institutional exploitation.The ecological philosophy underlying the novel also emphasizes the inseparable relationship between humanity and nature. Human civilization flourishes only when ecological balance is maintained, whereas environmental exploitation ultimately destroys both nature and the communities dependent upon it. Steinbeck's portrayal of barren landscapes, abandoned farms, starving children, exhausted labourers, and displaced families collectively illustrates that the destruction of the environment inevitably becomes the destruction of human dignity. Consequently, the novel advocates an ethical relationship with nature founded upon sustainability, responsibility, and collective welfare rather than exploitation and excessive commercialism. Such an ecological vision acquires increasing significance today as nations across the world continue to confront droughts, floods, declining agricultural productivity, food insecurity, and climate-induced migration.Steinbeck further demonstrates that genuine human survival depends not solely upon material resources but also upon solidarity, compassion, and mutual cooperation. Throughout the novel, the resilience displayed by Ma Joad, the humanitarian ideals articulated by Jim Casy, and the final act of sacrifice performed by Rose of Sharon

collectively affirm that hope survives even amidst overwhelming adversity. These characters remind readers that while ecological disasters may destroy material possessions, they cannot extinguish the moral strength that binds humanity together. Such moments elevate The Grapes of Wrath beyond social realism and transform it into a timeless meditation upon human endurance, collective responsibility, and ethical coexistence.

Conclusion: Climate change has emerged as one of the defining realities of the modern world, profoundly affecting ecological stability, agricultural production, and nutritional security. John Steinbeck's The Grapes of Wrath remarkably anticipates these contemporary concerns by portraying the Dust Bowl as an environmental catastrophe that gradually develops into a humanitarian crisis characterized by migration, hunger, poverty, labour exploitation, and the erosion of human dignity. Through an ecocritical reading, it becomes evident that the novel establishes an inseparable relationship between environmental degradation and nutritional insecurity, demonstrating that the destruction of nature inevitably threatens the survival of human civilization.Steinbeck successfully reveals that ecological disasters alone do not produce widespread suffering; rather, it is the combination of environmental collapse and unequal socio-economic structures that intensifies human misery. The destruction of fertile land deprives farming communities of their livelihood, while capitalist exploitation and unequal food distribution transform scarcity into chronic hunger and malnutrition. Consequently, the novel presents food not merely as a biological necessity but as a question of justice, equality, and human rights. The experiences of the Joad family become representative of countless marginalized communities across the world who continue to suffer the devastating consequences of climate-induced displacement and food insecurity.Thus, The Grapes of Wrath remains one of the most significant literary explorations of the relationship between ecology and humanity. Its enduring relevance lies in its powerful warning that environmental irresponsibility, unsustainable agricultural practices, and economic inequality collectively threaten the future of human existence. At the same time, Steinbeck affirms that compassion, social solidarity, and ecological consciousness offer the only meaningful path towards sustainable development and collective survival. The novel therefore continues to inspire readers to reimagine the relationship between nature, food, and humanity, making it an indispensable text for understanding the interconnected challenges of climate change and nutritional security in the contemporary world.

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Medicinal application of bark and leaf of Rosewood (Dalbergia sissoo): A brief study

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Abstract: Dalbergia sissoo Roxb. (Indian Rosewood), a prominent member of the Fabaceae family, has long been recognized in traditional medicinal systems for its diverse therapeutic potential. The present study critically examines the medicinal applications of the bark and leaf of *D. sissoo* through an integrative evaluation of its phytochemical composition and experimentally validated pharmacological activities. Particular emphasis is placed on bioactive constituents such as flavonoids, phenolic compounds, and neoflavonoids, which are considered fundamental to its biological efficacy.

Experimental evidence indicates that ethanolic bark extracts exhibit significant dose-dependent antinociceptive activity, along with marked antioxidant potential demonstrated through in vitro assays, including DPPH radical scavenging and metal ion chelation. In parallel, leaf extracts have been associated with pronounced anti-inflammatory and anti-arthritic effects, suggesting their relevance in the management of chronic inflammatory conditions. Mechanistically, these effects are closely linked to oxidative stress modulation and nitric oxide inhibition pathways.

By synthesizing traditional knowledge with contemporary experimental findings, the study establishes a coherent pharmacological framework for *D. sissoo*, thereby underscoring its significance as a potential source of safe and plant-based therapeutic agents in modern medicine [1]–[5].

Keywords: Dalbergia sissoo, Bark extract, Leaf extract, Antioxidant activity, Antinociceptive effect, Phytochemicals, Oxidative stress.

Introduction - The systematic exploration of plant-derived therapeutics has gained considerable prominence in modern biomedical research, primarily due to the limitations and adverse effects associated with synthetic pharmacological agents. Within this evolving paradigm, medicinal plants serve as a crucial interface between traditional healing practices and contemporary drug discovery. Among such plants, *Dalbergia sissoo*Roxb., commonly known as Indian Rosewood, occupies a distinctive position owing to its extensive ethnomedicinal relevance and increasing scientific validation [1].

Botanically classified under the family Fabaceae, *D. sissoo* is a deciduous perennial tree predominantly distributed across the sub-Himalayan region and adjoining areas of the Indian subcontinent. Its ecological adaptability and wide availability have facilitated its integration into indigenous healthcare systems, where various plant parts—particularly bark and leaves—are traditionally utilized for therapeutic purposes. These components have been employed in the management of gastrointestinal disorders, dermatological conditions, inflammatory states, and infectious diseases, reflecting a broad pharmacological spectrum [2], [3].

The transition from traditional usage to scientific validation necessitates a detailed understanding of the plant's phytochemical architecture. Studies have revealed that *D. sissoo* contains a diverse array of bioactive compounds, including flavonoids, phenolic acids, isoflavones, and neoflavonoids such as dalbergin and dalbergenone. These constituents are known to exert significant biological effects, particularly through the modulation of oxidative stress and inflammatory pathways [4]. This becomes especially relevant in the context of oxidative stress-mediated pathologies, where reactive oxygen species (ROS) play a central role in cellular damage and disease progression.

From a pharmacological perspective, experimental investigations provide substantial evidence supporting the medicinal efficacy of *D. sissoo*. Bark extracts, in particular, have demonstrated pronounced antinociceptive activity in animal models, exhibiting dose-dependent responses without acute toxicity at higher concentrations. These findings suggest the involvement of flavonoid-mediated pathways in pain modulation and inflammation control [5]. Concurrently, in vitro antioxidant assays confirm the plant's ability to neutralize free radicals and reduce oxidative

burden, thereby reinforcing its therapeutic relevance. Parallel investigations on leaves further substantiate their medicinal significance, particularly in relation to anti-inflammatory and anti-arthritic effects. These properties are of considerable importance in chronic disease conditions, where persistent inflammation acts as a major pathological driver. Collectively, these observations indicate that both bark and leaf components contribute synergistically to the overall pharmacological profile of the plant.

In this context, the present study is designed to provide a focused yet comprehensive evaluation of the medicinal applications of *Dalbergia sissoo*, with specific emphasis on its bark and leaf. By integrating traditional knowledge with phytochemical insights and experimental pharmacology, the study aims to establish a coherent understanding of its therapeutic potential within the broader framework of plant-based medicinal research.

1. Phytochemical Architecture of *Dalbergia sissoo:* The pharmacological significance of *Dalbergia sissoo*Roxb. is fundamentally rooted in its complex and diverse phytochemical architecture, which governs its broad-spectrum medicinal efficacy. In phytopharmacological research, the therapeutic potential of medicinal plants is primarily attributed to secondary metabolites—bioactive compounds that, although not essential for primary metabolism, play a critical role in biochemical defense and interaction mechanisms. In *D. sissoo*, these metabolites constitute the biochemical foundation underlying its extensive medicinal applications [6].

Comprehensive phytochemical profiling reveals the presence of a wide spectrum of bioactive constituents, including flavonoids, phenolic compounds, neoflavonoids, alkaloids, tannins, saponins, phytosterols, and polysaccharides. Among these, flavonoids and phenolics are of particular pharmacological importance due to their well-established antioxidant and anti-inflammatory properties. Compounds such as dalbergin, dalbergenone, methyl dalbergin, and dalbergichromene—primarily isolated from the stem bark—represent the characteristic neoflavonoid framework of the species and contribute significantly to redox regulation and cellular protection [7], [8].

A notable feature of *D. sissoo* is the organ-specific variation in its phytochemical composition, especially between bark and leaves. The bark is predominantly enriched with neoflavonoids, chromene derivatives, and tannins, along with substantial phenolic content. These constituents are closely associated with protective functions and are reflected pharmacologically in its pronounced antinociceptive, anti-inflammatory, and antioxidant activities. Chromatographic studies have identified compounds such as dalberginine, 4-phenylchromene, and isodalbergin, thereby establishing the biochemical distinctiveness of bark extracts [6], [9].

In contrast, the leaves exhibit a comparatively diverse phytochemical profile characterized by flavonoids (biochanin-A, genistein), sterols (â-sitosterol, stigmasterol), triterpenoids (â-amyrin), and water-soluble polysaccharides such as rhamnose, galactose, and glucuronic acid. These constituents are functionally associated with anti-inflammatory, anti-arthritic, and immunomodulatory activities. The higher proportion of polysaccharides and glycosidic compounds further indicates their role in metabolic regulation and cellular signaling processes [8], [10].

To illustrate the biochemical composition of leaves, Table 1 presents a representative overview of their primary nutritional and mineral constituents.

Table 1: Biochemical Composition of *Dalbergia sissoo* Leaves (Dry Weight Basis)

Component	Percentage / Concentration
Crude Protein	18.4 – 24.1%
Fat	3.5 – 4.9%
Nitrogen-Free Extract	~48.5%
Crude Fiber	19.3 – 26.1%
Ash Content	8.43 – 12.0%
Calcium	1855.5 mg/100 g
Phosphorus	270 mg/100 g

While these macro- and micro-nutrients contribute to the nutritional value of the plant, the therapeutic specificity is primarily governed by secondary metabolites. These compounds actively participate in multiple biochemical pathways that define the pharmacodynamics of *D. sissoo*. Flavonoids and phenolics function as potent free radical scavengers, mitigating oxidative stress implicated in chronic diseases such as cancer, cardiovascular disorders, and neurodegenerative conditions. Tannins contribute to antimicrobial and astringent properties, whereas alkaloids are often associated with analgesic and anti-inflammatory responses [7], [10].

Importantly, the synergistic interaction among these phytochemicals enhances the overall therapeutic efficacy of the plant. Unlike synthetic drugs, which typically act via a single active compound, *D. sissoo* exemplifies a polypharmacological model in which multiple constituents collectively modulate diverse biological targets. This integrative mechanism not only improves therapeutic outcomes but also reduces the likelihood of adverse effects. In summary, the phytochemical architecture of *Dalbergia sissoo* is characterized by a structurally diverse and functionally integrated network of bioactive compounds, with distinct yet complementary profiles in bark and leaves. This biochemical complexity forms the foundational basis for its extensive medicinal applications and supports its continued exploration in pharmacological and clinical research.

2. Ethnomedicinal and Traditional Perspectives: The ethnomedicinal significance of *Dalbergia sissoo*Roxb. is deeply rooted in the classical traditions of Ayurveda and diverse regional folk medical systems of the Indian subcontinent. Historically, medicinal plants have functioned

not merely as therapeutic agents but as integral components of a holistic healthcare framework, wherein disease is conceptualized as an imbalance of physiological, environmental, and metabolic factors. Within this paradigm, *D. sissoo* has been consistently acknowledged for its multifaceted therapeutic applications, particularly in conditions associated with inflammation, gastrointestinal disturbances, dermatological disorders, and systemic toxicity. Ayurvedic interpretations associate its actions with properties such as *shothahara* (anti-inflammatory) and *krimighna* (antimicrobial), indicating its enduring clinical relevance.

In traditional practices across rural and tribal communities, the bark and leaves are utilized in formulations such as decoctions, poultices, and infusions. The bark is commonly employed as a blood purifier and in the treatment of piles, ulcers, and skin diseases, whereas the leaves are applied in managing joint pain, swelling, and inflammatory conditions. These applications reflect region-specific adaptations based on ecological availability and cumulative empirical knowledge. Importantly, such traditional uses exhibit strong concordance with contemporary pharmacological findings, suggesting a meaningful convergence between indigenous knowledge systems and modern scientific validation [6], [11].

The transition from traditional knowledge to empirical scientific frameworks represents a critical evolution in understanding *D. sissoo*. While traditional systems rely on experiential observations, modern research employs analytical and experimental methodologies to elucidate mechanisms of action and isolate bioactive compounds. This transition has enabled the scientific validation of traditional claims, positioning *D. sissoo* as a model example where ethnomedicinal knowledge informs and guides pharmacological investigation.

3. Pharmacological Profile of Bark: The bark of *Dalbergia sissoo* constitutes a pharmacologically active component, enriched with neoflavonoids, phenolics, and tannins that contribute to its diverse biological activities. Among these, antinociceptive activity has been extensively evaluated using experimental models such as the tail flick method in Wistar rats. Administration of ethanolic bark extracts at graded doses (300–1000 mg/kg) produces a significant, dose-dependent increase in pain threshold, comparable to standard analgesic agents. This effect is largely attributed to the modulation of prostaglandin synthesis pathways mediated by flavonoid constituents, indicating both peripheral and central analgesic mechanisms [2], [7].

In addition to its analgesic potential, the bark demonstrates substantial anti-inflammatory activity, as evidenced by carrageenan-induced paw edema models. The observed reduction in inflammation is associated with inhibition of inflammatory mediators and stabilization of cellular membranes. Phytochemical analyses further reveal the presence of proteins, amino acids, and phenolic compounds that synergistically contribute to these effects. Moreover, antioxidant capacity has been confirmed through multiple in vitro assays, including DPPH radical scavenging, ferric reducing antioxidant power (FRAP), and metal ion chelation. These findings indicate a strong ability of bark extracts to neutralize reactive oxygen species and mitigate oxidative stress-induced cellular damage [12], [13].

Toxicological studies suggest a high safety margin, with no significant acute toxicity observed up to 3000 mg/kg body weight. This reinforces the therapeutic potential of bark extracts, particularly in comparison with synthetic pharmacological agents that often exhibit adverse effects.

4. Pharmacological Profile of Leaf : The leaves of *Dalbergia sissoo* exhibit a distinct yet complementary pharmacological profile, primarily characterized by anti-inflammatory, anti-arthritic, and immunomodulatory activities. Experimental investigations using aqueous and alcoholic extracts have demonstrated significant inhibition of inflammatory responses, thereby validating their traditional use in managing joint disorders and chronic inflammatory conditions. Isoflavones such as biochanin-A and genistein play a central role in modulating inflammatory pathways and enhancing cellular resilience [14], [15].

Beyond inflammatory conditions, leaf extracts have shown promising efficacy in chronic and metabolic disorders. Anti-diabetic studies report reductions in blood glucose levels and improvements in lipid profiles, suggesting a regulatory role in metabolic homeostasis. Additionally, neuroprotective and cardioprotective effects observed in experimental models highlight the broader systemic relevance of leaf-derived phytochemicals.

Comparatively, while bark exhibits more pronounced localized pharmacological actions such as analgesic and acute anti-inflammatory effects, leaves demonstrate a wider spectrum of systemic activity, particularly in chronic disease modulation. This complementary relationship underscores the integrative therapeutic potential of different plant parts.

5. Mechanistic Insights and Biochemical Pathways: The pharmacological efficacy of *Dalbergia sissoo* is mediated through complex biochemical pathways involving oxidative stress regulation, enzyme modulation, and molecular signaling mechanisms. A central aspect of its activity is the scavenging of reactive oxygen species (ROS), which are critically implicated in the pathogenesis of chronic diseases. Flavonoids and phenolic compounds act as potent antioxidants, neutralizing free radicals and protecting cellular components from oxidative damage [15].

Another key mechanism involves the inhibition of nitric oxide synthesis, a major contributor to inflammatory processes. By modulating nitric oxide levels, *D. sissoo* extracts effectively attenuate inflammation and prevent associated tissue damage. Furthermore, the inhibition of cyclooxygenase (COX) and lipoxygenase (LOX) pathways plays a significant role in reducing inflammatory mediators,

thereby contributing to both anti-inflammatory and analgesic effects.

The therapeutic efficacy is further enhanced by the synergistic interaction of multiple phytochemicals. This polypharmacological mode of action enables simultaneous modulation of diverse biological targets, distinguishing *D. sissoo* from conventional single-compound synthetic drugs and contributing to improved safety and efficacy profiles.

6. Therapeutic Potential and Clinical Relevance : The therapeutic scope of *Dalbergia sissoo* extends across a broad spectrum of pathological conditions, including metabolic, inflammatory, infectious, and degenerative disorders. In the context of diabetes management, both bark and leaf extracts exhibit significant hypoglycemic effects, primarily attributed to polyphenols and related bioactive compounds. Similarly, their anti-inflammatory properties support their application in conditions such as arthritis, skin diseases, and chronic inflammatory disorders. Compared to synthetic drugs, plant-based therapeutics derived from *D. sissoo* offer notable advantages, including lower toxicity, multi-target mechanisms, and improved patient tolerability. However, challenges such as variability in phytochemical composition and lack of standardization limit their direct clinical application.

Despite these limitations, the integration of traditional knowledge with modern pharmacological research provides a strong foundation for the development of novel plant-based therapeutics. Continued research focusing on standardization, clinical validation, and formulation strategies is essential to fully realize the medicinal potential of *D. sissoo*.

7. Limitations and Future Research Directions : Despite the substantial pharmacological evidence supporting the medicinal applications of *Dalbergia sissoo*, several limitations constrain its full clinical translation. A significant proportion of existing studies remain confined to in vitro experiments and animal models, with relatively limited human clinical trials available to conclusively establish efficacy and safety. This gap highlights the necessity for well-designed, controlled clinical investigations to validate its therapeutic potential in human populations.

Additionally, the lack of standardized extraction protocols and variability in phytochemical composition across different plant parts present challenges in reproducibility and consistency. Factors such as geographical variation, seasonal influences, and processing methods further contribute to this inconsistency.

Future research should therefore prioritize the development of standardized formulations, rigorous pharmacokinetic evaluations, and advanced drug delivery systems. In particular, emerging approaches in nanomedicine and phytochemical encapsulation offer promising avenues to enhance bioavailability, stability, and targeted therapeutic action. Addressing these limitations is essential for bridging the gap between experimental evidence and clinical application.

8. Standardization and Extraction Strategies of Dalbergia sissoo: The progression of *Dalbergia sissoo* from a traditionally utilized medicinal plant to a clinically viable therapeutic entity necessitates a robust framework of standardization and extraction optimization. While its phytochemical diversity and pharmacological efficacy have been well established, their reproducibility and translational applicability are fundamentally dependent on consistency in extraction procedures and precise quantification of bioactive constituents.

Extraction strategies critically influence the qualitative and quantitative composition of phytochemicals. Solvent systems such as aqueous, methanolic, ethanolic, and non-polar solvents (hexane, ethyl acetate) have been extensively employed to isolate distinct classes of compounds. Among these, ethanolic extracts consistently demonstrate superior pharmacological efficacy, particularly in anti-inflammatory, antinociceptive, and antimicrobial activities, owing to their ability to extract both polar and moderately non-polar compounds. In contrast, aqueous extracts have shown relatively enhanced antioxidant activity in certain assays, reflecting efficient extraction of hydrophilic phenolic constituents [12], [13].

The solvent-dependent variability in phytochemical yield underscores the importance of selecting appropriate extraction methods aligned with specific therapeutic objectives. Methanolic extracts are widely utilized in phytochemical profiling due to their broad extraction capacity, whereas ethyl acetate fractions are enriched with semi-polar flavonoid aglycones, and hexane extracts primarily contain lipophilic constituents such as sterols and terpenoids.

A major challenge in the medicinal application of *D. sissoo* lies in the absence of standardized formulations. Variability arising from environmental conditions, harvesting practices, and processing techniques significantly affects phytochemical composition, thereby influencing therapeutic efficacy and safety. Establishing standardized protocols, including chromatographic fingerprinting, marker compound quantification, and bioactivity validation, is therefore imperative.

Bioavailability further represents a critical consideration. Crude plant extracts often exhibit limited absorption and systemic distribution due to their complex phytochemical matrices. To overcome these limitations, contemporary research increasingly focuses on advanced delivery systems such as nanoparticle-based carriers, liposomal encapsulation, and phytochemical conjugation. These approaches enhance solubility, stability, and targeted delivery, thereby improving therapeutic efficiency.

Integration of traditional extraction knowledge with modern analytical techniques, including high-performance liquid chromatography (HPLC), gas chromatography–mass spectrometry (GC–MS), and high-performance thin-layer

chromatography (HPTLC), offers a scientifically robust pathway for the development of standardized herbal formulations.

Table 2: Solvent-Based Extraction and Phytochemical Yield in *Dalbergia sissoo*

Solvent Type	Major Compounds Extracted	Primary Pharmacol -ogical Activity
Aqueous	Phenolics, polysaccharides	Antioxidant, free radical scavenging
Methanol	Flavonoids, tannins, phenolics	Antioxidant, anti-inflammatory
Ethanol	Isoflavonoids,flavonoids, glycosides	Analgesic, anti-inflammatory, antimicrobial
Ethyl Acetate	Flavonoid aglycones, semi-polar compounds	Antibacterial, antioxidant
Hexane	Sterols, terpenoids	Mild antimicrobial, lipid-related effects

In summary, standardization and optimized extraction strategies constitute a critical interface between traditional knowledge and modern pharmacological application. Their refinement is essential for ensuring consistency, safety, and efficacy, thereby facilitating the incorporation of *D. sissoo* into evidence-based therapeutic systems.

Conclusion : The present study provides a coherent and evidence-based evaluation of the medicinal applications of the bark and leaf of *Dalbergia sissoo*, integrating traditional knowledge with contemporary pharmacological validation. The phytochemical richness of the plant, particularly its flavonoids, phenolics, and isoflavonoids, forms the fundamental basis of its diverse biological activities. Comparative analysis indicates that while the bark exhibits pronounced antinociceptive, anti-inflammatory, and antioxidant properties, the leaves demonstrate broader systemic effects, especially in chronic and metabolic disorders.

Mechanistically, the therapeutic efficacy of *D. sissoo* is mediated through oxidative stress modulation, inhibition of inflammatory mediators, and enzyme regulatory pathways, thereby reinforcing its role in disease prevention and management. The study further emphasizes the importance of extraction strategies and standardization in ensuring consistency, safety, and clinical applicability.

Despite its considerable pharmacological promise, the transition of *D. sissoo* into mainstream therapeutics remains constrained by limited clinical validation and lack of standardized protocols. Future research must therefore focus on controlled clinical trials, advanced analytical validation, and innovative delivery systems. Overall, *Dalbergia sissoo* represents a scientifically promising yet underexplored medicinal resource, warranting systematic investigation for its integration into modern healthcare.

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Brand Affinity among Generation Z Consumers : A Pilot Study

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Abstract: Generation Z represents an increasingly important consumer segment for experience-oriented service industries. Understanding their relationships with brands requires measurement approaches that capture favourable attitudes, emotional responses and preference-related outcomes. The present pilot study assesses the preliminary reliability of a multidimensional instrument developed to examine brand affinity among Generation Z consumers across Recreation, Entertainment, Sport and Tourism (REST) consumption contexts. A quantitative pilot study was conducted among 104 respondents selected through purposive sampling. Data were collected using a structured questionnaire and a seven-point Likert scale. The instrument measured four dimensions of brand affinity-positive disposition, emotional connection, favourable brand associations, and likelihood of choosing the brand over competitors-along with brand experience, brand communication and choice overload. Descriptive statistics and Cronbach's alpha were employed to assess the preliminary characteristics and internal consistency of the instrument. The overall instrument demonstrated high internal consistency, while construct-level Cronbach's alpha values ranged from 0.797 to 0.966. Item–rest correlations were $\geq$0.50, and no items were removed based on the reliability analysis. The findings provide preliminary support for the internal consistency of the instrument and its use in the subsequent main study.
Keywords: Brand Affinity, Generation Z, REST Industry.

Introduction - Experience-oriented industries have become important contexts for consumer-brand interaction, as consumers encounter brands through multiple sensory, affective, cognitive and behavioural touchpoints, including brand communications and consumption environments (Brakus, et. al., 2009). In recreation, entertainment, sport and tourism, such interactions are closely associated with consumers' experiences of services, environments and other brand-related encounters. Research in sport, for example, highlights the importance of service, social and communication encounters in shaping consumer experience and behaviour (Karg, et. al., 2017).

Brand affinity is relevant in this context because consumer-brand relationships can involve favourable attitudes, emotional connections, associations and behavioural preferences. Research on consumer-brand relationships demonstrates that brands can acquire emotional and personally meaningful significance for consumers, extending beyond purely functional evaluations (Batra, et. al., 2012; Bagozzi, et. al., 2021).

Generation Z is particularly relevant to this area of inquiry because its consumption takes place within an increasingly digital and interconnected environment in which consumers encounter numerous brands and communication channels. This makes the examination of how younger consumers develop relationships with brands particularly relevant to contemporary consumer research.The Recreation, Entertainment, Sport and Tourism (REST) industry provides a diverse setting for examining such relationships. Although these segments differ in their specific offerings, they involve substantial consumer interaction with services, experiences and brand-related stimuli.

Against this background, the present study reports a pilot assessment of a structured instrument developed to measure brand affinity and related constructs among Generation Z consumers. The pilot focuses on the preliminary reliability and suitability of the instrument before its application in the main study.

Review of Literature

1. Brand Affinity: Brand affinity reflects a favourable orientation towards a brand and the development of a positive consumer-brand relationship. It incorporates affective and preference-related responses that may distinguish a preferred brand from competing alternatives. Keller (2003) emphasised the importance of strong, favourable and unique brand associations in developing customer-based brand equity.

In the present study, brand affinity is operationalised through four dimensions: positive disposition, emotional connection, favourable brand associations, and likelihood of choosing the brand over competitors(Keller, K. L., 2003). This multidimensional approach captures different aspects of consumers' relationships with brands.

2. Brand Experience: Brand experience refers to consumers' responses arising from interactions with brand-related stimuli. Brakus, et. al. (2009) conceptualised brand experience through sensory, affective, behavioural and intellectual dimensions and demonstrated its relevance as a distinct consumer-brand construct.

Experience is particularly significant in service industries, where service delivery, ambience, interaction and the overall consumption environment form an important part of the offering. Accordingly, brand experience is included among the constructs assessed by the present instrument.

3. Brand Communication: Brand communication encompasses the ways through which brands communicate with consumers, including advertising, social media, promotional communication and brand messaging. The expansion of digital platforms has increased both the frequency and diversity of consumer encounters with brands.

Voorveld (2019) highlights the importance of social-media environments in contemporary brand communication. Such communication can shape consumer perceptions and reinforce brand-related meanings. The present instrument therefore incorporates items relating to brand communication.

4. Choice Overload: Consumers increasingly encounter numerous alternatives within service categories. While variety may provide greater freedom of choice, an extensive set of alternatives can also increase decision-making difficulty.

Iyengar, et. al. (2000) demonstrated that larger choice sets can, under certain circumstances, reduce consumers' motivation to make a choice. Chernev, et. al. (2015) subsequently noted that the effects of choice overload depend on contextual and individual factors.

The availability of numerous competing offerings across REST contexts makes choice overload a relevant construct for inclusion in the broader research instrument.

Research Objective: The present pilot study aims to assess the preliminary reliability and suitability of the structured instrument developed to measure brand affinity and related constructs among Generation Z consumers in REST consumption contexts.

Research Methodology

1. Research Design: The broader research adopts a mixed-methods approach involving exploratory qualitative research through literature review and focus group discussions, followed by a descriptive quantitative phase using a structured questionnaire.

The present paper focuses exclusively on the pilot conducted as part of the quantitative phase.

2. Population and Sampling: The study population comprises Generation Z consumers who use services in the REST industry. The sampling unit is an individual Gen Z consumer with experience of brands in the relevant consumption contexts.

A total of 104 respondents participated in the pilot study. Purposive sampling was employed to select respondents meeting the study requirements.

3. Data Collection: Primary data were collected using a structured questionnaire. Measurement statements were assessed on a seven-point Likert scale, ranging from 1 = Strongly Disagree to 7 = Strongly Agree. The questionnaire consisted of demographic questions, segment identification, and measurement items.

4. Structure of the Questionnaire: The principal constructs and number of measurement items were as shown in table 1 below:

Construct	Number of Items
Positive Disposition	4
Emotional Connection	5
Favourable Brand Associations	5
Likelihood of Choosing the Brand over Competitors	4
Brand Experience	6
Brand Communication	6
Choice Overload	4

Table 1: List of principal constructs and number of measurement items

The four dimensions of brand affinity were measured through a total of 18 items. Brand experience, brand communication and choice overload were measured through 6, 6 and 4 items respectively.

5. Data Analysis: The pilot data were analysed using frequency distributions, descriptive statistics and Cronbach's alpha. Frequency distributions were used to describe respondent characteristics, descriptive statistics were used to examine item-level response patterns, and Cronbach's alpha was calculated to assess internal consistency of the measurement scales.

The pilot study was primarily undertaken for preliminary instrument assessment. Accordingly, the present paper does not report hypothesis testing or inferential conclusions regarding the relationships among the broader research constructs.

Results and Findings

1. Profile of Respondents: The pilot study included 104 Generation Z respondents. The sample represented all four REST contexts as shown in table 2, allowing the instrument to be examined across different consumption settings.

REST Segment	Frequency
Recreation	36
Entertainment	24
Sport	24
Tourism	20
Total	**104**

Table 2: Frequency distribution of pilot study respondents across the REST segments

Recreation represented the largest segment with 36 respondents, followed by entertainment and sport with 24 respondents each and tourism with 20 respondents.

The gender distribution was relatively balanced, comprising 53 female respondents and 51 male respondents. With respect to education, 89 respondents were graduates, 10 had completed 12th/HSC and 5 were postgraduates.The occupation profile consisted predominantly of students, with 102 respondents being students and 2 being working professionals. Regarding marital status, 99 respondents were single, 3 were married and 2 preferred not to say.

Monthly household income was distributed across all categories included in the questionnaire. The largest category was Rs. 25,001–Rs. 50,000, with 30 respondents, followed by Rs. 1,00,001–Rs. 2,00,000 with 19 respondents and above Rs. 3,00,000 with 18 respondents.

2. Descriptive Statistics: The descriptive analysis indicated that the mean scores for most measurement items were above the midpoint of 4 on the seven-point Likert scale, indicating generally positive responses.

The Favourable Brand Associations item FBA2 recorded a mean of 5.29, representing one of the relatively higher item-level means. In comparison, the lowest reported mean values occurred within the Emotional Connection construct, at approximately 4.49.

The standard deviations across the measurement items ranged approximately from 1.3 to 2.0, indicating moderate variability in respondent responses.

These findings indicate that the instrument generated generally favourable responses while retaining variability across respondents.

3. Reliability Analysis: Cronbach's alpha was calculated for the overall instrument and each construct. The results are presented below in table 3.

Construct	Cronbach's Alpha
Overall Instrument	0.968
Positive Disposition	0.797
Emotional Connection	0.869
Favourable Brand Associations	0.925
Likelihood of Choosing the Brand over Competitors	0.887
Brand Experience	0.910
Brand Communication	0.966
Choice Overload	0.911

Table 3: Cronbach's alpha value for the overall instrument and each construct

All constructs achieved Cronbach's alpha values above 0.70, indicating satisfactory internal consistency. The lowest coefficient was observed for Positive Disposition ($\alpha = 0.797$), while Brand Communication recorded the highest construct-level coefficient ($\alpha = 0.966$). The overall instrument demonstrated high internal consistency($\alpha = 0.968$).

The reported item–rest correlations were all ≥ 0.50, providing additional evidence of internal consistency. No items were removed based on the Cronbach's alpha analysis.

Discussion: The pilot findings provide preliminary support for the internal consistency of the proposed instrument. All constructs exceeded the commonly applied threshold of 0.70, while the overall scale demonstrated a high alpha coefficient of 0.968.

The four dimensions used to operationalise brand affinity also demonstrated satisfactory reliability, with coefficients ranging from 0.797 to 0.925. This supports their continued assessment as distinct dimensions of the broader construct in the main study.

The descriptive results showed generally favourable responses, although the variation in item scores indicates that respondents did not respond uniformly across all dimensions. The comparatively higher score for favourable brand associations and lower values within emotional connection suggest that different aspects of the consumer-brand relationship may be experienced at different levels. The findings are consistent with the broader emphasis on multidimensional measurement of consumer-brand constructs. Brakus et al. (2009), for instance, demonstrated the value of multidimensional measurement in examining brand experience.

Importantly, the pilot establishes internal consistency. The results therefore support taking the instrument forward for further validation and analysis using the larger main-study sample.

Implications: The pilot provides a preliminary methodological basis for using the instrument in the main study. The satisfactory reliability coefficients and item–rest correlations indicate that the measurement items demonstrate sufficient internal consistency for further investigation.

From a research perspective, the findings support the multidimensional operationalisation of brand affinity and the inclusion of the related constructs in the broader research framework. Further statistical analysis using the main-study sample will be necessary to examine relationships among the variables.

For practitioners in experience-oriented industries, the multidimensional approach highlights that consumer-brand relationships may encompass favourable perceptions, emotional responses, associations and choice preferences. However, these implications remain preliminary given the pilot nature of the study.

Limitations of the Pilot Study: The findings of the present pilot study should be interpreted in light of its exploratory purpose and methodological limitations.First, the pilot study was based on 104 respondents selected through purposive sampling. Consequently, the findings cannot be generalised to the entire Generation Z population.Second, the respondent profile was heavily concentrated among students, with 102 of the 104 respondents being students.

This limits the extent to which the findings can represent the broader occupational characteristics of Generation Z.Third, the respondents were distributed unevenly across the four REST segments, with recreation accounting for 36 respondents and tourism for 20 respondents. The larger study can provide broader and more balanced representation.Finally, the present analysis is limited to descriptive statistics and internal consistency. Further analyses are required to assess relationships among the study variables.

Conclusion: The present pilot study assessed the preliminary reliability of an instrument designed to measure brand affinity and related constructs among Generation Z consumers across REST consumption contexts. Based on data from 104 purposively selected respondents, the instrument demonstrated satisfactory internal consistency, with construct-level Cronbach's alpha values ranging from 0.797 to 0.966 and an overall alpha of 0.968. Item–rest correlations were e"0.50, and no items were removed during the reliability assessment.

The findings provide sufficient preliminary support for taking the instrument forward to the main study. However, the pilot's sample characteristics and limited analytical scope mean that the results should be regarded as preliminary. The main study will provide further evidence through a larger sample and more extensive statistical analysis. The pilot study consequently represents an important methodological stage in establishing the suitability of the research instrument for investigating brand affinity among Generation Z consumers.

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Stronger Than Stereotypes: Women Redefining Sports

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Introduction: Sports is the most public stage where gender inequality has played out. It's visible. There are cameras, scoreboards, world records, and medals. But for most of history, that stage had a sign that said: "No Women Allowed."

Despite that, women kept showing up. They ran, lifted, fought, swam, and won — not just against opponents, but against laws, traditions, stereotypes, and pay gaps.

This is not just a story of records. It's a story of rights, space, and respect.

Keywords: Breaking barriers, Athletics, Women Empowerment, Gender Discrimination.

1. The Beginning: "Sports Are Not For Girls": In the 19th and early 20th century, the idea that women should play competitive sports was considered dangerous.

Doctors claimed running would damage a woman's reproductive system. Schools told girls to play gently. Society called athletic women "unfeminine."

i. 1896 Athens Olympics – The first modern Olympics. Women were not allowed to compete at all. Pierre de Coubertin, the founder, said a woman's role was to "crown the victors."

ii. 1900 Paris Olympics – 22 women competed, in just 5 sports: Tennis and Golf. They had to wear long skirts and corsets.

iii. 1928 Amsterdam – Women ran the 800m for the first time. Some runners looked tired at the finish. Newspapers wrote: "Too strenuous for women." The IOC banned the women's 800m for 32 years. It returned in 1960.

From the very beginning, every meter was a fight.

2. The Big Barriers That Were Broken

A. Legal Barrier: Title IX – USA 1972

The biggest game-changer in sports history.

Title IX stated: _"No person in the US shall, on the basis of sex, be excluded from participation in any education program receiving federal aid."_

The impact:

- 1972: 1 girl for every 27 boys in school sports
- 2019: 1 girl for every 2.4 boys

Without Title IX, there would be no Serena Williams, no Simone Biles, no Megan Rapinoe. Billie Jean King said, "Title IX didn't give me opportunity. It gave my mother opportunity."

B. Social Barrier: "Good Girls Don't Play": In many countries, the biggest match was getting permission from family.

In India in the 1980s, PT Usha's mother supported her, but neighbors asked, "Who will marry her?"

The Phogat sisters from Haryana were told wrestling was "not for girls." Their father built an akhada in the village. Today Geeta, Babita, and Vinesh are Commonwealth and Olympic medalists.

C. Economic Barrier: The Pay Gap: In 2016, the US Women's Soccer Team earned 38% of what the men's team earned — even though the women had won 4 World Cups. Led by Megan Rapinoe, they sued. In 2022 they won a $24 million settlement and equal pay going forward.

In tennis, Wimbledon only introduced equal prize money in 2007. The excuse before that? "Men play 5 sets."

D. Body and Media Barrier

Female athletes face two tests: performance and appearance.

Caster Semenya was barred from racing due to natural testosterone levels.

Serena Williams was called "too muscular."

Commentators still say, "She played well for a girl."

3. Records That Made History

- **Track & Field**

a. Florence Griffith Joyner "Flo-Jo" 1988: 100m – 10.49 seconds. Still the world record, 36 years later.

b. Allyson Felix: Most decorated US track athlete in Olympic history with 11 medals. Won bronze in Tokyo 2021, 10 months after giving birth.

c. Dutee Chand: India's fastest woman. National record 11.22s in 100m. Fought and won a case against IAAF's rules on testosterone, becoming the first Indian athlete to openly come out as gay.

- **Cricket**

a. Mithali Raj: 23-year career. 7,805 runs in WODIs – the most by anyone in the world.

b. Jhulan Goswami: 255 wickets in WODIs – the most by any woman.
c. Harmanpreet Kaur 2017: 171_ off 115 balls vs Australia in the World Cup semi-final. After that innings, viewership for women's cricket in India tripled.
d. WPL 2023: The first Women's Premier League. Smriti Mandhana sold for $432,000. Money came in. The system changed.

- **Badminton**

a. PV Sindhu: First Indian woman to win Olympic silver 2016, then bronze 2021. World Champion 2019.
b. Saina Nehwal: Reached World No.1. Olympic bronze 2012. After her, every street in India had a badminton racket.

- Wrestling, Boxing, Weightlifting

a. Mary Kom: 6-time World Champion. Olympic bronze 2012. Returned to the ring after having 5 children.
b. Sakshi Malik: 2016 Rio – India's first female Olympic wrestling medalist. Bronze.
c. Mirabai Chanu: Tokyo 2020 – Silver. India's first Olympic medal in weightlifting by a woman.

- **Football**

a. Marta: Brazil. 17 World Cup goals – a record for men and women.
b. Megan Rapinoe: 2 World Cups, Olympic gold. Became the loudest voice for equal pay off the field.
c. Sam Kerr: Australia's captain. Top scorer in the Premier League.

- **Tennis**

a. Serena Williams: 23 Grand Slams. Won the 2017 Australian Open while 2 months pregnant. Came back to finals after maternity.
b. Billie Jean King 1973: "Battle of the Sexes." Beat 55-year-old Bobby Riggs. 90 million people watched on TV. After that, no one could call women's tennis a "joke."

- **Other Fields**

a. Simone Biles: Gymnastics. 25 World + Olympic medals. Spoke openly about "the twisties" and mental health, breaking stigma.
b. Katie Ledecky: Swimming. Her 1500m freestyle times are close to men's records.
c. Manu Bhaker: At 18, won 2 Olympic bronze medals in Paris 2024. First Indian woman to win 2 medals in a single Olympics.

4. The Indian Story: India's barriers were even higher — gender + class + village.

i. PT Usha "Payyoli Express" 1980s: Finished 4th in 400m hurdles at 1984 Olympics. Missed bronze by 1/100th of a second. After her, tracks came up in schools across Kerala.
ii. Karnam Malleswari 2000: Bronze in Sydney. First Indian woman to win an Olympic medal. Then a 20-year gap.
iii. 2016 Rio: Sakshi and Sindhu won medals on the same day. That night, fathers across India thought, "My daughter can too."
iv. Tokyo 2020: Mirabai – Silver. Lovlina – Bronze. PV Sindhu – Bronze. 3 women.

Paris 2024: Manu Bhaker – 2 bronzes.
Challenges remain: funding, coaches, grounds, safety. But "you can't" is said far less now.

5. Barriers That Still Exist:

i. Media Coverage: Men's sports get 90% of TV time. The Women's World Cup Final still gets 30-second highlights.
ii. Pay Gap: FIFA Women's World Cup 2023 prize money = $110 million. Men 2022 = $440 million. 4x difference.
iii. Maternity: Until 2019, Nike cut pay for pregnant athletes. Allyson Felix left and started her own brand.
iv. Safety: Many girls can't practice at night. They need safe infrastructure and trustworthy coaches.
v. Uniform Policing: Beach volleyball once required bikinis. Shorts were only allowed in 2021. Norway's handball team was fined for wearing shorts instead of bikini bottoms.

6. Why This Fight Matters: Sports is not just a game. It does 3 things:

1. Bodily Freedom: When a girl runs, jumps, and builds muscle, she breaks the "weak" stereotype.
2. Economic Freedom: One WPL contract can equal 10 years of family income. Sports means scholarships, jobs, and identity.
3. The Role Model Effect: Harvard research shows that in schools with girls' sports teams, girls have better grades and higher confidence.

When an 8-year-old girl watches Harmanpreet hit a six on TV, "cricketer" becomes an option in her mind, alongside "doctor" or "teacher."

7. What's Needed:

1. Grounds and coaches at the grassroots level
2. Equal media deals
3. Maternity protection policies in every federation
4. 1 hour of compulsory sports for every girl in school

Conclusion: Records Aren't Just On The Scoreboard

Every time a woman breaks the finish line, she's not just winning a race. She's breaking the idea that said, "You can't."
As Billie Jean King said: "Champions keep playing until they get it right."
That's what women in sports are doing today. Breaking records. And breaking barriers along the way.
The next record? It might be a girl from a village, who right now only has an open field and a dream.

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Black Datura (*Datura metel*): A Brief Study of Its Leaves

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Abstract: *Datura metel*, commonly known as Black Datura, occupies a significant position in traditional botanical literature owing to its striking morphology, potent bioactive profile, and longstanding medicinal associations [1], [2]. Among its various organs, the leaf represents one of the most functionally important structures, serving not only as a primary photosynthetic unit but also as a major reservoir of secondary metabolites such as tropane alkaloids, phenolics, tannins, and related phytoconstituents. Despite the frequent mention of the species in ethnomedicinal discourse, focused academic treatments devoted specifically to leaf structure, composition, and applied significance remain comparatively limited. The present paper offers a concise yet critical study of the leaves of *Datura metel* through botanical, phytochemical, therapeutic, and toxicological perspectives [3], [4].

The study aims to examine the taxonomic identity and morphological characteristics of the leaves, evaluate their medicinal relevance in traditional systems, and assess the scientific concerns associated with their toxic nature. Special attention is given to the dual character of the plant: on one hand, its leaves have been historically employed in practices relating to respiratory discomfort, inflammatory conditions, dermal disorders, and analgesic applications; on the other hand, the presence of atropine, scopolamine, and hyoscyamine demands rigorous caution in handling and usage. This paradox between utility and toxicity makes the species an important subject of scholarly investigation.

Available literature indicates that the leaves possess notable pharmacological potential including antimicrobial, antioxidant, anti-inflammatory, bronchodilatory, and wound-healing tendencies under controlled conditions. However, indiscriminate use, inaccurate identification, and non-standardized dosage may result in severe physiological consequences [5]. Therefore, a balanced scientific approach is necessary.

The paper concludes that the leaves of *Datura metel* deserve continued interdisciplinary study in pharmacognosy, medicinal botany, and toxicology. Their traditional relevance may be strengthened through evidence-based validation, standardization protocols, and responsible therapeutic exploration [6].

Keywords: Black Datura, *Datura metel*, Leaf Morphology, Medicinal Plant, Phytochemistry, Toxicology, Ethnobotany, Solanaceae.

Introduction - Black Datura, botanically recognized as *Datura metel* L., is a prominent species of the family Solanaceae and is widely known for its ornamental appearance, narcotic potency, and medicinal history [1], [7]. The plant is distinguished by robust growth, broad leaves, trumpet-shaped flowers, and spiny capsules. In South Asian traditions it has long been associated with ritual, therapeutic, and folk-healing contexts. The vernacular names attached to the species across linguistic regions indicate its deep cultural familiarity. Yet, despite widespread recognition, the plant continues to evoke caution because of its toxic alkaloidal composition [8].

The term “Black Datura” generally refers to darker-stemmed or purple-tinged forms of *Datura metel*, which are frequently observed in cultivated and semi-wild habitats. Its dramatic visual form has often overshadowed the scientific importance of its vegetative organs, particularly the leaves, which constitute one of the most biologically active portions of the plant.

Botanical Importance of *Datura metel:* Within the genus *Datura*, *D. metel* is regarded as a species of notable taxonomic and pharmacological interest. It exhibits adaptive growth across tropical and subtropical climates and thrives in disturbed soils, roadsides, gardens, and marginal habitats. Botanically, the species demonstrates marked variability in pigmentation, floral morphology, and vegetative vigor. Such variability has encouraged comparative studies concerning chemotypes, ecological adaptability, and medicinal value [9].

From a phytobotanical standpoint, *Datura metel* is significant because it synthesizes diverse secondary metabolites, especially tropane alkaloids. These compounds contribute to the plant’s defense mechanisms and simultaneously account for its pharmacological and

toxic effects. Leaves often function as a major site of biosynthesis and accumulation, making them central to scientific investigation [10].

Significance of Leaf Study: The leaf is one of the most diagnostically useful and physiologically active organs of higher plants. In *Datura metel*, leaves are typically ovate to broadly elliptic, petiolate, and variably lobed or entire depending on growth conditions and genotype. Their venation pattern, surface texture, coloration, and odor provide useful characters for field identification. Beyond morphology, leaves are of considerable medicinal interest because they contain substantial concentrations of alkaloids and phenolic substances [11].

Traditional systems have used leaf preparations externally and internally for selected ailments, especially respiratory spasm, pain, inflammatory swellings, and skin conditions. Historical practices also include fumigation or smoke-based applications for bronchial distress. Modern scientific studies have further examined leaf extracts for antimicrobial and antioxidant potential. Consequently, leaf-centered research becomes essential for linking classical knowledge with contemporary evidence [12], [13].

Purpose of the Present Study: Although *Datura metel* has been discussed in ethnomedicinal and phytochemical literature, many studies treat the plant in a generalized manner without sufficient concentration on the leaf as a discrete unit of analysis. The present paper seeks to address that gap by presenting a systematic review of the leaves of Black Datura from botanical, medicinal, and safety-oriented perspectives.

The specific objectives are: (i) to outline the identity and structural characteristics of the leaves; (ii) to examine the major phytochemical tendencies reported in literature; (iii) to assess their traditional and emerging medicinal relevance; and (iv) to highlight toxicological concerns requiring scientific prudence. By integrating these dimensions, the study aims to present a concise but academically grounded understanding of one of the most debated leaves in medicinal botany [14].

1. Taxonomic Position of *Datura metel* : The scientific classification of *Datura metel* provides an essential framework for understanding its botanical identity, evolutionary relations, and medicinal relevance. As a member of the family Solanaceae, the species shares taxonomic affinity with several economically and pharmacologically significant plants. Its placement within the genus *Datura* is particularly important because the genus is distinguished by potent alkaloidal chemistry, characteristic floral architecture, and broad ethnobotanical significance. Accurate taxonomic recognition is indispensable not only for botanical scholarship but also for pharmacognostic standardization, as confusion with allied species may lead to serious toxicological consequences [1], [2].

Table 1: Taxonomic Classification of *Datura metel*

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta (Angiosperms)
Class	Magnoliopsida (Dicotyledons)
Order	Solanales
Family	Solanaceae
Genus	*Datura*
Species	*Datura metel* L.

The above classification demonstrates that *Datura metel* belongs to a lineage known for chemically active metabolites and considerable medicinal utility. At the same time, many members of Solanaceae possess toxic constituents, requiring scientific caution in therapeutic interpretation [7].

2. Botanical Description of Black Datura Leaves: The leaves of Black Datura constitute one of the most diagnostically valuable and biologically active organs of the plant. They display notable variation according to age, environmental conditions, and cultivated form; however, certain structural traits remain sufficiently stable for identification. In medicinal botany, leaf morphology often serves as the first criterion for field recognition, collection, and preliminary authentication [14].

Shape of Leaves: Leaves are generally broad, ovate to elliptic-ovate, occasionally somewhat irregular in outline. Mature leaves may appear shallowly lobed or gently undulate, while younger leaves are comparatively smoother in contour. Their expanded lamina gives the plant a dense and vigorous appearance.

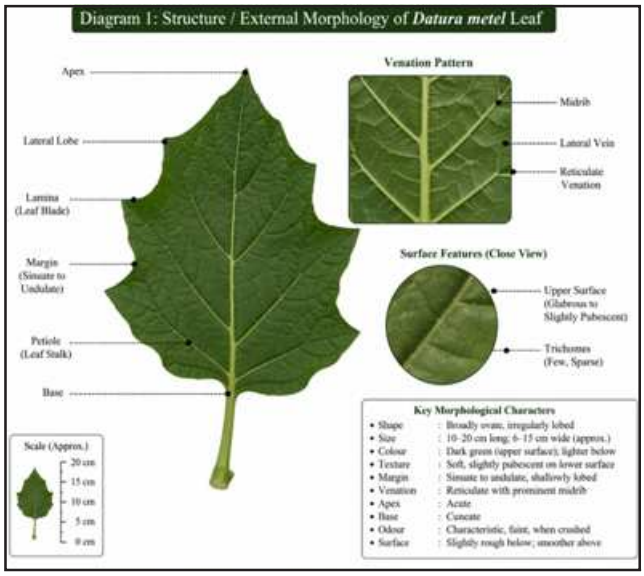
Size and Structure: The leaves are comparatively large, simple, and petiolate, with a soft but substantial laminar body. Under favorable growth conditions, they may attain considerable length and width, reflecting the species' luxuriant vegetative habit. The petiole is distinct and supports a spreading blade adapted for efficient light interception.

Colour and Texture: Leaf colour ranges from deep green to dark green, and in certain black-stemmed ornamental forms may appear more intense because of contrast with purple or dusky stems. The texture is usually soft, somewhat fleshy, and moderately smooth, though mature leaves may become slightly coarse with age.

Margin, Apex and Venation: Margins are entire to sinuately toothed or weakly lobed. The apex is commonly acute to acuminate, while the base tends to be rounded or slightly tapering. Venation is reticulate, with a prominent midrib and clearly spreading lateral veins, contributing both structural support and physiological transport efficiency.

Odour and Surface Nature: When crushed, leaves often emit a strong and characteristic odor associated with the plant's volatile and alkaloidal chemistry. The surface may be glabrous or faintly pubescent depending upon ecological conditions and variety. This sensory feature has historically aided traditional identification, though it cannot substitute scientific authentication [11].

Figure -1



The external morphology of the leaf reflects both adaptive efficiency and taxonomic utility. Its broad lamina enhances photosynthetic performance, while venation and petiole architecture support hydration and mechanical balance.

3. Habitat and Distribution

Natural Habitat: *Datura metel* commonly thrives in open, disturbed, and nutrient-responsive habitats. It is frequently encountered near roadsides, abandoned fields, garden margins, waste lands, village boundaries, and semi-cultivated landscapes. The plant shows remarkable resilience in soils affected by moderate disturbance and seasonal dryness. Such ecological plasticity contributes to its widespread persistence [9].

Climatic Condition: The species flourishes best in warm tropical and subtropical climates. It responds favorably to moderate sunlight, seasonal rainfall, and well-drained soils enriched with organic matter. Although comparatively hardy, prolonged frost and excessive shade restrict vigorous growth. High temperature zones with intermittent moisture generally support luxuriant foliage development.

Distribution in India and Other Regions: In India, *Datura metel* is distributed across plains, peri-urban landscapes, temple surroundings, agricultural edges, and domestic gardens in numerous states. It is especially familiar in northern, western, eastern, and southern regions where warm climatic conditions prevail. Beyond India, the species is reported across South and Southeast Asia, parts of Africa, tropical America, and several subtropical horticultural zones. Its spread has been facilitated both by ornamental cultivation and naturalized seed dispersal [3], [4].

The broad geographical presence of *Datura metel* explains the diversity of vernacular knowledge systems attached to the plant. Nevertheless, regional variation in morphology and phytochemical expression suggests the need for locality-specific study.

4. Traditional and Medicinal Importance of Leaves:

The leaves of *Datura metel* occupy a particularly significant position among the vegetative organs of the plant because they combine diagnostic botanical value with a long history of ethnomedicinal recognition. In numerous traditional systems, leaves were considered more accessible and practically utilizable than roots or seeds, as they could be harvested seasonally with relative ease. Their documented applications, however, were largely empirical in origin and varied widely according to region, healer tradition, and method of preparation. Modern interpretation therefore requires both historical sensitivity and scientific caution.

Folk Uses of Leaves: The leaves of *Datura metel* have occupied a notable place in several traditional healing systems of South Asia and other tropical regions. In village-based ethnomedicinal practices, warmed leaves were historically applied externally over painful joints, localized swellings, muscular stiffness, and chronic discomfort associated with seasonal ailments. In some communities, leaf paste was placed over restricted areas for temporary soothing action. Certain folk traditions also mention the cautious use of processed dried leaf material in respiratory distress; however, such practices are medically unsafe when undertaken without supervision because toxic exposure can occur rapidly. These historical references are best understood as cultural records rather than present-day therapeutic recommendations.

Medicinal Relevance: Phytochemical investigations indicate that the leaves contain tropane alkaloids, phenolic constituents, flavonoid-associated fractions, and other secondary metabolites. These compounds have drawn scholarly attention for possible antispasmodic, antimicrobial, anti-inflammatory, antioxidant, and neuromodulatory relevance. Preliminary pharmacological reports suggest that carefully standardized extracts may possess research value in controlled settings. Nevertheless, uncontrolled therapeutic use remains unsafe because the toxic threshold is narrow, variable, and influenced by plant maturity, ecology, and dosage inconsistency.

External Applications: Historically documented external applications include poultices, pastes, and oil-based preparations for rheumatic discomfort, neuralgic pain, insect irritation, glandular swelling, and certain chronic skin complaints. Such uses were generally localized rather than internal and were often accompanied by traditional restrictions regarding quantity and duration. Modern toxicological understanding demands that any external use should be approached cautiously, as dermal absorption, mucosal contact, and accidental secondary exposure may occur. Accordingly, historical utility should not be equated with routine safety.

Table 2. Traditional Uses of *Datura metel* Leaves

Traditional Context	Leaf Preparation	Reported Purpose
Folk household remedy	Warm leaf compress	Joint pain and swelling
Rural topical	Leaf paste	Skin irritation /

practice		localized inflammation
Traditional smoke use	Dried processed leaf material	Historical respiratory use
Herbal oil preparations	Leaf-infused oil	Muscular discomfort
Ritual-ethno medicinal use	Symbolic/ceremonial use	Cultural significance

5. Toxic Nature and Precautions: Despite its medicinal reputation, *Datura metel* is fundamentally recognized as a toxic plant. The leaves, though sometimes perceived as less hazardous than seeds, still contain potent pharmacologically active constituents capable of producing serious adverse reactions. For this reason, any scholarly treatment of the species remains incomplete without toxicological emphasis.

Toxic Constituents in Leaves: The leaves contain potent tropane alkaloids, chiefly atropine, hyoscyamine, and scopolamine. These compounds exert marked anticholinergic effects on the nervous system, cardiovascular function, secretory glands, and visual pathways. Their concentration may vary with season, maturity, habitat, plant variety, and physiological stage of growth, making casual dosage assumptions unreliable.

Harmful Effects: Improper exposure or ingestion may produce dryness of mouth, intense thirst, dilated pupils, blurred vision, rapid heartbeat, agitation, confusion, hallucinations, impaired coordination, urinary retention, hyperthermia, convulsions, and in severe instances coma. Sensitive individuals may respond strongly even to comparatively small quantities. Toxic reactions can therefore arise unpredictably and should always be treated as medical emergencies.

Safe Handling Precautions: Responsible botanical handling is essential in academic, horticultural, and field contexts. Preventive care is preferable to emergency treatment because symptom onset may be delayed yet progressive.

1. Avoid self-medication or experimental consumption.
2. Use gloves while handling fresh plant material in bulk.
3. Keep away from children and domestic animals.
4. Do not inhale smoke from leaves or seeds.
5. Wash hands and tools after botanical handling.
6. In suspected poisoning, seek immediate emergency medical care.

Discussion: The preceding observations reveal that the leaves of *Datura metel* cannot be interpreted through a single lens of utility or danger. They must instead be understood through an integrated botanical, ethnomedical, phytochemical, and toxicological framework.

The leaves of *Datura metel* represent a compelling intersection of botanical elegance and pharmacological seriousness. Morphologically, the broad ovate leaves are diagnostically significant for species recognition and field identification. Their venation, texture, margin variability, and dark green surface contribute to taxonomic interpretation. Chemically, they function as repositories of bioactive alkaloids and phenolic substances, explaining their long-standing medicinal reputation.

However, traditional esteem must be balanced with scientific caution. Many historical uses emerged before modern dose-standardization, toxicology, and evidence-based therapeutics. Consequently, the same leaf that was valued for pain relief or respiratory applications may also provoke severe poisoning when misidentified, overused, or crudely prepared.

From a research perspective, the species warrants continued study in phytochemistry, controlled pharmacology, toxic dose mapping, and safe derivative drug development. Standardization of extraction methods and validated analytical profiling remain especially important. Public awareness is equally essential so that ornamental familiarity does not lead to casual medicinal misuse or accidental poisoning.

Conclusion: The study of Black Datura leaves demonstrates how a single plant organ may embody ornamental presence, historical medicinal use, and toxicological complexity simultaneously.

Datura metel leaves possess clear botanical, ethnomedicinal, and phytochemical importance. Their traditional relevance is supported by the presence of physiologically active secondary metabolites, yet these same constituents confer substantial toxicity. Therefore, accurate identification, disciplined handling, and strict medical caution are indispensable.

Future investigations should prioritize standardized extraction, compound isolation, toxicity mapping, molecular characterization, and clinically validated applications. Comparative studies across ecological regions may further clarify chemical variation in leaf material. With responsible scholarship, the leaves of Black Datura may remain a subject of scientific value rather than public health risk.

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

विपश्यना साधना और भावनात्मक समायोजन के बीच संबंध : एक मनोवैज्ञानिक विश्लेषण

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शोध सारांश – मानव जीवन में भावनाएँ व्यक्ति के व्यवहार, व्यक्तित्व विकास और सामाजिक संबंधों को निर्धारित करने वाली महत्वपूर्ण मनोवैज्ञानिक प्रक्रियाएँ हैं। वर्तमान युग में तीव्र सामाजिक परिवर्तन, प्रतिस्पर्धा, तकनीकी निर्भरता और जीवनशैली में बदलाव के कारण व्यक्ति तनाव, चिंता, क्रोध, निराशा और भावनात्मक अस्थिरता जैसी समस्याओं का सामना कर रहा है। इन परिस्थितियों में भावनात्मक समायोजन व्यक्ति के मानसिक स्वास्थ्य और जीवन की गुणवत्ता के लिए आवश्यक माना जाता है।

विपश्यना साधना एक प्राचीन ध्यान प्रणाली है जो व्यक्ति को अपने विचारों, भावनाओं और शारीरिक अनुभवों के प्रति सजग बनाती है। यह साधना व्यक्ति को भावनाओं को दबाने के बजाय उन्हें समझने, स्वीकार करने और संतुलित प्रतिक्रिया देने की क्षमता विकसित करती है। आधुनिक मनोविज्ञान में विपश्यना को माइंडफुलनेस आधारित प्रक्रिया के रूप में देखा जाता है, जो आत्म-जागरूकता, भावनात्मक नियंत्रण और मनोवैज्ञानिक कल्याण को बढ़ावा देती है।

प्रस्तुत सैद्धांतिक लेख में विपश्यना साधना और भावनात्मक समायोजन के बीच संबंध का मनोवैज्ञानिक दृष्टिकोण से विश्लेषण किया गया है। इसमें यह स्पष्ट करने का प्रयास किया गया है कि विपश्यना किस प्रकार व्यक्ति की भावनात्मक स्थिरता, तनाव सहनशीलता, आत्म-नियंत्रण और सकारात्मक मानसिक दृष्टिकोण के विकास में योगदान देती है।

शब्द कुंजी – विपश्यना साधना, भावनात्मक समायोजन, माइंडफुलनेस, भावनात्मक विनियमन, मानसिक स्वास्थ्य, आत्म-जागरूकता।

प्रस्तावना – मनुष्य का जीवन केवल बाहरी परिस्थितियों से प्रभावित नहीं होता, बल्कि उसकी आंतरिक मानसिक प्रक्रियाएँ भी उसके अनुभवों और व्यवहार को प्रभावित करती हैं। विचार, भावनाएँ और व्यवहार एक-दूसरे से जुड़े हुए हैं। व्यक्ति जिस प्रकार किसी घटना को समझता है, उसी के अनुसार उसकी भावनात्मक प्रतिक्रिया उत्पन्न होती है।

भावनाएँ मानव जीवन की आवश्यक मनोवैज्ञानिक प्रक्रियाएँ हैं। वे व्यक्ति को परिस्थितियों के अनुसार प्रतिक्रिया देने, निर्णय लेने और सामाजिक संबंध स्थापित करने में सहायता करती हैं। हालांकि, जब भावनाएँ अत्यधिक तीव्र या अनियंत्रित हो जाती हैं, तो वे व्यक्ति के मानसिक संतुलन को प्रभावित कर सकती हैं।

आधुनिक समाज में तनाव और भावनात्मक समस्याएँ तेजी से बढ़ रही हैं। कार्यस्थल का दबाव, पारिवारिक संघर्ष, आर्थिक असुरक्षा और सामाजिक अपेक्षाएँ व्यक्ति में मानसिक तनाव उत्पन्न करती हैं। लंबे समय तक तनाव रहने से व्यक्ति की भावनात्मक स्थिरता कमजोर हो सकती है और चिंता तथा अवसाद जैसी समस्याएँ विकसित हो सकती हैं।

मनोविज्ञान में भावनात्मक समायोजन को व्यक्ति की अनुकूलन क्षमता का महत्वपूर्ण भाग माना जाता है। भावनात्मक रूप से समायोजित व्यक्ति अपनी भावनाओं को पहचानने, नियंत्रित करने और परिस्थितियों के अनुरूप सकारात्मक व्यवहार करने में सक्षम होता है।

इसी संदर्भ में ध्यान आधारित पद्धतियों का महत्व बढ़ा है। विपश्यना साधना व्यक्ति को अपने मानसिक अनुभवों का निरीक्षण करने और भावनाओं के प्रति संतुलित दृष्टिकोण विकसित करने में सहायता करती है। यह व्यक्ति को प्रतिक्रियात्मक व्यवहार से हटाकर जागरूक व्यवहार की ओर ले जाती है।

साहित्य समीक्षा

विपश्यना साधना और माइंडफुलनेस आधारित ध्यान पद्धतियों के मनोवैज्ञानिक प्रभावों को समझने के लिए पिछले वर्षों में अनेक शोध किए गए हैं। इन अध्ययनों से यह स्पष्ट होता है कि ध्यान अभ्यास व्यक्ति की भावनात्मक स्थिरता, तनाव नियंत्रण और मानसिक स्वास्थ्य को सकारात्मक रूप से प्रभावित कर सकता है।

खौर और सिंह (2016) ने माइंडफुलनेस आधारित ध्यान और मनोवैज्ञानिक कल्याण के संबंध का अध्ययन किया। अध्ययन में पाया गया कि नियमित ध्यान अभ्यास करने वाले व्यक्तियों में आत्म-जागरूकता, भावनात्मक संतुलन और तनाव से निपटने की क्षमता अधिक पाई गई। शोधकर्ताओं के अनुसार माइंडफुलनेस व्यक्ति को अपनी भावनाओं को समझने और नियंत्रित करने में सहायता करता है।

गुप्ता और शर्मा (2017) ने भारतीय संदर्भ में ध्यान अभ्यास और भावनात्मक समायोजन के बीच संबंध का अध्ययन किया। उनके निष्कर्षों से पता चला कि ध्यान करने वाले व्यक्तियों में भावनात्मक स्थिरता, सकारात्मक सोच और जीवन संतुष्टि का स्तर अधिक था। उन्होंने बताया

कि ध्यान व्यक्ति में आत्म-नियंत्रण और मानसिक शांति विकसित करता है।

केंग, स्मोस्की और रॉबिन्स (2017) ने माइंडफुलनेस और मनोवैज्ञानिक स्वास्थ्य पर किए गए विभिन्न अध्ययनों की समीक्षा की। उनके अनुसार माइंडफुलनेस अभ्यास तनाव, चिंता और नकारात्मक भावनाओं को कम करने में प्रभावी पाया गया। उन्होंने यह भी बताया कि ध्यान व्यक्ति की भावनात्मक विनियमन क्षमता को मजबूत करता है।

खोलर और सहकर्मियों (2018) ने ध्यान अभ्यास के भावनात्मक नियंत्रण पर प्रभाव का अध्ययन किया। शोध में पाया गया कि नियमित ध्यान करने वाले प्रतिभागियों में भावनाओं को नियंत्रित करने और तनावपूर्ण परिस्थितियों का सामना करने की क्षमता बेहतर थी। अध्ययन ने निष्कर्ष दिया कि माइंडफुलनेस व्यक्ति को प्रतिक्रियात्मक व्यवहार से बचाकर संतुलित प्रतिक्रिया विकसित करने में सहायता करता है।

गोल्डबर्ग और सहयोगियों (2018) ने माइंडफुलनेस-based interventions पर एक मेटा-विश्लेषण किया। अध्ययन में पाया गया कि माइंडफुलनेस कार्यक्रम मानसिक तनाव, चिंता और भावनात्मक समस्याओं को कम करने में मध्यम स्तर तक प्रभावी रहे। शोधकर्ताओं ने सुझाव दिया कि ध्यान मानसिक स्वास्थ्य सुधार के लिए एक उपयोगी सहायक तकनीक हो सकती है।

लोपेज और सहकर्मियों (2019) ने माइंडफुलनेस और भावनात्मक बुद्धिमत्ता के संबंध का अध्ययन किया। परिणामों से पता चला कि नियमित ध्यान अभ्यास आत्म-जागरूकता, सहानुभूति और आत्म-नियंत्रण को बढ़ाता है। शोधकर्ताओं के अनुसार माइंडफुलनेस व्यक्ति की भावनात्मक क्षमताओं को विकसित करने में महत्वपूर्ण भूमिका निभाता है।

लिन और सहयोगियों (2020) ने ध्यान अभ्यास और मनोवैज्ञानिक लचीलापन (psychological resilience) के बीच संबंध का अध्ययन किया। अध्ययन में पाया गया कि माइंडफुलनेस अभ्यास करने वाले व्यक्तियों में कठिन परिस्थितियों से निपटने की क्षमता अधिक थी। शोध ने यह संकेत दिया कि ध्यान भावनात्मक समायोजन और मानसिक मजबूती को बढ़ाने में सहायक है।

गौतम और वर्मा (2021) ने भारतीय युवाओं में ध्यान अभ्यास, तनाव और भावनात्मक संतुलन के संबंध का अध्ययन किया। अध्ययन के अनुसार नियमित ध्यान करने वाले युवाओं में तनाव का स्तर कम और भावनात्मक नियंत्रण बेहतर पाया गया। शोधकर्ताओं ने निष्कर्ष दिया कि विपश्यना जैसी ध्यान पद्धतियाँ आधुनिक जीवन में मानसिक स्वास्थ्य को मजबूत करने में सहायक हो सकती हैं।

भावनात्मक समायोजन की अवधारणा

1. भावनात्मक समायोजन का अर्थ- भावनात्मक समायोजन व्यक्ति की वह क्षमता है जिसके द्वारा वह अपनी भावनाओं को समझता, नियंत्रित करता और परिस्थितियों के अनुसार उचित प्रतिक्रिया देता है। यह मानसिक स्वास्थ्य और व्यक्तित्व विकास का महत्वपूर्ण भाग है।

भावनात्मक रूप से संतुलित व्यक्ति अपनी भावनाओं को दबाने के बजाय उन्हें समझता है और सकारात्मक तरीके से व्यक्त करता है।

2. भावनात्मक समायोजन की विशेषताएँ

(क) भावनात्मक स्थिरता- व्यक्ति कठिन परिस्थितियों में भी शांत और संतुलित रहने में सक्षम होता है।

(ख) आत्म-नियंत्रण- यह व्यक्ति को क्रोध, चिंता और तनाव जैसी भावनाओं को नियंत्रित करने में सहायता करता है।

(ग) सकारात्मक सोच - भावनात्मक रूप से समायोजित व्यक्ति समस्याओं को समाधान के दृष्टिकोण से देखता है।

(घ) सामाजिक अनुकूलन- भावनात्मक संतुलन व्यक्ति को अच्छे सामाजिक संबंध स्थापित करने में सहायता करता है।

3. भावनात्मक समायोजन को प्रभावित करने वाले कारक- भावनात्मक समायोजन पर व्यक्तिगत अनुभव, व्यक्तित्व, पारिवारिक वातावरण, सामाजिक संबंध और मानसिक स्थिति का प्रभाव पड़ता है। सकारात्मक वातावरण और आत्म-जागरूकता भावनात्मक संतुलन को बढ़ाने में सहायक होते हैं।

4. भावनात्मक समायोजन का महत्व - भावनात्मक समायोजन व्यक्ति को तनावपूर्ण परिस्थितियों का सामना करने, उचित निर्णय लेने और स्वस्थ संबंध बनाए रखने में सहायता करता है। यह व्यक्ति के मानसिक स्वास्थ्य और जीवन संतुष्टि के लिए आवश्यक है।

5. विपश्यना और भावनात्मक समायोजन का संबंध - विपश्यना साधना आत्म-जागरूकता, धैर्य, समता और आत्म-नियंत्रण जैसे गुणों का विकास करती है, जो भावनात्मक समायोजन के प्रमुख आधार हैं। इसलिए विपश्यना व्यक्ति को अपनी भावनाओं को बेहतर ढंग से समझने और नियंत्रित करने में सहायता कर सकती है।

विपश्यना साधना और भावनात्मक विनियमन का संबंध- भावनात्मक विनियमन आधुनिक मनोविज्ञान की एक महत्वपूर्ण अवधारणा है, जिसका अर्थ है व्यक्ति की वह क्षमता जिसके द्वारा वह अपनी भावनाओं को पहचानता, समझता और परिस्थितियों के अनुसार नियंत्रित करता है। भावनात्मक विनियमन व्यक्ति को तनावपूर्ण परिस्थितियों में संतुलित रहने और उचित निर्णय लेने में सहायता करता है।

विपश्यना साधना भावनात्मक विनियमन की प्रक्रिया को मजबूत करने में महत्वपूर्ण भूमिका निभाती है। यह व्यक्ति को अपनी भावनाओं को दबाने या उनसे भागने के बजाय उन्हें स्वीकार करने और समझने की क्षमता प्रदान करती है।

1. भावनाओं के प्रति जागरूकता का विकास- अक्सर व्यक्ति अपनी भावनाओं के प्रभाव में तुरंत प्रतिक्रिया देता है। उदाहरण के लिए, क्रोध की स्थिति में व्यक्ति बिना सोचे कठोर व्यवहार कर सकता है। विपश्यना साधना व्यक्ति को अपनी आंतरिक अवस्थाओं का निरीक्षण करना सिखाती है।

जब व्यक्ति यह पहचानने लगता है कि उसके भीतर क्रोध, भय या चिंता उत्पन्न हो रही है, तो वह उस भावना से दूरी बनाकर अधिक संतुलित प्रतिक्रिया दे सकता है। इस प्रकार विपश्यना भावनात्मक जागरूकता को बढ़ाती है।

2. प्रतिक्रिया और व्यवहार के बीच अंतराल- मनोवैज्ञानिक दृष्टिकोण से भावनात्मक नियंत्रण का एक महत्वपूर्ण पहलू है कि व्यक्ति किसी घटना और अपनी प्रतिक्रिया के बीच मानसिक अंतराल विकसित कर सके।

विपश्यना व्यक्ति को यह क्षमता प्रदान करती है कि वह किसी भावना को तुरंत व्यक्त करने के बजाय पहले उसे समझे। यह प्रक्रिया आवेगपूर्ण व्यवहार को कम करती है और आत्म-नियंत्रण को बढ़ाती है।

3. नकारात्मक भावनाओं का प्रबंधन- चिंता, भय, ईर्ष्या और क्रोध जैसी भावनाएँ व्यक्ति के मानसिक स्वास्थ्य को प्रभावित कर सकती हैं।

विपश्यना इन भावनाओं को समाप्त करने का प्रयास नहीं करती, बल्कि व्यक्ति को उनके वास्तविक स्वरूप को समझने में सहायता करती है।

जब व्यक्ति यह समझता है कि भावनाएँ अस्थायी होती हैं, तो वह उनसे अत्यधिक प्रभावित नहीं होता। इससे भावनात्मक स्थिरता विकसित होती है।

विपश्यना का न्यूरो-मनोवैज्ञानिक आधार- आधुनिक न्यूरोसाइंस के शोधों ने यह स्पष्ट किया है कि ध्यान अभ्यास मस्तिष्क की संरचना और कार्यप्रणाली को प्रभावित कर सकता है।

1. **प्रीफ्रंटल कॉर्टेक्स और भावनात्मक नियंत्रण-** मस्तिष्क का प्रीफ्रंटल कॉर्टेक्स निर्णय लेने, आत्म-नियंत्रण और भावनाओं को नियंत्रित करने में महत्वपूर्ण भूमिका निभाता है।

नियमित ध्यान अभ्यास इस क्षेत्र की कार्यक्षमता को मजबूत करने में सहायता कर सकता है, जिससे व्यक्ति अधिक सोच-समझकर प्रतिक्रिया देता है।

2. **अमिगडाला और तनाव प्रतिक्रिया-** अमिगडाला मस्तिष्क का वह भाग है जो भय और तनाव जैसी भावनाओं से जुड़ा होता है। अत्यधिक तनाव में अमिगडाला अधिक सक्रिय हो सकता है, जिससे व्यक्ति भावनात्मक रूप से अस्थिर हो सकता है।

ध्यान अभ्यास तनाव प्रतिक्रिया को नियंत्रित करने में सहायक माना जाता है, जिससे व्यक्ति अधिक शांत और संतुलित रह सकता है।

3. **मस्तिष्क की जागरूकता प्रणाली -** विपश्यना व्यक्ति की ध्यान क्षमता और आत्म-जागरूकता से संबंधित मानसिक प्रक्रियाओं को मजबूत करती है। इससे व्यक्ति अपने विचारों और भावनाओं को अधिक स्पष्ट रूप से समझ पाता है।

विपश्यना साधना और भावनात्मक बुद्धिमत्ता का संबंध- भावनात्मक बुद्धिमत्ता आधुनिक मनोविज्ञान की एक महत्वपूर्ण अवधारणा है, जिसका संबंध व्यक्ति की अपनी भावनाओं को समझने, नियंत्रित करने तथा दूसरों की भावनाओं को पहचानने की क्षमता से है। डैनियल गोलमैन के अनुसार भावनात्मक बुद्धिमत्ता व्यक्ति को केवल बौद्धिक क्षमता के आधार पर नहीं, बल्कि भावनात्मक संतुलन और सामाजिक व्यवहार के आधार पर भी सफल बनाती है।

भावनात्मक बुद्धिमत्ता के प्रमुख घटक हैं आत्म-जागरूकता, आत्म-नियंत्रण, प्रेरणा, सहानुभूति और सामाजिक कौशल। विपश्यना साधना इन सभी क्षमताओं के विकास में महत्वपूर्ण भूमिका निभा सकती है।

1. **आत्म-जागरूकता का विकास-** आत्म-जागरूकता भावनात्मक बुद्धिमत्ता का आधार है। इसका अर्थ है व्यक्ति का अपनी भावनाओं, विचारों, इच्छाओं और मानसिक अवस्थाओं को पहचानने की क्षमता।

विपश्यना साधना में व्यक्ति अपने श्वास, शारीरिक संवेदनाओं और विचारों का निरीक्षण करता है। इस प्रक्रिया से व्यक्ति यह समझने लगता है कि उसके भीतर कौन-सी भावनाएँ उत्पन्न हो रही हैं और वे उसके व्यवहार को किस प्रकार प्रभावित कर रही हैं।

उदाहरण के लिए, जब व्यक्ति क्रोध की भावना को केवल अनुभव के रूप में देखना सीखता है, तो वह क्रोध के कारण तुरंत प्रतिक्रिया देने के बजाय शांतिपूर्वक निर्णय लेने में सक्षम होता है।

2. **आत्म-नियंत्रण और भावनात्मक संतुलन-** भावनात्मक बुद्धिमत्ता का दूसरा महत्वपूर्ण पक्ष आत्म-नियंत्रण है। इसका अर्थ है अपनी भावनाओं को नियंत्रित करना और परिस्थितियों के अनुसार उचित प्रतिक्रिया देना।

विपश्यना व्यक्ति को यह सिखाती है कि प्रत्येक भावना अस्थायी होती है। सुखद और दुखद अनुभव स्थायी नहीं रहते। इस समझ के कारण व्यक्ति भावनाओं के अत्यधिक प्रभाव से बच सकता है।

इस प्रकार विपश्यना व्यक्ति में धैर्य, सहनशीलता और भावनात्मक स्थिरता का विकास करती है।

3. **सहानुभूति और सामाजिक संबंधों का विकास-** विपश्यना केवल आत्म-अवलोकन तक सीमित नहीं है, बल्कि यह व्यक्ति में करुणा और सहानुभूति का विकास करती है। जब व्यक्ति अपने मानसिक अनुभवों को समझता है, तो वह दूसरों की भावनाओं को भी बेहतर ढंग से समझने लगता है।

सहानुभूति बेहतर सामाजिक संबंधों, सहयोग और सकारात्मक व्यवहार को बढ़ावा देती है।

विपश्यना और संज्ञानात्मक मनोविज्ञान - संज्ञानात्मक मनोविज्ञान के अनुसार व्यक्ति की भावनाएँ केवल बाहरी घटनाओं से उत्पन्न नहीं होतीं, बल्कि उन घटनाओं के प्रति व्यक्ति की सोच और व्याख्या से प्रभावित होती हैं।

एक ही परिस्थिति में अलग-अलग व्यक्ति अलग-अलग भावनात्मक प्रतिक्रिया दे सकते हैं क्योंकि उनकी सोचने की प्रक्रिया अलग होती है। विपश्यना साधना व्यक्ति की सोचने की प्रक्रिया को समझने और नियंत्रित करने में सहायता करती है।

1. **विचारों के प्रति जागरूकता-** मनुष्य अक्सर अपने विचारों को वास्तविकता मान लेता है। नकारात्मक विचार जैसे- 'मैं असफल हूँ', 'मेरे साथ हमेशा गलत होता है' आदि भावनात्मक तनाव को बढ़ा सकते हैं।

विपश्यना व्यक्ति को यह समझने में सहायता करती है कि विचार केवल मानसिक घटनाएँ हैं, वे अंतिम सत्य नहीं हैं। इससे व्यक्ति नकारात्मक विचारों से दूरी बना सकता है।

2. **संज्ञानात्मक पुनर्मूल्यांकन** - संज्ञानात्मक पुनर्मूल्यांकन का अर्थ है किसी परिस्थिति को नए और सकारात्मक दृष्टिकोण से देखना।

विपश्यना व्यक्ति को कठिन परिस्थितियों को स्वीकार करने और उनके प्रति संतुलित दृष्टिकोण विकसित करने में सहायता करती है।

उदाहरण के लिए, असफलता को केवल नकारात्मक अनुभव मानने के बजाय व्यक्ति उसे सीखने और विकास के अवसर के रूप में देख सकता है।

3. **चिंता और तनावपूर्ण विचारों में कमी-** भविष्य की चिंता और अतीत की नकारात्मक घटनाएँ व्यक्ति के मानसिक स्वास्थ्य को प्रभावित करती हैं। विपश्यना व्यक्ति को वर्तमान क्षण पर केंद्रित करती है, जिससे अनावश्यक चिंतन और मानसिक तनाव कम हो सकता है।

सकारात्मक मनोविज्ञान के संदर्भ में विपश्यना- सकारात्मक मनोविज्ञान मनुष्य की सकारात्मक क्षमताओं, मानसिक कल्याण और जीवन संतुष्टि का अध्ययन करता है। इसका उद्देश्य केवल मानसिक समस्याओं को कम करना नहीं, बल्कि व्यक्ति के जीवन में सकारात्मक गुणों का विकास करना भी है।

विपश्यना साधना सकारात्मक मनोविज्ञान के कई उद्देश्यों से संबंधित है।

1. **मानसिक कल्याण** - विपश्यना व्यक्ति को आत्म-स्वीकृति, मानसिक शांति और संतुलित दृष्टिकोण विकसित करने में सहायता करती

है। इससे व्यक्ति अपने जीवन के प्रति अधिक संतुष्टि अनुभव कर सकता है।

2. **धैर्य और सहनशीलता का विकास–** जीवन में कठिन परिस्थितियाँ स्वाभाविक हैं। विपश्यना व्यक्ति को कठिन अनुभवों से भागने के बजाय उन्हें स्वीकार करने की क्षमता प्रदान करती है।

इससे व्यक्ति में मानसिक दृढ़ता (psychological resilience) विकसित होती है।

3. **करुणा और सकारात्मक भावनाएँ–** विपश्यना व्यक्ति में करुणा, क्षमा और सहानुभूति जैसे सकारात्मक गुणों को बढ़ावा देती है। ये गुण व्यक्ति के सामाजिक और भावनात्मक जीवन को बेहतर बनाते हैं।

4. **जीवन संतुष्टि में वृद्धि–** जब व्यक्ति अपनी भावनाओं और विचारों को संतुलित करना सीखता है, तो वह जीवन की परिस्थितियों को अधिक सकारात्मक दृष्टिकोण से स्वीकार करता है। इससे जीवन संतुष्टि बढ़ सकती है।

आधुनिक जीवन में विपश्यना की उपयोगिता– आधुनिक समाज में तनाव, प्रतिस्पर्धा और मानसिक दबाव तेजी से बढ़ रहे हैं। इस परिस्थिति में मानसिक संतुलन बनाए रखना एक बड़ी चुनौती बन गया है। विपश्यना साधना व्यक्ति को आंतरिक स्थिरता और भावनात्मक संतुलन विकसित करने में सहायता कर सकती है।

1. **व्यक्तिगत जीवन में उपयोगिता–** व्यक्तिगत स्तर पर विपश्यना व्यक्ति को अपनी भावनाओं को समझने और नियंत्रित करने में सहायता करती है। इससे आत्मविश्वास, धैर्य और मानसिक शांति विकसित होती है। यह व्यक्ति को क्रोध, भय और चिंता जैसी भावनाओं को बेहतर ढंग से संभालने में सक्षम बनाती है।

2. **शिक्षा क्षेत्र में उपयोगिता–** विद्यार्थियों के जीवन में परीक्षा तनाव, प्रतिस्पर्धा और भविष्य की चिंता सामान्य समस्याएँ हैं। विपश्यना ध्यान एकाग्रता, आत्म-नियंत्रण और तनाव प्रबंधन में सहायक हो सकता है। यह छात्रों में सकारात्मक सोच और सीखने की क्षमता को बढ़ावा दे सकता है।

3. **कार्यस्थल में उपयोगिता–** व्यावसायिक जीवन में तनाव, समय का दबाव और प्रतिस्पर्धा व्यक्ति के मानसिक स्वास्थ्य को प्रभावित कर सकते हैं। विपश्यना कर्मचारियों में तनाव नियंत्रण, बेहतर निर्णय क्षमता और भावनात्मक संतुलन विकसित करने में सहायक हो सकती है।

4. **पारिवारिक और सामाजिक जीवन में उपयोगिता–** भावनात्मक संतुलन बेहतर पारिवारिक और सामाजिक संबंधों के लिए आवश्यक है। विपश्यना व्यक्ति में धैर्य, समझ और सहानुभूति विकसित करती है, जिससे संबंधों में सुधार होता है।

निष्कर्ष – विपश्यना साधना और भावनात्मक समायोजन के बीच गहरा मनोवैज्ञानिक संबंध पाया जाता है। विपश्यना व्यक्ति को अपने विचारों, भावनाओं और व्यवहार को समझने की क्षमता प्रदान करती है। यह आत्म-जागरूकता, भावनात्मक नियंत्रण, तनाव सहनशीलता और मानसिक संतुलन को विकसित करने में सहायक होती है।

भावनात्मक समायोजन आधुनिक जीवन की एक आवश्यक क्षमता है। विपश्यना व्यक्ति को परिस्थितियों से भागने के बजाय उन्हें शांत और जागरूक दृष्टिकोण से देखने की क्षमता प्रदान करती है।

इस प्रकार कहा जा सकता है कि विपश्यना केवल आध्यात्मिक अभ्यास नहीं है, बल्कि यह एक प्रभावी मनोवैज्ञानिक प्रक्रिया भी है जो व्यक्ति के मानसिक स्वास्थ्य और भावनात्मक विकास में महत्वपूर्ण योगदान दे सकती है।

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

कुंतक तथा भोजकृत वक्रोक्तिजीवितम्

डॉ. पी.एस. बघेल *

* प्राध्यापक (संस्कृत) पीएम एक्सीलेंस शहीद भीमा नायक शासकीय स्नातकोत्तर महाविद्यालय, बड़वानी (म.प्र.) भारत

प्रस्तावना – डॉ. वेलवेकर की कृपा से सन् 1923 में कुन्तक की प्रति वक्रोक्ति जीवित प्रकाशित हो पाई। उसके बाद सन् 1928 में उनका एक स्वच्छ प्रति प्राप्त हुई।

प्रस्तुत ग्रन्थ में वक्रोक्ति जीवित के कारिका, वृत्ति और उदाहरण तीनों भाग उदाहरण सहित उपलब्ध हुए। इस ग्रन्थ की कारिका, वृत्ति, उदाहरण आदि सभी कुन्तक से ही प्राप्त हुए। जिसे वक्रोक्ति जीवित कहा गया।

कुंतक के अनुसार केवल कारिका भभाग को ही काव्यालंकार कहा जाना शोधकर्ताओं की ओर से कहा गया।

उक्त वृत्ति में इस प्रकार व्यक्त किया गया है कि–

'लोकोत्तर चमत्कारकारि वैचित्र्य सिद्धये।'
काव्स्यायमलंकार : कोऽपूर्व विधीते।।

आगे यह भी वृत्ति में कहा है कि–

'नन् सन्ति चिरंतंनास्तदलंकारास्तत्
किमर्थ मित्याह–अपूर्व: तद्
व्यतिरिक्तार्थीभिधायी
कोपि अलौकिक: सातिशय:।
लोको... सिद्धये–असामान्योहलाद।।
विधायिविचित्रभाव सम्पत्ते।
यद्यपि सन्ति शतश: काव्यालंकारास्तथापि
न कुतश्चिद प्येवंविध वैचित्र्य सिद्धि:।।'

उक्त कथन मेंभभामह, उद्भट और रुद्रट की रचनाओं को काव्यालंकार कहा जाता था। किन्तु प्राय: सभी आलोचकों ने उसे वक्रोक्ति–जीवित ही माना है।

इसी ग्रन्थ में यह भी कहा गया है कि वक्रोक्ति को काव्य की आत्मा मानते हैं। कुंतक द्वारा ही वक्रोक्तिजीवित लक्षण दर्शायें हैं।

कतिपय लेखक वक्रोक्ति को काव्य की आत्मा मानते हैं। महिमभट्ट के अनुसार वक्रोक्ति क्तिजीवितगत लक्षण कुन्तक द्वारा ही रचित है। टीकाकार व्याख्या रूप वृत्ति और श्लोकभभी वक्रोक्ति जीवित के ही भाग है। प्रथम उन्मेश में देवी सूक्तानुसार निम्न श्लोक कहा गया है:–

'वाचो विषनैयत्यमुत्पादयितुमुच्चते।
आदि वाक्येभिध्यादि निर्मिते र्मान सूत्रवत्।
लोकोत्तर चमत्कार का वैचित्र्य सिद्धये।
काव्यस्यामलकार: कोऽप्पूर्वविधीयते।
धर्मादिसाधनोपाय: सुकुमार क्रमोदित:।
काव्यबंधोभिजातानां हृदयाह्लादकारक:।।'

भामह के समान ही काव्य का प्रयोग 'धर्मार्थ...काव्य निबन्धनम्।' इसके अनुसार इसे काव्यालंकार ही कहा गया है।

भामह के अनुसार 'शब्दार्थौ सहितौ काव्यम्'

कुन्तक ने भी इन्हीं शब्दों से काव्य की परिभाषा की है यथा–

'शब्दार्थौ सहितौ वक्र' कवि व्यापारशालिनि।
बन्धे व्यवस्थितौ काव्यं तद्विदाह्लदकारिणी।।'

अर्थात् कवि की कल्पना–कुशलता से शब्दार्थ के संयोंग से जो चमत्कृतिपूर्ण रचना होती है, उसी का नाम काव्य है। सालंकृत शब्द और अर्थ मिलकर काव्य होते हैं उसी से ही अलंकार काव्य के लिए अनिवार्य है। अर्थात् काव्य की अलंकार के बिनाभभी स्थिति संभव है। साधारण बोलचाल से भिन्न और उच्चकोटि का चमत्कृतिजनक वर्णन को ही वक्रोक्ति कहते हैं।

'वक्रोक्ति: प्रसिद्धाभिधान व्यतिरेकिणी विचित्र्यैवाभिधा वैदग्ध्यं कवि कर्म कौशलं तस्म भंगी विच्छिति तया भणिति:।'

काव्य के उदाहरण के साथ यह दिखाया गया है कि शब्दों के परिवर्तन से किस प्रकार रमणीता लाई जा सकती है। साहित्य में जो साहचर्य है यह वाचक का दूसरे वाचक के साथ व वाक्य के दूसरे वाच्य के साथ होना चाहिए। वक्रता की व्याख्या में कहा गया है कि–

'वक्रत्वं प्रसिद्ध प्रस्थान व्यतिरेकिवैचित्र्यम्।।' (पृ.27, कारिका 1.19)

इसके बाद कविव्यापारवक्रता के छ: भेद बताये हैं यथा–

1. वर्णविन्यासवक्रता।
2. पदपूर्वार्द्धवक्रता
3. प्रत्ययवक्रता
4. वाक्य वक्रता
5. प्रबंध वक्रता
6. वाक्य प्रकरण वक्रता।

कुंतक ने उन भेदों के उदाहरण सहित निरूपण किया है। इनकी स्थापना है कि– 'वक्रोक्ति' काव्य की आत्मा है। जो काव्य में प्राणों का संचार करती है। इसके बिना काव्य की सत्ता ही नहीं हो सकती। परन्तु वक्रोक्ति तब तक नहीं बन सकती जब तक कवि में आवश्यक कल्पना शक्ति नहीं होती।

वैचित्र्य के माधुर्य, प्रसाद, लावण्य और अभिजात्य– ये विशिष्ट गुण होते हैं।

दूसरा उन्मेष वर्ण विन्यास वक्रता की परिभाषा में कहा गया है कि– एको द्वौ बहवोवर्णा: बध्यमाना: पुन: पुन:। वर्णविन्यासवक्रता प्राय: प्राचीन आलंकारिकों द्वारा निरूपित अनुप्रास ही है। यमक भी वर्ण विन्यास वक्रता का ही एक प्रकार है। 'मक' नाम कोप्यस्या: प्रकारं परिदृश्यते।'

ध्वन्यालोक में क्रमश: अर्थान्तर संक्रमित वाच्य तथा अत्यन्ततिरस्कृतवाक्य ध्वनि के उदाहरण है।

कुंतक ने रूपक, प्रशंसा, पर्यायोक्त ब्याजस्तुति उत्प्रेक्षा, अतिशयोक्ति तथा अन्य दस से बीस तक अलंकारों के लक्षणों का परीक्षण किया है।

चतुर्थ उन्मेष में प्रकरण वक्रता, और प्रबंध वक्रता का विवेचन किया है। वक्रोक्तिजीवित में ध्वनियाँ व्यंग की काव्य की आत्मा के रूप में स्वतंत्र सत्ता का प्रत्याख्यान किया गया है। और वक्रोक्ति के व्यापक स्वरूप में ही अर्न्तभाव का प्रयत्न किया है। सामान्य पद्धति से भिन्न या उससेभभी उच्च प्रकार की चमत्कारिक वस्तु को वे काव्य की आत्मा मानते हैं। जयरथ ने वक्रोक्ति जीवित का अन्तर्भाव भभक्तिवादी सम्प्रदाय में किया है।

वक्रोक्ति जीवित एक अत्यंत मूल्यवान कृति है। कुन्तक नेभभामह और दण्डी के ग्रन्थ से अधिकांश अवतरण लिये हैं।

भोज और वक्रोक्ति – 'वक्रोक्तिरेव काव्यनां पराभूषेति भामह:।' भोज ने एकादश शृंगार प्रकाश में वक्रोक्ति मत भामह और दण्डी सेभभी अधिक पुराना है। वस्तुत: भामह ने अतिशोक्ति अलंकार (2, 85) के वर्णन में वक्रोक्ति शब्द का प्रयोग अलंकार के पर्याय के रूप में किया है।

भामह ने स्पष्ट रूप में कहा है कि वक्रोक्ति का अर्थ चमत्कार वाचां–

'वक्रार्थ शब्दोक्तिरलंकारा कल्पते। (5.66)

युक्तं वक्र स्वभावोक्त्या सर्वमेवैदिव्यते।' (1,30)

अपने अतिशयोक्ति अलंकार (2–85) के वर्णन में उन्होंने वक्रोक्ति शब्दं का प्रयोग अलंकार के पर्याय के रूप में किया है। अत: भामह के मत से सम्पूर्ण काव्योक्तियों का क्षेत्र वक्रोक्ति का क्षेत्र है । सारा चमत्कारिक और असाधारण कथन इसके अन्तर्गत आता है।

वक्रता काव्य की प्रथम आवश्कता है और ही काव्य अन्य कथनों से पृथक् करती है। भामह ने कहा है कि वक्रोक्ति के अभाव में काव्य नहीं होता वह केवल सादा कथन, भाषण या वार्ता हो सकती है।

भामह की कृति में सामान्य तथा काव्यात्मक उक्ति दोनों भिन्न माने गये हैं। किन्तु कुन्तक स्वभावोक्ति को अलंकार मानने के पक्ष में नहीं है। वे स्वभावोक्ति अलंकार को मानने के विरोधी है।

उक्त सन्दर्भ में दण्डी का विवेचन अधिक स्पष्ट है। दण्डी ने काव्यात्मक कथन को वक्रोक्ति और स्वभावोक्ति–इन दो भागों में बाँटा है। रसवर्णना के सन्दर्भ में भामह के समान दण्डी ने भी वक्रोक्ति के अन्तर्गत रखा है। भोज ने काव्योक्ति का आगे विवेचन किया है। भोज ने संकेत रूप में दण्डी की बात को ग्रहण किया है। भोज ने प्रेयस् रसवत् और उर्जस्वि इन तीन अलंकारों का वक्रोक्ति के अन्तर्गत वर्णन करते हुए भी दण्डी की दृष्टि रसों और भावों से संबद्ध होने के कारण इनकी प्रकृति पृथक् और विशिष्ट है, तथा प्रभाव महत्तर है।

भोज ने रसवत् अलंकारों को वक्रोक्ति के अन्य भेदों से पृथक् स्वीकार किया है। इस प्रकार भोज अलंकार शब्द का प्रयोग इसी अर्थ में करते हैं जिस अर्थ में इसका प्रयोग वामन ने अपने सौदर्यलंकार सूत्र (1,1,2) में किया है।

इस प्रकार भोज ने वक्रोक्ति का प्रयोग सामान्य काव्यत्मक वर्णन और रूपकादि अलंकार के रूप में किया है।

भोज ने वक्रोक्ति का विचार भामह और दण्डी से लिया है। यद्यपि भोज ने उपमादिक समस्त अलंकारों को वक्रोक्ति जैसा एक निश्चित नाम दिया है।

भोज ने वक्रोक्ति को उपमादि अलंकारों के गौण अर्थ तक सीमित रखा, सामान्यता व्यापक अर्थ में अलंकार शब्द का प्रयोग किया है।

भोज ने अन्यत्र व्यापक रूप में काव्यात्मक भणिति के लिए वक्रता शब्द का प्रयोग किया है।

इस रूप में उसनेभभामह का समर्थन ही किया है। भोज का दृष्टिकोण कुन्तक से सर्वाधिक मिलता है।

भोज का कहना है कि–

'तात्पर्यमेव वचसि ध्वनिरेव काव्ये।'

भोज अलंकार वक्रता के रूप में जोर देने की बात कहते हैं। भोज रसों को भी अलंकार मानते हैं अत: रस, ध्वनि और हर वस्तु जो सौंदर्य के रूप में स्थापित है वह वक्रता का ही निर्माण करती है।

भोज और कुन्तक में बहुत सी बातें समान है।

वक्रोक्ति में भोज कहता है–

'शब्दार्थो सहितौ वक्रकविवपार शालिनि।

बंधे व्वस्थितौ काव्यं तद्विदाह्लादकारिणी।।' (वक्रोक्तिजीवित्–1.7)

कुन्तक ने भी प्राचीन अलंकारों को भोज की तरह जीवित किया है। उन्होंने अपनी छ: प्रकार की वक्रोक्ति की समता अलंकार से स्थापित की है। वक्रोक्तिजीवित में अलंकार ही वक्रोक्ति माना है–

'काव्यास्यालंकार: कोऽप्यपूर्वो विधीयते।' (वक्रोक्तिजीवित् 1.2)

'उभावेतावलंकार्यौ तयो पुनरलंकृति:।'

'वक्रोक्तिरेव वैदग्धभीभागतिरुच्यते।।' (वक्रोक्तिजीवित 1.10)

कुन्तक ने गुण को भी अलंकारों में ही शामिल किया है। कुन्तक के मत में वक्रता के अन्तर्गत आने वाली ध्वनि अलंकार है। कुन्तक की दृष्टि में गुण भी अलंकार है। विशिष्ट कथन प्रणाली के वक्रता ही नाम दिया है। भोज और कुन्तक इस बात का साम्य है कि– दोनों प्रबंधालंकार को स्वीकार करते हैं।

भोज का शब्दार्थ विवेचन विशुद्ध व्याकरण की दृष्टि से युक्त है। वक्रोक्ति के सन्दर्भ में काव्य की परिभाषा करते हुए वक्रोक्ति के बारे में कहा है कि–

'यद् वक्रं वच: शास्त्रे लोके च एव तत्।

वक्र यथार्थवादादौ तस्य काव्यमिति स्मृत:।।' (वक्रोक्ति जीवित्)

रुद्रट के पश्चात् वक्रोक्ति शब्द और अर्थ से संबंधित विशिष्ट काव्यालंकार एवं सामान्य अलंकार दोनों का बोधक बन गया।

भोज में इस संकुचित वक्रोक्ति का प्रयोग विशिष्ट काव्यालंकार के अर्थ में भी मिलता है। और सामाान्य व्यापक अलंकार के लिए भी। मम्मट के साथ–साथ भोज ने भी रुद्रट का अनुसरण करते हुए वक्रोक्ति को शब्दालंकार माना है।

वामन ने वक्रोक्ति को अर्थालंकार के रूप माना है। क्योंकि उनकी दृष्टि में समता उपमा तथा वक्रोक्ति में ही निहित है। दण्डी ने इसे समाधि गुण कहा है। जिसमें समता के आधार पर एक अच्छे विशेषणों का उपयोग दूसरे के लिए हो सकता है।

वक्रोक्ति की प्राणभूता लक्षणा के अन्तर्गत सब प्रकार की लक्षणा आती है। वक्रोक्ति का अर्थ है सब प्रकार की काव्योक्तियाँ।

संदर्भ ग्रंथ सूची :–

1. भोजकृत शृंगार प्रकाश– म.प्र. हिन्दी अकादमी
2. हिन्दी साहित्य का इतिहास
3. महाभारत–चित्रशाला प्रेस–भण्डार ओरीन्टल तुलनात्मक
4. वामन (संस्करण) (दोषों का वर्गीकरण)
5. रुद्रट (अधिक पद) नामिसाधु
6. आनंदवर्धन (ध्वनलोक) (हेमचंद्र कृत टीका)

Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

भारतीय ज्ञान परंपरा एवं जैन दर्शन : एक अध्ययन

विरेन्द्र मुवेल*

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शोध सारांश – भारतीय ज्ञान परंपरा विश्व की प्राचीनतम एवं समृद्ध ज्ञान परंपराओं में से एक है। यह केवल धार्मिक अथवा आध्यात्मिक ज्ञान तक सीमित नहीं है, बल्कि दर्शन, शिक्षा, विज्ञान, चिकित्सा, साहित्य, कला, संस्कृति, नैतिकता तथा पर्यावरण संरक्षण जैसे विविध क्षेत्रों को समाहित करती है। भारतीय ज्ञान परंपरा का मूल उद्देश्य मनुष्य के सर्वांगीण विकास, आत्मबोध, नैतिक चेतना एवं लोककल्याण की भावना का विकास करना है। भारतीय ज्ञान परंपरा के निर्माण एवं विकास में वैदिक, बौद्ध और जैन परंपराओं का विशेष योगदान रहा है। इनमें जैन दर्शन ने अहिंसा, अनेकांतवाद, स्याद्वाद, अपरिग्रह, सत्य तथा आत्मसंयम जैसे सिद्धांतों के माध्यम से भारतीय चिंतन को नई दिशा प्रदान की। भगवान महावीर द्वारा प्रतिपादित सिद्धांत आज भी वैश्विक शांति, पर्यावरण संरक्षण, सामाजिक समरसता, नैतिक नेतृत्व तथा सतत विकास के संदर्भ में अत्यंत प्रासंगिक हैं।

प्रस्तुत शोध-पत्र में भारतीय ज्ञान परंपरा की अवधारणा, जैन दर्शन के उद्भव, उसके प्रमुख सिद्धांतों तथा भारतीय ज्ञान परंपरा एवं जैन दर्शन में अंतर्संबंध का विश्लेषणात्मक अध्ययन किया गया है। यह अध्ययन दर्शाता है कि जैन दर्शन भारतीय ज्ञान प्रणाली का अभिन्न अंग है, जो आज भी मानवता को नैतिक एवं व्यावहारिक जीवन के लिए प्रेरित करता है।

शब्द कुंजी – भारतीय ज्ञान परंपरा, जैन दर्शन, अहिंसा, अनेकांतवाद, स्याद्वाद, अपरिग्रह, भगवान महावीर, भारतीय ज्ञान प्रणाली।

प्रस्तावना – भारत को प्राचीन काल से ही ज्ञान, दर्शन और संस्कृति की भूमि माना जाता है। यहाँ विकसित ज्ञान परंपरा ने मानव जीवन के आध्यात्मिक, नैतिक, सामाजिक तथा बौद्धिक विकास को समान महत्व दिया है। भारतीय ज्ञान परंपरा का मूल उद्देश्य केवल सूचना या तकनीकी ज्ञान प्रदान करना नहीं, बल्कि व्यक्ति के चरित्र, विवेक, आत्मानुशासन तथा समाजोपयोगी व्यक्तित्व का निर्माण करना है। भारतीय ज्ञान परंपरा का आधार वेद, उपनिषद, पुराण, रामायण, महाभारत, बौद्ध साहित्य तथा जैन साहित्य जैसे प्राचीन ग्रंथ हैं। इन सभी ने भारतीय संस्कृति और दर्शन को समृद्ध बनाया। विशेष रूप से जैन दर्शन ने सत्य, अहिंसा, करुणा, आत्मसंयम तथा सह-अस्तित्व जैसे सिद्धांतों के माध्यम से भारतीय चिंतन को एक नई दिशा दी। जैन दर्शन केवल धार्मिक आस्था नहीं, बल्कि एक वैज्ञानिक एवं नैतिक जीवन-दृष्टि है। यह मनुष्य को आत्मानुशासन, तर्कशीलता तथा उत्तरदायित्वपूर्ण जीवन जीने की प्रेरणा देता है। वर्तमान समय में जब विश्व हिंसा, पर्यावरण संकट, उपभोक्तावाद और नैतिक मूल्यों के ह्रास जैसी समस्याओं से जूझ रहा है, तब जैन दर्शन की शिक्षाएँ अत्यंत प्रासंगिक प्रतीत होती हैं।

अध्ययन के उद्देश्य– इस शोध-पत्र के प्रमुख उद्देश्य हैं:

1. भारतीय ज्ञान परंपरा की अवधारणा का अध्ययन करना।
2. जैन दर्शन के उद्भव एवं विकास का परिचय प्रस्तुत करना।
3. जैन दर्शन के प्रमुख सिद्धांतों का विश्लेषण करना।
4. भारतीय ज्ञान परंपरा में जैन दर्शन के योगदान का अध्ययन करना।
5. समकालीन समाज में जैन दर्शन की प्रासंगिकता का मूल्यांकन करना।

शोध पद्धति – प्रस्तुत अध्ययन वर्णनात्मक एवं विश्लेषणात्मक प्रकृति का है। अध्ययन में मुख्यत: द्वितीयक स्रोतों का उपयोग किया गया है।

भारतीय ज्ञान परंपरा की अवधारणा– भारतीय ज्ञान परंपरा एक ऐसी समग्र ज्ञान प्रणाली है, जिसका विकास हजारों वर्षों में हुआ है। इसका उद्देश्य व्यक्ति, समाज और प्रकृति के मध्य संतुलित संबंध स्थापित करना है। भारतीय ज्ञान परंपरा केवल शिक्षा तक सीमित नहीं है, बल्कि यह जीवन जीने की एक समग्र पद्धति प्रस्तुत करती है। इसमें आध्यात्मिकता, नैतिकता, विज्ञान, चिकित्सा, योग, आयुर्वेद, गणित, ज्योतिष, व्याकरण, साहित्य, संगीत तथा दर्शन जैसे अनेक विषय सम्मिलित हैं।

भारतीय ज्ञान परंपरा का मूल मंत्र है–

'सा विद्या या विमुक्तये'

अर्थात् वही विद्या वास्तविक है जो मनुष्य को अज्ञान, बंधनों एवं दु:ख से मुक्त करे।

भारतीय ज्ञान परंपरा की प्रमुख विशेषताएँ:

1. समग्र एवं बहुआयामी दृष्टिकोण
2. आत्मज्ञान एवं आत्मविकास पर बल
3. नैतिक एवं चारित्रिक विकास
4. प्रकृति के साथ सामंजस्य
5. सत्य एवं विवेक की खोज
6. सह-अस्तित्व एवं विश्व बंधुत्व
7. मानव कल्याण की भावना

जैन दर्शन का संक्षिप्त परिचय– जैन धर्म भारत के सबसे प्राचीन धार्मिक एवं दार्शनिक संप्रदायों में से एक है। जैन परंपरा के अनुसार 24 तीर्थकरों ने समय-समय पर मानव समाज को सत्य एवं धर्म का मार्ग प्रशस्त किया। प्रथम तीर्थकर ऋषभदेव (आदिनाथ)तथा अंतिम एवं 24वें तीर्थकर भगवान महावीर स्वामी माने जाते हैं। भगवान महावीर का जन्म लगभग 599 ईसा

पूर्व वैशाली के निकट कुंडग्राम में हुआ। उन्होंने 30 वर्ष की आयु में राजसी जीवन का त्याग कर कठोर तपस्या की और केवलज्ञान प्राप्त करने के बाद मानव समाज को अहिंसा, सत्य, अपरिग्रह एवं आत्मसंयम का संदेश दिया। महावीर स्वामी ने कर्मकांड, हिंसा, पशुबलि तथा सामाजिक असमानता का विरोध किया तथा समानता, करुणा एवं नैतिक जीवन पर बल दिया।

जैन दर्शन के मूल सिद्धांत – भगवान महावीर ने गृहस्थ को पंच महाव्रत अहिंसा, अस्तेय, सत्य, अपरिग्रह एवं ब्रह्मचर्य के पालन पर जोर दिया। पंच महाव्रत के साथ-साथ सम्यक् दर्शन, सम्यक् ज्ञान और सम्यक् चरित्र अर्थात् त्रिरत्न पालन की भी शिक्षा दी।

1. **अहिंसा–** मानव जीवन के दो आधार स्तम्भ हैं- आचार और विचार। आचार जीवन का व्यावहारिक पक्ष है और विचार सैद्धान्तिक। आदमी जैसा सोचता है, वैसा करता है और जैसा करता है, वैसा सोचता भी है। आचार और विचार - दोनों एक-दूसरे पर आधारित हैं। जैन दर्शन की आचार मीमांसा अहिंसा पर आधारित है। अहिंसा परमो धर्म: उनका मुख्य घोष है। अहिंसक आचार-विचार में ही मानव का विकास निहित है। यह सिद्धांत मानवाधिकार, सामाजिक सद्भाव, पशु संरक्षण तथा पर्यावरण संरक्षण की आधुनिक अवधारणाओं के अनुरूप है।
2. **सत्य–** सत्य जैन धर्म का मूल नैतिक सिद्धांत है। सत्य का पालन व्यक्ति के चरित्र, विश्वास एवं सामाजिक जीवन को सुदृढ बनाता है।
3. **अस्तेय–** बिना अनुमति किसी वस्तु का ग्रहण न करना ही अस्तेय है। यह सामाजिक न्याय एवं नैतिक आचरण का आधार है।
4. **ब्रह्मचर्य –** ब्रह्मचर्य का व्यापक अर्थ आत्मसंयम एवं इन्द्रिय-निग्रह है। यह मानसिक एवं आध्यात्मिक उन्नति का आधार माना गया है।
5. **अपरिग्रह–** अपरिग्रह का अर्थ है आवश्यकता से अधिक संग्रह न करना। यह सिद्धांत उपभोक्तावाद, संसाधनों के अंधाधुंध दोहन तथा पर्यावरणीय असंतुलन को रोकने में सहायक है।

जैन धर्म में मोक्ष प्राप्ति के लिए विभिन्न उपाय दृष्टिगत हैं, जिसे ष्त्रिरत्नष के रूप में जाना जाता है जो इस प्रकार हैं:-

1. **सम्यक दर्शन–** सम्यक दर्शन का आशय सत्य में पूरी दृढता के साथ विश्वास एवं श्रद्धा रखने से है। जैन दर्शन में सबसे महत्वपूर्ण कदम मोक्ष मार्ग है। सम्यक दर्शन का अभिप्राय व्यक्ति को आत्मा एवं उसके गुणों में विश्वास से है, इसके अभाव में मोक्ष प्राप्त करना संभव नहीं है।
2. **सम्यक ज्ञान–** सम्यक ज्ञान का आशय आत्मा, कर्म एवं मोक्ष के बारे में सही और तथ्यपरक ज्ञान से है। सम्यक ज्ञान प्राप्त करने के लिए व्यक्ति को अनवरत ध्यान एवम् अध्ययन करते रहना चाहिए।
3. **सम्यक चरित्र –** सम्यक चरित्र के अंतर्गत अहिंसा, सत्य, अस्तेय, अचौर्य ब्रह्मचर्य एवं अपरिग्रह का पालन करना महत्वपूर्ण है, क्योंकि सही आचरण के अभाव में सम्यक दर्शन एवं सम्यक ज्ञान की प्राप्ति नहीं हो पाती है।

अनेकांतवाद – अनेकांतवाद जैन दर्शन की सबसे महत्वपूर्ण देन है। इसका अर्थ है कि प्रत्येक वस्तु, विचार या सत्य के अनेक पक्ष होते हैं। किसी भी विषय को केवल एक दृष्टिकोण से समझना पूर्ण सत्य नहीं हो सकता। अनेकान्तिक दृष्टिकोण वाला व्यक्ति हर कथन में सत्य खोजने का प्रयास करता है। अनेकान्त विवादास्पद प्रसंगों में सामंजस्य तथा समन्वय की मनोवृत्ति का विकास करता है। अनेकान्त का पहला सिद्धान्त है- सापेक्षता। यह एक वैज्ञानिक एवं सार्वभौम सिद्धान्त है। यह दर्शन-युग से वैज्ञानिक युग में भी प्रवेश पा चुका है। विश्व-विख्यात वैज्ञानिक आल्बर्ट आइंस्टीन द्वारा आविष्कृत 'सापेक्षवाद' (Theory of Relativity) विज्ञान का एक प्रमुख सिद्धान्त बन चुका है। आज के बहुसांस्कृतिक एवं वैश्विक समाज में अनेकांतवाद सामाजिक समरसता और शांतिपूर्ण सह-अस्तित्व की आधारशिला बन सकता है।

स्याद्वाद – स्याद्वाद अनेकांतवाद का व्यवहारिक रूप है। इसके अनुसार प्रत्येक कथन परिस्थितियों, समय, स्थान एवं दृष्टिकोण के अनुसार सत्य हो सकता है। स्याद्वाद व्यक्ति को बिना पर्याप्त विचार के निर्णय लेने से रोकता है तथा विवेकपूर्ण, संतुलित एवं वैज्ञानिक दृष्टिकोण अपनाने की प्रेरणा देता है। आधुनिक अनुसंधान, न्यायशास्त्र, सामाजिक विज्ञान एवं वैज्ञानिक पद्धति में भी यह सिद्धांत अत्यंत उपयोगी माना जाता है।

कर्म सिद्धांत– जैन दर्शन के अनुसार प्रत्येक व्यक्ति अपने कर्मों का स्वयं उत्तरदायी है। जैन धर्म ने जन्म आधारित श्रेष्ठता का विरोध किया तथा प्रत्येक व्यक्ति को उसके कर्मों के आधार पर सम्मान देने की शिक्षा दी। अच्छे कर्म शुभ परिणाम तथा बुरे कर्म अशुभ परिणाम उत्पन्न करते हैं। यह सिद्धांत व्यक्ति में उत्तरदायित्व की भावना, नैतिक जीवन, आत्मानुशासन, ईमानदारी, आत्मविश्वास का विकास करता है।

भारतीय ज्ञान परंपरा में जैन दर्शन का दार्शनिक योगदान एवम् वर्तमान में प्रासंगिकता – भारतीय दर्शन की विभिन्न धाराओं में जैन दर्शन का विशिष्ट स्थान है। जैन दर्शन ने मानव जीवन, आत्मा, कर्म, मोक्ष तथा नैतिक आचरण की ऐसी वैज्ञानिक एवं तर्कसंगत व्याख्या प्रस्तुत की, जिसने भारतीय ज्ञान परंपरा को समृद्ध बनाया। यह दर्शन केवल आध्यात्मिक चिंतन तक सीमित नहीं है, बल्कि व्यवहारिक जीवन के लिए भी स्पष्ट मार्गदर्शन प्रदान करता है:

1. **पर्यावरण संरक्षण एवं सतत विकास–** जलवायु परिवर्तन और प्राकृतिक संसाधनों के अंधाधुंध दोहन के कारण पर्यावरण संकट गहरा रहा है। जैन दर्शन का अपरिग्रह एवं जीव-दया का सिद्धांत संसाधनों के संतुलित उपयोग और प्रकृति के संरक्षण का संदेश देता है। सतत विकास (Sustainable Development) के लिए आवश्यक है कि मनुष्य अपनी आवश्यकताओं तक सीमित उपभोग करे और प्रकृति के साथ संतुलित संबंध बनाए रखे। यह दृष्टिकोण जैन दर्शन में स्पष्ट रूप से प्रतिपादित है।
2. **मानसिक स्वास्थ्य एवं आत्मविकास–** आधुनिक जीवनशैली के कारण तनाव, चिंता एवं अवसाद जैसी समस्याएँ बढ रही हैं। जैन दर्शन आत्मचिंतन, ध्यान, संयम एवं सकारात्मक जीवन-दृष्टि के माध्यम से मानसिक शांति और आत्मविकास का मार्ग प्रस्तुत करता है।
3. **नैतिक नेतृत्व–** आज प्रशासन, व्यापार, राजनीति एवं शिक्षा के क्षेत्र में नैतिक नेतृत्व की आवश्यकता अनुभव की जा रही है। जैन दर्शन सत्यनिष्ठा, उत्तरदायित्व, आत्मसंयम तथा सेवा-भाव पर बल देता है। ये गुण एक आदर्श नेतृत्व के लिए आवश्यक हैं।
4. **विश्व शांति एवं अहिंसा–** जैन दर्शन का मूल आधार अहिंसा है। भगवान महावीर ने मन, वचन और कर्म से किसी भी जीव को कष्ट न पहुँचाने का संदेश दिया। वर्तमान वैश्विक परिदृश्य में अहिंसा केवल एक धार्मिक आदर्श नहीं, बल्कि शांति, मानवाधिकार तथा अंतरराष्ट्रीय सहयोग की आधारशिला है। यदि व्यक्ति और राष्ट्र अहिंसा के सिद्धांत को अपनाएँ, तो संघर्ष एवं हिंसा स्वतरू ही काम हो जाएगी
5. **मूल्य आधारित शिक्षा–** राष्ट्रीय शिक्षा नीति-2020 भारतीय ज्ञान

प्रणाली (IKS) को शिक्षा में सम्मिलित करने पर बल देती है। जैन दर्शन के सिद्धांतकृसत्य, अहिंसा, आत्मसंयम, अनुशासन एवं सहिष्णुता विद्यार्थियों के नैतिक एवं चारित्रिक विकास में अत्यंत सहायक हो सकते हैं।

सुझाव:

1. भारतीय ज्ञान परंपरा एवं जैन दर्शन को विद्यालय एवं विश्वविद्यालय स्तर के पाठ्यक्रमों में व्यापक रूप से सम्मिलित किया जाए।
2. मूल्य आधारित शिक्षा के अंतर्गत अहिंसा, सत्य, अपरिग्रह एवं अनेकांतवाद जैसे सिद्धांतों का व्यावहारिक प्रशिक्षण दिया जाए।
3. जैन साहित्य एवं प्राचीन ग्रंथों का डिजिटलीकरण तथा विभिन्न भाषाओं में अनुवाद किया जाए।
4. भारतीय ज्ञान प्रणाली (IKS) पर अंतर्विषयक शोध को प्रोत्साहित किया जाए।
5. पर्यावरण संरक्षण एवं सतत विकास की नीतियों में जैन दर्शन के सिद्धांतों का समावेश किया जाए।
6. युवाओं में आत्मसंयम, नैतिकता एवं सामाजिक उत्तरदायित्व विकसित करने हेतु जागरूकता कार्यक्रम संचालित किए जाएँ।
7. विश्वविद्यालयों में भारतीय ज्ञान परंपरा एवं जैन दर्शन पर विशेष शोध केंद्र स्थापित किए जाएँ।

निष्कर्ष– भारतीय ज्ञान परंपरा केवल प्राचीन ज्ञान का संग्रह नहीं, बल्कि मानव जीवन को नैतिक, आध्यात्मिक एवं सामाजिक दृष्टि से समृद्ध बनाने वाली एक समग्र जीवन–पद्धति है। इस परंपरा के विकास में जैन दर्शन का योगदान अत्यंत महत्वपूर्ण रहा है। वर्तमान समय में जब विश्व हिंसा, असहिष्णुता, उपभोक्तावाद, नव उपनिवेशवाद एवं पर्यावरणीय संकट जैसी समस्याओं से जूझ रहा है, तब जैन दर्शन का संतुलित एवं मानवीय दृष्टिकोण एक प्रभावी समाधान प्रस्तुत करता है। इसलिए भारतीय ज्ञान परंपरा के अध्ययन में जैन दर्शन का समुचित स्थान सुनिश्चित किया जाना चाहिए तथा इसकी शिक्षाओं को समकालीन शिक्षा, नीति निर्माण एवं सामाजिक जीवन में अधिकाधिक अपनाया जाना चाहिए।

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RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

आदिवासी समुदाय की पारंपरिक औषधीय पद्धतियाँ एवं भारतीय अर्थव्यवस्था पर उनका प्रभाव

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शोध सारांश – भारत में आदिवासी समुदाय सदियों से प्रकृति के साथ सहजीवन (Symbiotic relationship) स्थापित कर जीवन यापन करते आए हैं। इनके पारंपरिक ज्ञान में औषधीय पौधों का विशेष महत्व है। जंगलों में उपलब्ध जड़ी–बूटियों, पेड़ों, पौधों और खनिजों का उपयोग वे रोगों के उपचार में करते हैं। इस ज्ञान को एथ्नो–मेडिसिन (Ethnomedicine) या लोक–औषधि परंपरा कहा जाता है। यह परंपरा न केवल स्वास्थ्य संरक्षण में सहायक है बल्कि आदिवासी समाज की स्थानीय अर्थव्यवस्था का महत्वपूर्ण आधार भी है। वर्तमान समय में औषधीय पौधों का वैश्विक बाजार तेजी से बढ़ रहा है, जिससे आदिवासी समुदायों के लिए रोजगार और आय के नए अवसर उत्पन्न हो रहे हैं।

यह शोध–पत्र आदिवासी समुदायों की औषधीय परंपराओं, उनके ज्ञान–स्रोत, औषधीय पौधों के उपयोग तथा इनसे उत्पन्न आर्थिक संभावनाओं का विश्लेषण प्रस्तुत करता है।

शब्द कुंजी – आदिवासी समुदाय, पारंपरिक औषधीय पद्धतियाँ, एवं भारतीय अर्थव्यवस्था।

प्रस्तावना – भारत विविध संस्कृतियों, परंपराओं और समुदायों का देश है। इन समुदायों में आदिवासी समाज का विशेष स्थान है तथा आदिवासी समाज का इतिहास अत्यंत प्राचीन है। आदिवासी समुदायों का जीवन प्रकृति के साथ गहराई से जुड़ा हुआ है। वे जंगलों, पहाड़ों और प्राकृतिक संसाधनों पर निर्भर रहते हैं। आदिवासी समाज की जीवन शैली, संस्कृति और पारंपरिक ज्ञान प्रणाली अत्यंत समृद्ध है। इनकी परंपराओं में औषधीय पौधों का उपयोग विशेष रूप से महत्वपूर्ण है। आदिवासी लोग सदियों से जंगलों में उपलब्ध जड़ी–बूटियों का उपयोग विभिन्न रोगों के उपचार के लिए करते आए हैं।

इस पारंपरिक चिकित्सा प्रणाली को लोक चिकित्सा या एथ्नो–मेडिसिन कहा जाता है। यह चिकित्सा पद्धति मुख्यत: प्राकृतिक संसाधनों पर आधारित होती है और इसमें पौधों, जड़ों, पत्तियों, छाल, फल और बीजों का उपयोग किया जाता है। ये समुदाय प्रकृति के साथ घनिष्ठ संबंध रखते हैं और जंगलों, पहाड़ों तथा नदियों के आसपास निवास करते हैं। उनकी जीवन शैली, संस्कृति और स्वास्थ्य व्यवस्था प्राकृतिक संसाधनों पर आधारित है। आदिवासी समाज में पारंपरिक चिकित्सक (Traditional Healers) को विभिन्न नामों से जाना जाता है जैसे –

- बैगा
- भुमका
- वैद्य
- गुनिया
- भगत

आदिवासी लोग पीढ़ी दर पीढ़ी जड़ी–बूटियों का ज्ञान प्राप्त करते हैं और स्थानीय लोगों का उपचार करते हैं। आज आधुनिक चिकित्सा प्रणाली के विकास के बावजूद आदिवासी समाज में पारंपरिक औषधीय ज्ञान की उपयोगिता बनी हुई है।

अध्ययन के उद्देश्य :

1. आदिवासी समुदायों के औषधीय ज्ञान की प्रकृति को समझना।
2. औषधीय पौधों और जड़ी–बूटियों के उपयोग का अध्ययन करना।
3. आदिवासी औषधीय परंपरा और स्थानीय अर्थव्यवस्था के संबंध का विश्लेषण करना।
4. औषधीय पौधों के संरक्षण और विकास के लिए सुझाव देना।

3. शोध पद्धति – इस शोध–पत्र में निम्नलिखित पद्धतियों का उपयोग किया गया है –

1. द्वितीयक स्रोत
2. पुस्तकें, शोध पत्र, सरकारी रिपोर्ट, इंटरनेट स्रोत
3. वर्णनात्मक अध्ययन पद्धति
4. सामाजिक–आर्थिक विश्लेषण

साहित्य समीक्षा – आदिवासी औषधीय ज्ञान पर किए गए क्षेत्रीय अध्ययन भारत के विभिन्न राज्यों में आदिवासी औषधीय ज्ञान पर कई क्षेत्रीय अध्ययन किए गए हैं।

मध्य प्रदेश – मध्य प्रदेश में गोंड, भील, बैगा और बरेला जनजातियों के बीच किए गए अध्ययनों से पता चलता है कि ये समुदाय जंगलों में पाए जाने वाले पौधों का उपयोग अनेक रोगों के उपचार में करते हैं।

उदाहरण के लिए:

1. गिलोय का उपयोग बुखार और प्रतिरक्षा शक्ति बढ़ाने के लिए
2. नीम का उपयोग त्वचा रोगों के उपचार के लिए
3. आंवला का उपयोग पाचन और स्वास्थ्य सुधार के लिए

छत्तीसगढ़– छत्तीसगढ़ के आदिवासी समुदायों में भी पारंपरिक औषधीय

ज्ञान अत्यंत विकसित है। यहाँ के आदिवासी लोग जंगलों में मिलने वाली जड़ी-बूटियों का उपयोग सर्पदंश, बुखार और पाचन रोगों के उपचार के लिए करते हैं।

झारखंड और ओडिशा – झारखंड और ओडिशा के आदिवासी समुदायों में भी औषधीय पौधों का व्यापक उपयोग किया जाता है। कई शोधों में पाया गया है कि इन क्षेत्रों के पारंपरिक चिकित्सकों को सैकड़ों प्रकार के पौधों की जानकारी होती है।

साहित्य समीक्षा से प्राप्त निष्कर्ष – उपलब्ध साहित्य के अध्ययन से निम्नलिखित प्रमुख निष्कर्ष सामने आते हैं :

1. आदिवासी समुदायों के पास औषधीय पौधों का अत्यंत समृद्ध पारंपरिक ज्ञान उपलब्ध है।
2. यह ज्ञान मुख्यत: मौखिक परंपरा के माध्यम से पीढ़ी दर पीढ़ी हस्तांतरित होता रहा है।
3. औषधीय पौधों का उपयोग स्वास्थ्य संरक्षण के साथ-साथ आर्थिक विकास में भी महत्वपूर्ण भूमिका निभाता है।
4. आधुनिक समय में इस पारंपरिक ज्ञान के संरक्षण और वैज्ञानिक अध्ययन की आवश्यकता बढ़ गई है।

अध्ययन का सार– इस अध्याय में आदिवासी औषधीय ज्ञान से संबंधित विभिन्न पुस्तकों, शोध पत्रों और रिपोर्टों का अध्ययन प्रस्तुत किया गया है। इससे यह स्पष्ट होता है कि आदिवासी समुदायों की पारंपरिक चिकित्सा प्रणाली अत्यंत महत्वपूर्ण और उपयोगी है।

आगे के अध्याय में आदिवासी समुदायों के औषधीय ज्ञान, प्रमुख जड़ी-बूटियों तथा उनके उपयोग का विस्तृत विश्लेषण प्रस्तुत किया जाएगा। इन पौधों को आयुर्वेद में त्रिफला के रूप में भी जाना जाता है।

अध्ययन का महत्व– इस अध्ययन का महत्व निम्नलिखित कारणों से है:

1. आदिवासी पारंपरिक ज्ञान का संरक्षण
2. औषधीय पौधों की पहचान और उपयोग का अध्ययन
3. आदिवासी अर्थव्यवस्था में औषधीय संसाधनों की भूमिका का विश्लेषण
4. ग्रामीण और जनजातीय विकास के लिए नए अवसरों की पहचान

यह अध्ययन आदिवासी समाज की पारंपरिक ज्ञान प्रणाली को समझने और उसके आर्थिक महत्व को उजागर करने में सहायक होगा।

अध्ययन की सीमाएँ – इस अध्ययन की कुछ सीमाएँ भी हैं:

1. सभी आदिवासी समुदायों का विस्तृत अध्ययन संभव नहीं है।
2. पारंपरिक ज्ञान मौखिक परंपरा में होने के कारण कुछ जानकारी सीमित हो सकती है।
3. अध्ययन मुख्यत: उपलब्ध साहित्य और रिपोर्टों पर आधारित है।

4. भारत में आदिवासी समुदाय– भारत में लगभग 700 से अधिक जनजातियाँ पाई जाती हैं। ये मुख्यत: निम्न राज्यों में निवास करती हैं:

- मध्य प्रदेश, छत्तीसगढ़, झारखंड, ओडिशा, गुजरात राजस्थान, महाराष्ट्र, मध्य प्रदेश में प्रमुख जनजातियाँ : भील, गोंड, बैगा, बरेला, भीलाला, कोरकू आदि । इन समुदायों का जीवन जंगलों और प्राकृतिक संसाधनों पर आधारित है।

आदिवासी समुदाय और प्रकृति का संबंध –आदिवासी समाज का प्रकृति के साथ गहरा और संतुलित संबंध होता है। वे जंगलों को केवल संसाधन नहीं बल्कि जीवन का आधार मानते हैं। उनकी संस्कृति में पेड़-पौधों, नदियों और पहाड़ों का धार्मिक और सामाजिक महत्व होता है। कई आदिवासी समुदाय विशेष पेड़ों को पवित्र मानते हैं और उनकी पूजा करते हैं। प्रकृति के साथ इस घनिष्ठ संबंध के कारण आदिवासी लोगों को विभिन्न पौधों के गुणों और उपयोगों की गहरी जानकारी होती है।

5. आदिवासी औषधीय ज्ञान– आदिवासी समाज में औषधीय ज्ञान को पारंपरिक ज्ञान प्रणाली कहा जाता है। यह ज्ञान मुख्यत: निम्न स्रोतों से प्राप्त होता है:

1. अनुभव आधारित ज्ञान
2. पीढ़ी दर पीढ़ी हस्तांतरण
3. प्राकृतिक संसाधनों का अवलोकन

आदिवासी लोग पौधों के निम्न भागों का उपयोग करते हैं:

- जड़, छाल, पत्तो, फल, फूल, बीज – इनसे विभिन्न रोगों का उपचार किया जाता है।

आदिवासी औषधीय ज्ञान की विशेषताएँ – आदिवासी लोग जंगलों में उपलब्ध पौधों की पहचान और उनके औषधीय गुणों के बारे में विस्तृत ज्ञान रखते हैं। आदिवासी औषधीय चिकित्सा प्रणाली की कई विशेषताएँ हैं:

1. प्राकृतिक आधारित चिकित्सा – यह पूरी तरह से प्राकृतिक संसाधनों पर आधारित होती है।

2. सस्ती और सुलभ– यह चिकित्सा प्रणाली आर्थिक रूप से सस्ती होती है और ग्रामीण क्षेत्रों में आसानी से उपलब्ध होती है।

3. कम दुष्प्रभाव – अधिकांश प्राकृतिक औषधियों के दुष्प्रभाव कम होते हैं।

4. पर्यावरण के अनुकूल – यह चिकित्सा प्रणाली पर्यावरण के संरक्षण को भी बढ़ावा देती है।

5. पीढ़ी दर पीढ़ी हस्तांतरित ज्ञान
6. स्थानीय उपलब्धता
7. कम लागत

6. प्रमुख औषधीय पौधे का महत्व और उनका उपयोग – औषधीय पौधे मानव स्वास्थ्य के लिए अत्यंत महत्वपूर्ण हैं। इनका उपयोग आयुर्वेद, यूनानी, सिद्ध और होम्योपैथी जैसी पारंपरिक चिकित्सा प्रणालियों में किया जाता है। भारत में हजारों प्रकार के औषधीय पौधे पाए जाते हैं। इनमें से अनेक पौधों की जानकारी आदिवासी समुदायों के पास पारंपरिक रूप से उपलब्ध है। कुछ प्रमुख औषधीय पौधे हैं :

1. नीम – उपयोग : त्वचा रोग, संक्रमण, दांतों की समस्या
2. तुलसी – उपयोग: सर्दी-खांसी, बुखार, श्वसन रोग
3. गिलोय – उपयोग: प्रतिरक्षा शक्ति बढ़ाने में, बुखार, मधुमेह नियंत्रण
4. अश्वगंधा – उपयोग: कमजोरी, तनाव, मानसिक स्वास्थ्य
5. आंवला – उपयोग : विटामिन C, पाचन, बाल और त्वचा स्वास्थ्य।
6. सफेद मूसली – सफेद मूसली एक गुणकारी आयुर्वेदिक जड़ी-बूटी है। यह शारीरिक कमजोरी दूर करने, स्टेमिना बढ़ाने, और रोग प्रतिरोधक क्षमता (इम्यूनिटी) को मजबूत करने के लिए उपयोग की जाती है। पुरुष और महिला दोनों इसका सेवन कर सकते हैं।
7. कालमेघ – प्रसिद्ध है, जिसे 'कड़वाहट का राजा' (Kings of Bitters) भी कहा जाता है। यह मुख्य रूप से लिवर को स्वस्थ रखने, पाचन तंत्र सुधारने और शरीर की रोग प्रतिरोधक क्षमता (इम्यूनिटी) बढ़ाने के

लिए उपयोग किया जाता है।

त्वचा रोगों के उपचार के पौधे – आदिवासी समाज त्वचा संबंधी रोगों के उपचार के लिए कई प्राकृतिक औषधियों का उपयोग करता है।

उदाहरण:

1. नीम
2. हल्दी
3. एलोवेरा

इन पौधों में जीवाणुरोधी और सूजनरोधी गुण पाए जाते हैं।

हड्डी और मांसपेशियों के रोग– हड्डी टूटने या मांसपेशियों में दर्द होने पर कुछ विशेष पौधों का उपयोग किया जाता है

उदाहरण:

1. हड़जोड़
2. अश्वगंधा

इन पौधों का उपयोग दर्द कम करने और हड्डियों को मजबूत करने के लिए किया जाता है।

आदिवासी लोग इन पौधों का उपयोग प्राकृतिक उपचार के रूप में करते हैं।

औषधि तैयार करने की विधियाँ – आदिवासी समुदायों में औषधि तैयार करने की कई पारंपरिक विधियाँ प्रचलित हैं।

1. काढ़ा – जड़ी–बूटियों को पानी में उबालकर काढ़ा तैयार किया जाता है। यह विधि बुखार, सर्दी–खांसी और संक्रमण के उपचार में उपयोगी होती है।

2. लेप – कुछ पौधों की पत्तियों या जड़ों को पीसकर लेप बनाया जाता है और उसे शरीर के प्रभावित भाग पर लगाया जाता है।

यह विधि मुख्यत:

1. घाव
2. त्वचा रोग
3. सूजन

के उपचार में उपयोग की जाती है।

3. रस – कुछ पौधों का रस निकालकर सीधे पिलाया जाता है। यह पाचन और रोग प्रतिरोधक क्षमता बढ़ाने में सहायक होता है।

4. चूर्ण – कुछ जड़ी–बूटियों को सुखाकर उनका चूर्ण बनाया जाता है और उसे पानी या दूध के साथ लिया जाता है।

7. आदिवासी औषधि और स्वास्थ्य प्रणाली– आदिवासी चिकित्सा प्रणाली निम्न सिद्धांतों पर आधारित है:

1. प्रकृति के साथ संतुलन
2. शरीर और मन का समन्वय
3. प्राकृतिक उपचार

इस चिकित्सा पद्धति के लाभ:

1. कम खर्च
2. स्थानीय उपलब्धता
3. कम दुष्प्रभाव

अध्याय का सार – इस अध्याय में आदिवासी समुदायों की पारंपरिक चिकित्सा प्रणाली, औषधीय पौधों के उपयोग और पारंपरिक चिकित्सकों की भूमिका का विस्तृत अध्ययन प्रस्तुत किया गया है। यह स्पष्ट होता है कि आदिवासी समाज का औषधीय ज्ञान अत्यंत समृद्ध और वैज्ञानिक दृष्टि से महत्वपूर्ण है।

8. औषधीय पौधे का ज्ञान और आदिवासी अर्थव्यवस्था – औषधीय पौधों का आदिवासी अर्थव्यवस्था में महत्वपूर्ण योगदान है। वे जंगलों से जड़ी–बूटियों का संग्रह करते हैं और उन्हें स्थानीय बाजारों या औषधीय कंपनियों को बेचते हैं। इससे उन्हें अतिरिक्त आय प्राप्त होती है। आज विश्व स्तर पर औषधीय पौधों की मांग तेजी से बढ़ रही है। आयुर्वेदिक और हर्बल उत्पादों के बढ़ते उपयोग के कारण यह क्षेत्र आर्थिक दृष्टि से भी महत्वपूर्ण बन गया है।

आय के स्रोत :

1. जड़ी–बूटियों का संग्रह
2. औषधीय पौधों की बिक्री
3. आयुर्वेदिक कंपनियों को आपूर्ति
4. जंगल उत्पादों का व्यापार

भारत में औषधीय पौधों का बाजार लगातार बढ़ रहा है।

उदाहरण:

1. अश्वगंधा
2. सफेद मूसली
3. सर्पगंधा
4. कालमेघ

इन पौधों की मांग आयुर्वेदिक और फार्मास्यूटिकल उद्योगों में अधिक है। आदिवासी समुदायों के लिए औषधीय पौधे केवल स्वास्थ्य का साधन ही नहीं बल्कि आय का स्रोत भी हैं।

अध्याय का सार – इस अध्याय में आदिवासी समुदाय, उनके पारंपरिक औषधीय ज्ञान और प्रकृति के साथ उनके संबंध का परिचय प्रस्तुत किया गया है। साथ ही औषधीय पौधों के महत्व और आदिवासी अर्थव्यवस्था में उनकी भूमिका को भी स्पष्ट किया गया है।

आधुनिक चिकित्सा और पारंपरिक ज्ञान – वर्तमान समय में आधुनिक चिकित्सा प्रणाली का विकास तेजी से हुआ है। इसके बावजूद आदिवासी समुदायों में पारंपरिक चिकित्सा का महत्व बना हुआ है।

आज कई वैज्ञानिक संस्थान और शोधकर्ता आदिवासी औषधीय ज्ञान का अध्ययन कर रहे हैं ताकि नए औषधीय उत्पाद विकसित किए जा सकें।

आदिवासी समाज में स्वास्थ्य और संस्कृति – आदिवासी समाज में स्वास्थ्य केवल शारीरिक स्थिति नहीं बल्कि सामाजिक और आध्यात्मिक संतुलन का प्रतीक माना जाता है।

कई आदिवासी समुदायों में रोगों को केवल शारीरिक कारणों से नहीं बल्कि आध्यात्मिक कारणों से भी जोड़ा जाता है। इसलिए कई उपचार पद्धतियों में धार्मिक अनुष्ठानों और पूजा का भी उपयोग किया जाता है।

रोजगार के अवसर – औषधीय पौधों के क्षेत्र में आदिवासी समुदायों के लिए कई प्रकार के रोजगार उपलब्ध हो सकते हैं।

1. जड़ी–बूटियों का संग्रह – यह आदिवासी समुदायों के लिए आय का पारंपरिक स्रोत है।

2. औषधीय पौधों की खेती – कई किसान अब औषधीय पौधों की खेती कर रहे हैं।

3. प्रसंस्करण उद्योग – जड़ी–बूटियों को सुखाने, पैक करने और प्रसंस्करण करने के लिए छोटे उद्योग स्थापित किए जा सकते हैं।

4. हर्बल उत्पाद निर्माण – स्थानीय स्तर पर हर्बल उत्पाद बनाकर बाजार

में बेचे जा सकते हैं।

औषधीय पौधों और अर्थव्यवस्था पर अध्ययन – कई शोधकर्ताओं ने औषधीय पौधों के आर्थिक महत्व का भी अध्ययन किया है। इन अध्ययनों से यह स्पष्ट हुआ है कि:

1. औषधीय पौधों का व्यापार ग्रामीण और आदिवासी क्षेत्रों में आय का महत्वपूर्ण स्रोत बन सकता है।
2. हर्बल उद्योग के विकास से रोजगार के नए अवसर उत्पन्न होते हैं।
3. औषधीय पौधों की खेती से किसानों की आय बढ़ सकती है।

भारत में आयुर्वेदिक और हर्बल उत्पादों की बढ़ती मांग के कारण औषधीय पौधों का बाजार तेजी से विकसित हो रहा है।

9. औषधीय पौधों का वैश्विक बाजार– विश्व स्वास्थ्य संगठन (WHO) के अनुसार:

- लगभग 80% लोग पारंपरिक चिकित्सा पर निर्भर हैं
- औषधीय पौधों का वैश्विक बाजार 100 बिलियन डॉलर से अधिक है।

भारत में भी आयुर्वेदिक उत्पादों की मांग तेजी से बढ़ रही है।

आदिवासी ज्ञान के सामने चुनौतियाँ:

1. वनों की कटाई
2. पारंपरिक ज्ञान का लोप
3. आधुनिक चिकित्सा का प्रभाव
4. औषधीय पौधों का अत्यधिक दोहन
5. बाजार तक पहुंच की कमी

इन कारणों से आदिवासी औषधीय परंपरा धीरे-धीरे कमजोर हो रही है।

औषधीय पौधों का संरक्षण विकास के उपाय – आदिवासी समुदायों ने पारंपरिक रूप से जंगलों और पौधों के संरक्षण की कई विधियाँ विकसित की हैं।

उदाहरण:

1. पवित्र वन (Sacred Groves) की परंपरा
2. विशेष पेड़ों की पूजा
3. पौधों का सीमित उपयोग

इन परंपराओं के कारण जैव विविधता का संरक्षण होता है।

1. औषधीय पौधों का संरक्षण
2. आदिवासी ज्ञान का दस्तावेजीकरण
3. सरकारी योजनाओं का विस्तार
4. औषधीय पौधों की खेती को बढ़ावा
5. आदिवासी समुदायों को प्रशिक्षण

भारत सरकार ने इस दिशा में कई योजनाएँ शुरू की हैं।

उदाहरण:

- राष्ट्रीय औषधीय पादप बोर्ड (NMPB)
- आयुष मंत्रालय

सरकारी योजनाएँ और पहल – भारत सरकार और विभिन्न राज्य सरकारों ने औषधीय पौधों के विकास के लिए कई योजनाएँ शुरू की हैं।

राष्ट्रीय औषधीय पादप बोर्ड – यह संस्था औषधीय पौधों के संरक्षण और विकास के लिए कार्य करती है।

इसके प्रमुख उद्देश्य हैं:

1. औषधीय पौधों की खेती को बढ़ावा देना
2. किसानों को प्रशिक्षण देना
3. औषधीय पौधों के संरक्षण को बढ़ावा देना

आयुष मंत्रालय की भूमिका– भारत सरकार का आयुष मंत्रालय पारंपरिक चिकित्सा प्रणालियों को बढ़ावा देने के लिए कार्य करता है।

इस मंत्रालय के माध्यम से औषधीय पौधों के अनुसंधान और विकास को प्रोत्साहित किया जाता है।

आदिवासी अर्थव्यवस्था पर प्रभाव – औषधीय पौधों का व्यापार आदिवासी समुदायों की अर्थव्यवस्था को कई प्रकार से प्रभावित करता है।

सकारात्मक प्रभाव:

1. आय में वृद्धि
2. रोजगार के अवसर
3. ग्रामीण विकास
4. पारंपरिक ज्ञान का संरक्षण

नकारात्मक प्रभाव:

1. अत्यधिक दोहन से पौधों की कमी
2. व्यापार में बिचौलियों की भूमिका
3. उचित मूल्य का अभाव

सतत विकास की आवश्यकता – औषधीय पौधों का उपयोग सतत विकास के सिद्धांतों के अनुसार होना चाहिए। इसके लिए निम्नलिखित उपाय आवश्यक हैं:

1. पौधों का संरक्षण
2. वैज्ञानिक तरीके से खेती
3. आदिवासी समुदायों को उचित मूल्य
4. स्थानीय स्तर पर प्रसंस्करण उद्योगों की स्थापना

3. बाजार तक सीमित पहुँच – अधिकांश आदिवासी समुदायों को औषधीय पौधों के उचित बाजार तक पहुँच नहीं मिल पाती।

अक्सर बिचौलिये कम कीमत पर जड़ी-बूटियाँ खरीद लेते हैं, जिससे आदिवासी लोगों को उचित लाभ नहीं मिल पाता।

4. वैज्ञानिक अनुसंधान की कमी – हालाँकि आदिवासी औषधीय ज्ञान अत्यंत महत्वपूर्ण है, फिर भी इस पर पर्याप्त वैज्ञानिक अनुसंधान नहीं हुआ है।

यदि इस ज्ञान का वैज्ञानिक अध्ययन किया जाए तो नई औषधियों का विकास संभव है।

5. संरक्षण की कमी – कई औषधीय पौधों का अत्यधिक दोहन किया जा रहा है, जिससे उनकी संख्या कम हो रही है।

यदि समय रहते संरक्षण के उपाय नहीं किए गए तो कई महत्वपूर्ण प्रजातियाँ विलुप्त हो सकती हैं।

सुझाव – आदिवासी औषधीय ज्ञान के संरक्षण और विकास के लिए निम्नलिखित सुझाव दिए जा सकते हैं:

1. पारंपरिक ज्ञान का दस्तावेजीकरण – आदिवासी समुदायों के औषधीय ज्ञान को लिखित रूप में दर्ज करना आवश्यक है ताकि यह भविष्य की पीढ़ियों के लिए सुरक्षित रह सके।

2. औषधीय पौधों का संरक्षण – वनों और जैव विविधता के संरक्षण के लिए विशेष कार्यक्रम चलाए जाने चाहिए।

3. औषधीय पौधों की खेती को बढ़ावा – किसानों और आदिवासी समुदायों को औषधीय पौधों की वैज्ञानिक खेती के लिए प्रशिक्षण दिया

जाना चाहिए।

4. बाजार सुविधाओं का विकास – सरकार और सहकारी संस्थाओं को आदिवासी समुदायों को उचित बाजार और उचित मूल्य उपलब्ध कराने के लिए प्रयास करने चाहिए।

5. अनुसंधान और शिक्षा – विश्वविद्यालयों और शोध संस्थानों को आदिवासी औषधीय ज्ञान पर अधिक शोध करना चाहिए।

अध्याय का सार – इस अध्याय में आदिवासी औषधीय ज्ञान के सामाजिक और आर्थिक महत्व का विश्लेषण किया गया है। साथ ही इस क्षेत्र में मौजूद चुनौतियों और उनके समाधान के लिए सुझाव प्रस्तुत किए गए हैं।

निष्कर्ष – प्रस्तुत शोध-अध्ययन से यह स्पष्ट होता है कि आदिवासी समुदायों का औषधीय ज्ञान अत्यंत महत्वपूर्ण सांस्कृतिक और वैज्ञानिक धरोहर है। आदिवासी समाज सदियों से प्रकृति के साथ सामंजस्य स्थापित कर जीवन यापन करता आया है। जंगलों में पाए जाने वाले पौधों, जड़ों, पत्तियों और जड़ी-बूटियों का उपयोग वे विभिन्न रोगों के उपचार के लिए करते हैं। यह पारंपरिक चिकित्सा प्रणाली स्वास्थ्य संरक्षण के साथ-साथ आदिवासी संस्कृति का भी महत्वपूर्ण हिस्सा है।

अध्ययन से यह भी स्पष्ट होता है कि औषधीय पौधे आदिवासी समुदायों की अर्थव्यवस्था में महत्वपूर्ण भूमिका निभाते हैं। जड़ी-बूटियों का संग्रह और व्यापार कई परिवारों के लिए आय का महत्वपूर्ण स्रोत है। वर्तमान समय में हर्बल और आयुर्वेदिक उत्पादों की बढ़ती मांग के कारण औषधीय पौधों का महत्व और अधिक बढ़ गया है।

हालाँकि इस क्षेत्र में कई चुनौतियाँ भी मौजूद हैं जैसे:

1. वनों की कटाई
2. पारंपरिक ज्ञान का लोप
3. बाजार तक सीमित पहुँच
4. औषधीय पौधों का अत्यधिक दोहन

इन समस्याओं के समाधान के लिए आवश्यक है कि आदिवासी समुदायों के पारंपरिक ज्ञान का संरक्षण किया जाए और उन्हें आर्थिक विकास की मुख्यधारा से जोड़ा जाए।

यदि उचित नीतियाँ और कार्यक्रम लागू किए जाएँ तो औषधीय पौधों के माध्यम से आदिवासी क्षेत्रों में सतत विकास को बढ़ावा दिया जा सकता है।

आदिवासी समुदायों का औषधीय ज्ञान अत्यंत महत्वपूर्ण सांस्कृतिक और वैज्ञानिक धरोहर है। यह ज्ञान न केवल स्वास्थ्य संरक्षण में सहायक है बल्कि स्थानीय अर्थव्यवस्था के विकास में भी महत्वपूर्ण भूमिका निभाता है।

यदि इस ज्ञान का सही संरक्षण और वैज्ञानिक उपयोग किया जाए तो यह:

1. ग्रामीण और आदिवासी अर्थव्यवस्था को मजबूत कर सकता है
2. औषधीय उद्योग को बढ़ावा दे सकता है
3. प्राकृतिक संसाधनों के संरक्षण में सहायक हो सकता है

इसलिए आवश्यक है कि आदिवासी समुदायों के पारंपरिक ज्ञान का सम्मान किया जाए और उन्हें आर्थिक विकास की मुख्यधारा से जोड़ा जाए।

टिप्पणी – इस शोध-प्रबंध के माध्यम से यह स्पष्ट होता है कि आदिवासी समुदायों का औषधीय ज्ञान न केवल सांस्कृतिक धरोहर है बल्कि भविष्य की स्वास्थ्य प्रणाली और अर्थव्यवस्था के लिए भी अत्यंत महत्वपूर्ण है।

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

रानीखेत के प्रमुख पर्यटन स्थल एवं दर्शनीय स्थल (रानी का मैदान) का परिदृश्य

डॉ. लक्ष्मी देवी*

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शोध सारांश – उत्तराखण्ड के अल्मोड़ा जिले में समुद्र तल से 1,869 मीटर की ऊँचाई पर स्थित रानीखेत जिसका अर्थ रानी का खेत है। रानीखेत अपनी प्राकृतिक सौन्दर्य के लिए मनमोहक है यहाँ पर शांत और खूबसूरत हील स्टेशन हैं। रानीखेत देवभूमि हैं। यहाँ पर प्राचीन समय में देव तपस्या करने हेतु आते थे। देवदार एवं चीड़ के जंगलों से घिरा यह शहर भारतीय सेना कि कुमाँऊ और नागा रेजीमेन्ट के मुख्यालय के नाम से जाना जाता है। यहाँ पर सीमावल का मुख्यालय भी हैं।

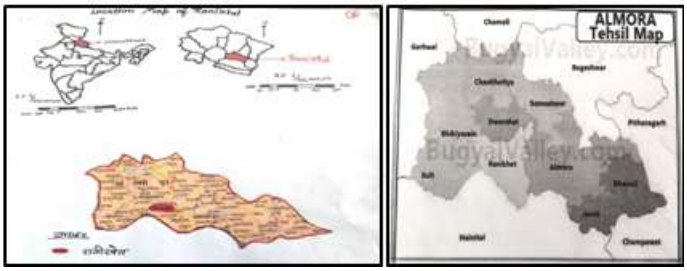
प्रमुख दर्शनीय स्थल जैसे–चौबटिया गार्डन, गोल्फकोर्स, भालूबांध, कुमाँऊ रेजिमेंट सेन्टर संग्रहालय, हेड़ाखान मन्दिर, कालिका मन्दिर पर्यटकों का मन मोह लेते हैं।

प्रस्तावना – रानीखेत इस पर्वतीय नगरी तक अल्मोड़ा और नैनीताल से भी आसानी से पहुँचा जा सकता हैं। रानीखेत क्षेत्र भारत के उत्तराखण्ड राज्य के अल्मोंड़ा जिले में स्थित हैं। और एक प्रसिद्ध पर्वतीय पर्यटन स्थल और दर्शनीय स्थल (छावनी नगर भी) है। रानीखेत अनेक सुन्दर स्थल, चीड़ के वन और फलों के बाग है। चौबटिया, जहाँ राज्य सरकार के फलों के बाग है, यहाँ से अधिक दूरी नही हैं। यहाँ पर गोल्फ कोर्स भी प्रसिद्ध हैं। यहाँ एक रज्जु मार्ग भी है। इसमे नोरम स्थल से बहुत समय पहले कुमाँऊ के एक चन्द राजा की रानी गुजर रही थी। उसे यह स्थान इतना मनोरम लगा कि उसने यहीं पर अपना डेरा डाल दिया। जहाँ पर आज कल रानीखेत क्लब है। उस समय वह एक खेत था। रानीखेत नाम उसी रानी के खेत के नाम पर पड़ा। वास्तव में यह नगर हिल स्टेशनों की रानी है। इस नगर की खोज सर्व प्रथम अंग्रेजो ने की थी।

एकदृष्टि में रानीखेत क्षेत्र से सम्बन्धित आँकड़े–

रानीखेत नगर की स्थापना	–	1869 ई0
क्षेत्रफल	–	4183 एकड़
कुल जनसख्या	–	19,049 (नगर)
2011 जनगणना		
पुरूष	–	11,412
स्त्री	–	7,472
साक्षरता दर	–	95.21 प्रतिशत

भौगोलिक स्थिति



ऊँचाई – 1869 मीटर (6132 फीट)

दूरी– यह नैनीताल से लगभग 59 किमी,अल्मोड़ा से 45 किमी दिल्ली से 341 किमी और देहरादून से 310 किमी दूर है।

धरातलीय स्वरूप– घुमाव दार पहाड़ियाँ, समतल मैदानों और घनेदेव दार और चीड़ के जंगलो में घिरा हुआ है यहाँ की जलवायु ठण्डी एवं सुहावनी रहती है।

भौगोलिक निर्देशांक :– 29.65^0 उत्तर अक्षांश और 79.42^0 पूर्व देशान्तर हैं।

प्रमुख प्रर्यटन स्थल एवं दर्शनीय स्थल :– मनकामेश्वर मन्दिर, हनुमान मन्दिर, झूलादेवी मन्दिर, नैसर्गिक सुन्दरता, गोल्फ कोर्स।

तापमान :– अधिकतम तापमान 27^0 C से 32^0 C के बीच रहता हैं।

न्यूनतम तापमान – सर्दियों में 3^0 C तक गिर जाता हैं।

वर्षा :– औसतन 1200 मिमी से 1500 मिमी के बीच।

शहर में सबसे अधिक वर्षा जुलाई एवं अगस्त के महिनों में मानसून के दौरान दर्ज की जाती हैं।

भाषा:– हिन्दी एवं कुमाँउनी।

छावनी होने के कारण अंग्रेजी भी बोलते हैं।

रानीखेत की प्रमुख नदियाँ:– कोसी एवं रामगंगा।

प्रमुख फसलें :–गेंहूँ, मक्का, धान, जौ, और मंडुआ (कोदा), भट्ट की दाल, पारम्परिक खाद्यान्न फसलें उगाई जाती हैं। उसके अतिरिक्त ठंडी जलवायु होने के कारण यहाँ सेब, आडू, खुंबानी, आलूबुखारा और अखरोट जैसी फल का उत्पादन किया जाता हैं।

सब्जियाँ–आलू, गोभी, मूली, ककड़ी, मटर, टमाटर, लोकी उगाई जाती हैं।

पशुपालन :– रानीखेत और उसके आसपास के पहाड़ी क्षेत्रों में पशुपालन (आजीविका, आय और कृषि का एक मुख्य हिस्सा हैं)। यहाँ पर मुख्य रूप से गाय (वद्रीगाय) भेड़, बकरी, मुर्गीपालन, मत्स्य पालन भी किया जाता हैं।

खनिज पदार्थ :– ताबाँ, चूना, लोहा, टंग्स्टन, डोलोमाइट।

धर्म एवं संस्कृति :– रानीखेत अपने धार्मिक स्थलों, समृद्ध, कुमाँउनी संस्कृति और शान्तिपुर्ण आध्यात्मिक माहौल के लिए जाना जाता हैं। रानीखेत में मुख्यरुप से हिन्दु धर्म के अनुयायी रहते हैं। परन्तु सभी धर्मो के लोग मिल–जुलकर रहते हैं। रानीखेत की संस्कृति एवं परम्परा में कुमाँउनी झलक मिलती हैं। तो यहाँके लोकगीत, नृत्यों और खान–पान में दिखती हैं।

1. भाषा।
2. त्यौहार।
3. लोककला एवं संगीत।
4. हस्तशिल्प और पहनाउ।
5. ऐतिहासिक एवं सांस्कृतिक महत्व।

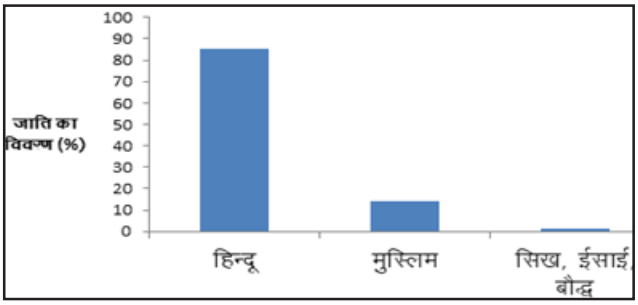
धर्म/जातियों का विवरण :–

(2011 में जनसंख्या के धर्म आधारित जनगणना के आँकड़े)

क्र.	धर्मजाति का नाम	प्रतिशत
1.	हिन्दु	85.11
2.	मुस्लिम	14.00
3.	सिख, ईसाई, बौद्ध	01.00 से कम
	कुल योग	**100.00**

स्रोत :–

1. उत्तराखंड समग्र अध्ययन।
2. नेट द्वारा प्राप्त आंकड़े।
3. सांख्यिकीय पत्रिका उत्तराखण्ड।



प्राकृतिक वनस्पति :– यह क्षेत्र चीड़, बांज और देवदार के सघन जंगलों से आच्छादित हैं।

मिट्टियाँ :– रानीखेत के पर्वतीय और पहाड़ी क्षेत्रो में मुख्य रूप से तीन प्रकार की मिट्टियाँ पाई जाती हैं।

1. पर्वतीय वन मिट्टी।
2. क्वार्टजाइट मिट्टी।
3. जलोढ़ मिट्टी।

परिवहन के साधन :– रानीखेत पहुँचने हेतु एवं घूमने के लिए सड़क परिवहन ही मुख्य साधन हैं। मुख्य साधनों के रूप में निजी टैक्सी। कैब, उत्तराखण्ड परिवहन निगम (UTC) की बसें और कार शामिल हैं।

रानीखेत के प्रमुख पर्यटन स्थल एवं दर्शनीय स्थल :– उत्तराखण्ड के कुमाँउ क्षेत्र में स्थित रानीखेत एक बेहद खूबसूरत हिल स्टेशन हैं। यहाँ के प्रमुख पर्यटन स्थलों में चोबटिया गार्डन, झूला देवी मन्दिर, उपत गोल्फ कोर्स और भालू डैम शामिल हैं।

1. **झूला देवी मन्दिर :–** यह मन्दिर लगभग 700 साल पुराना यह मन्दिर माँ दुर्गा देवी का हैं। यहाँ पर मन्नत पूरी होने के बाद भक्त घंटियाँ बाँधते हैं। यहाँ पर भक्तजन अधिक मात्रा में आते हैं।

2. **चौबटिया गार्डन :–** चौबटिया गार्डन यह स्थान सेब, आडू. और खुबानी के विशाल बागो के लिए प्रचलित हैं। यहाँ से नन्दा देवी और त्रिशूल चोटियों का शानदार नजारा देखने को मिलता हैं। पर्यटक ज्यादा मात्रा में आते हैं। मौसम सुहाना एवं प्राकृतिक सौन्दर्य स्थल हैं।
3. **भालू डैम :–** चौबटिया गार्डन के पास यह छोटा और शांत कृत्रिम जलाशय हैं। जो अंग्रेजो द्वारा 1903 में बनाया गया था। जिसमें भविष्य के लिए जल संरक्षण किया जाता हैं।
4. **रानीझील :–** छावनी बोर्ड द्वारा जल संरक्षण के लिए बनाई गई हैं यह कृत्रिम झील हैं जहाँ पर बोटिंग की जाती हैं। पास ही फोटोग्राफी करने हेतु गार्डन भी बना हैं।

5. हैड़ाखान बाबाजी मन्दिर :- यह मन्दिर भगवान शिव को समर्पित आश्रम बना हैं। शान्त स्थान पर हैं यहाँ पर विदेशी बहुत आते हैं हैड़ाखान मन्दिर में हॉस्पिटल बने हैं जिसमें देश-विदेश से व्यक्ति अपना ऑनलाईन रजिस्ट्रेशन कराने के बाद अपना इलाज कराने एवं थेरेपी, योग करने हेतु आते हैं। भोजन की व्यवस्था डॉक्टर के परामर्श पर दी जाती हैं। व्यवस्था बने आश्रम में रहने एवं खाने की होती हैं।

6. आशियाना पार्क :- यह रानीखेत में सदर बाजार के पास हैं जिसमें अनेक प्रकार के रंग-बिरंगे फब्बारे, जूलाँजिकल पार्क, हर्बल गार्डन और हिमालय के नजारें देखने हेतु व्यू-पॉइंट बने हैं। इसका प्रवेश शुल्क मात्र 5 रू हैं। मनोरम दृश्य देखे जात हैं।

7. कुमाँऊ रेजिमेंट सेन्टर संग्रहालय :- KRC Musium भी कहा गया हैं। यह ऐतिहासिक एवं इतिहास प्रेमियों के लिए बहुत ही बेहतरीन स्थल हैं जहाँ कुमाँऊ और गढ़वाल रेजिमेंट के इतिहास और अस्त्र-शस्त्रों को प्रदर्शित किया गया हैं।

8. उपत और कालिका-रानीखेत से लगभग 6 किमी की दूरी पर स्थित हैं। दो बेहद शान्त और सुरम्य गॉव हैं उपत अपने शानदार आर्मी गोल्फ कोर्स और आकर्षण नगरों के लिए जाना जाता है। वही कालिका गॉव अपने प्रसिद्ध 500 साल पुराने देवी मन्दिर के कारण पर्यटकों और श्रद्धालुओं के बीच तालमेल बनाये हैं। यहाँ से बर्फ से ढ़के हिमालय की चोटियों और घने चीड़ और देवदार के जंगलो का मनमोहक नजारा दिखता है।

माँ कालिका मन्दिर स्थानीय कुमाँऊ रेजीमेंट के जवानों के बीच बेहद पवित्र माना जाता हैं।

9. मनकामेश्वर मन्दिर- इस मन्दिर की स्थापना कुमाँऊ रेजीमेंट द्वारा स्थापित किया गया है और यह भगवान शिवजी का मन्दिर मनोकामना बना है। यह मन्दिर मुख्य शहर में बना है।

निष्कर्ष-रानीखेत प्राकृतिक सुन्दरता, समृद्ध सैन्य इतिहास और आध्यात्मिक, ऐतिहासिक स्थल, शान्ति का अनूठा संगम है। यहॉ प्रमुख पर्यटक स्थल एवं दर्शनीय स्थल, जैसे- प्राचीन मन्दिर, गोल्फकोर्स, संग्रहालय मनमोहक बगीचे पर्यटकों को एक यादगार अनुभव प्रदान करते है।

सन्दर्भ ग्रन्थ सूची:-

1. उत्तराखण्ड सामान्य ज्ञान
2. उत्तराखण्ड का भूगोल - राजेश नौटियाल जी एंव चौनियाल जी
3. उत्तराखण्ड समग्र अध्ययन
4. सांख्यिकीय पत्रिका उत्तराखण्ड
5. उत्तराखण्ड समग्र ज्ञान कोष- डॉ. राजेन्द्र प्रसाद बलोढ़ी
6. उत्तराखण्ड में पर्यटन के नए क्षितिज- डॉ. हरिमोहन
7. उत्तराखण्ड की खोज- डॉ. आर0 पी0 ध्यानी
8. उत्तराखण्ड का भूगोल- डॉ. डी0 डी0 मैठाणी, डॉ. गायत्री प्रसाद
9. हिमालय दर्शन- डॉ. कृष्ण नारायण गोसाई
10. पर्यटन एंव यात्रा के सिद्धान्त- डॉ. जगमोहन सिहँ
11. हमारा उत्तराखण्ड- डॉ. के0 सी0 पुरोहित
12. नेट द्वारा प्राप्त आँकड़े
13. संस्कृति, पर्यावरण और पर्यटन- डॉ. हरिमोहन
14. उत्तराखण्ड का पर्यटन विकास- डॉ. ताजरावत
15. उत्तराखण्ड एंव सर्वेक्षण- डॉ. गोविन्द चातक

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Measuring Consumer Acceptance and Patronage in the Sharing Economy: A Pilot Study

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Abstract: The growth of digital platforms has transformed consumer access to products and services, contributing to the expansion of the sharing economy. This pilot study evaluates the preliminary reliability of a structured instrument designed to measure consumer acceptance and patronage across sharing-economy categories, including shared mobility, peer-to-peer accommodation, rental clothing, and rental furniture. Data were collected from 51 respondents using a seven-point Likert scale. The study examined five constructs: consumer acceptance, perceived value, convenience, trust and safety, and customer patronage. Cronbach's alpha values ranged from 0.897 to 0.970, indicating strong internal consistency. The findings provide preliminary support for the reliability of the instrument and its use in the main study. However, the small convenience-based sample limits generalizability. Further validation with a larger and more diverse sample is recommended.

Keywords: Sharing Economy, Consumer Acceptance, Customer Patronage, Perceived Value, Convenience, Trust.

Introduction - Digitalisation has transformed consumer behaviour by enabling access to products and services through technology-based platforms rather than relying solely on ownership. This transformation has contributed to the growth of the sharing economy across sectors such as shared mobility, peer-to-peer accommodation, rental clothing and rental furniture. Digital platforms facilitate collaborative consumption by connecting consumers with products and services in flexible and accessible ways (Hamari et al., 2016).

Consumer participation in the sharing economy is influenced by factors such as perceived value, convenience, trust and safety, and consumer acceptance. Perceived value reflects the benefits consumers receive in relation to the costs involved (Sweeney & Soutar, 2001), while convenience is associated with ease of access, flexibility and time savings. Trust is particularly important in platform-based and peer-to-peer transactions, where consumers often interact with unfamiliar service providers or shared resources (Hawlitschek et al., 2016). Research also indicates that satisfaction and perceived benefits can influence consumers' willingness to use sharing services again (Möhlmann, 2015).

Before conducting large-scale research, it is important to establish that the research instrument is clear, reliable and suitable for the target respondents. Therefore, the present study undertakes a pilot assessment of a structured questionnaire developed to measure consumer acceptance and patronage in the sharing economy. The study examines five dimensions—consumer acceptance, perceived value, convenience, trust and safety, and customer patronage—with a focus on preliminary reliability and descriptive findings. The results provide an initial basis for refining and validating the instrument for the subsequent main study.

Literature Review

The sharing economy has changed traditional consumption by enabling consumers to access products and services through digital platforms rather than relying exclusively on ownership. Previous studies indicate that economic benefits, convenience, sustainability and personal values influence participation in collaborative consumption (Hamari et al., 2016; Piscicelli et al., 2015). Similarly, access-based consumption allows consumers to use products and services temporarily without owning them (Bardhi & Eckhardt, 2012).

Perceived value and convenience are important determinants of consumer participation. Consumers consider affordability, flexibility, accessibility and the benefits received in relation to the costs involved (Sweeney & Soutar, 2001). Technology-enabled platforms can further improve convenience through easy booking, accessibility and flexible usage, while perceived usefulness and ease of use contribute to consumer acceptance (Davis, 1989; Venkatesh et al., 2003).

Trust and reputation are especially important in peer-to-peer transactions, where consumers may interact with

unfamiliar providers. Ert et al. (2016) found that trust and reputation influence consumer decisions on Airbnb, while Hawlitschek et al. (2016) highlighted trust in platforms, providers and users as important determinants of sharing-economy participation.

Consumer acceptance and patronage are influenced by satisfaction, perceived benefits and previous usage experiences. Möhlmann (2015) found that satisfaction affects the likelihood of using sharing-economy services again. Tussyadiah and Pesonen (2016) also highlighted the influence of peer-to-peer accommodation on consumer travel behaviour. From a broader marketing perspective, Eckhardt et al. (2019) noted that the sharing economy has created new forms of interaction between consumers, platforms and service providers.

Overall, the literature indicates that perceived value, convenience, trust, acceptance and patronage are important dimensions of sharing-economy consumption. However, relatively limited research has examined these factors through a common measurement instrument across different categories such as shared mobility, accommodation, rental clothing and rental furniture. The present pilot study addresses this gap by assessing the preliminary reliability of an instrument covering consumer acceptance, perceived value, convenience, trust and safety, and customer patronage.

Objectives of the Pilot Study: The pilot study was undertaken to evaluate the preliminary suitability of the research instrument. The specific objectives were:

1. To assess the clarity and suitability of the questionnaire for the intended respondents.
2. To evaluate the internal consistency of the measurement items using Cronbach's alpha.
3. To identify and address any unclear, confusing, or ambiguous items in the questionnaire.
4. To assess the readiness of the instrument for use in the main data-collection phase.

These objectives were formulated to ensure that the questionnaire was appropriate, consistent, and adequately structured before proceeding with the full-scale study.

Conceptual Basis of the Measurement Instrument: The pilot questionnaire was structured around five key constructs relevant to understanding consumer responses to sharing-economy products and services: **Consumer Acceptance, Perceived Value, Convenience, Trust and Safety, and Customer Patronage**. These dimensions were selected to capture both the consumer's initial orientation towards sharing-economy offerings and the factors that may contribute to continued use. The research presentation identifies these constructs as the major dimensions included in the pilot instrument.

Consumer Acceptance: Consumer acceptance represents the extent to which individuals are receptive to using sharing-economy products and services. It reflects consumers' willingness to consider an access-based alternative to conventional ownership and their positive orientation towards digitally enabled sharing platforms.

In the context of the present study, acceptance is considered an important preliminary stage in consumer participation. A consumer may become interested in a sharing-economy service because it offers an alternative way of obtaining transportation, accommodation, clothing, furniture, or other resources. Acceptance therefore reflects the consumer's openness towards this form of consumption and willingness to engage with the service.

Perceived Value: Perceived value refers to the consumer's overall evaluation of the benefits obtained from a sharing-economy service in relation to the costs or sacrifices involved. In this context, value is not limited to monetary savings. Consumers may also consider the quality of the service, flexibility, variety, usefulness, and benefits obtained through temporary access.

For sharing-economy services, perceived value can therefore arise when consumers believe that accessing a product or service provides greater overall benefits than purchasing or owning it. A positive perception of value may contribute to favourable attitudes towards the platform and encourage continued use.

Convenience: Convenience refers to the extent to which a sharing-economy service makes consumption easier, quicker, and less demanding for the consumer. Digital platforms can simplify several stages of the consumption process, including searching, comparing alternatives, booking, making payments, accessing services, and cancelling or modifying reservations.

Convenience is particularly relevant to sharing-economy platforms because consumers often seek flexible solutions that reduce the time and effort associated with conventional purchasing or ownership. A convenient service experience may therefore strengthen consumers' willingness to use and reuse sharing-economy services.

Trust and Safety: Trust and safety represent consumers' confidence in the platform, service provider, product or transaction process. This construct is particularly relevant to the sharing economy because transactions may involve unfamiliar individuals, peer providers, digital payments, and reliance on information supplied through online platforms.

Consumers may therefore consider factors such as platform credibility, safety measures, reviews and ratings, transparency, secure payment systems, and mechanisms for handling complaints. A greater sense of trust and security can reduce uncertainty and perceived risk, thereby creating a more favourable environment for participation in sharing-economy services.

Customer Patronage: Customer patronage represents the consumer's intention to continue using sharing-economy products or services and to recommend them to others. While acceptance reflects the consumer's initial openness towards the sharing-economy concept, patronage focuses more strongly on continued engagement.

Patronage may be influenced by the consumer's overall experience with the service, particularly the value received, convenience, reliability, trust, and perceived quality. A consumer who is satisfied with these aspects may be more willing to reuse the service and recommend it to family, friends, or other potential users.

Thus, the five constructs together provide a preliminary framework for examining consumer responses to sharing-economy offerings. The pilot study primarily assesses whether these dimensions can be measured consistently through the proposed questionnaire before the instrument is applied to the larger sample.

Research Methodology: The pilot study was undertaken as an initial methodological step to evaluate the research instrument before proceeding with the main study. The methodology focused on assessing the suitability of the questionnaire, understanding respondents' responses to the measurement items, and examining the internal consistency of the proposed constructs.

Research Design: A quantitative pilot-study design was adopted for the present investigation. The pilot was primarily intended to assess the performance of the questionnaire rather than to test the proposed relationships among variables or draw conclusions about the larger consumer population.

The pilot stage provided an opportunity to examine whether the questionnaire was appropriately structured and whether the items used to measure consumer acceptance, perceived value, convenience, trust and safety, and customer patronage demonstrated satisfactory consistency. The findings were subsequently used to determine the suitability of the instrument for the main phase of the research.

Target Respondents: The study targeted respondents who were familiar with sharing-economy products and services. The scope included individuals having awareness or experience with different categories of sharing-economy offerings, namely shared mobility, peer-to-peer accommodation, rental clothing, and rental furniture.

The inclusion of respondents familiar with different categories was intended to provide an initial assessment of whether the questionnaire could capture common consumer perceptions across varied sharing-economy contexts.

Sample and Sampling Approach: The pilot study consisted of 51 respondents. The sample was selected for the purpose of preliminary testing of the research instrument. The presentation also indicates that responses were collected through both online and offline modes, with five respondents participating offline.

Given the relatively small size and pilot nature of the sample, the findings are intended to provide preliminary methodological evidence rather than statistically representative estimates of the broader population. Accordingly, the results are not intended for population-level generalisation.

Data Collection Instrument: Primary data were collected using a structured questionnaire developed around the major constructs of the study. A seven-point Likert scale was employed to record respondents' level of agreement with the statements included in the questionnaire.

The questionnaire covered five principal dimensions: Consumer Acceptance, Perceived Value, Convenience, Trust and Safety, and Customer Patronage

The use of a seven-point scale provided respondents with a broader range of response options and enabled the study to capture variations in their perceptions towards sharing-economy products and services.

Data Analysis: The pilot data were analysed using **descriptive statistics and reliability analysis**. Mean scores and standard deviations were examined to understand the general pattern and variation in respondents' responses to the measured constructs.

Cronbach's alpha was employed to assess the internal consistency of the items associated with each construct. The reliability assessment was undertaken to determine whether the items intended to measure a particular construct showed an acceptable level of consistency.

The pilot presentation reports that all major constructs achieved satisfactory reliability, with Cronbach's alpha values ranging from **0.897 to 0.970**.

The analysis therefore served two purposes: first, to provide preliminary descriptive evidence regarding consumer responses; and second, to assess whether the questionnaire demonstrated sufficient internal consistency to proceed to the larger data-collection phase.

Reliability Assessment: Reliability assessment is an important component of the pilot study as it provides an initial indication of the internal consistency of the measurement items used to represent the respective constructs. In the present study, **Cronbach's Alpha** was employed to assess the extent to which the items within each construct demonstrated consistency in their responses.As a general guideline, a Cronbach's Alpha coefficient of **0.70 or above** is considered indicative of acceptable internal consistency, while higher values suggest stronger consistency among the measurement items.

Table 1. Internal Consistency of the Major Constructs

Construct	Cronbach's Alpha
Consumer Acceptance	0.927
Perceived Value	0.925
Convenience	0.897
Trust & Safety	0.918
Customer Patronage	0.97

The results demonstrate a high level of internal consistency across all five constructs examined in the pilot study. **Customer Patronage** recorded the highest Cronbach's Alpha coefficient (α **= 0.970**), indicating a very high degree of consistency among its measurement items. This was followed by **Consumer Acceptance (α = 0.927), Perceived**

Value (α = 0.925), and Trust & Safety (α = 0.918), all of which demonstrate excellent internal consistency. **Convenience (α = 0.897)** also recorded a high reliability coefficient, indicating strong consistency among its constituent items.

Overall, the reliability results provide preliminary evidence that the measurement items used for the five constructs are sufficiently consistent for further investigation. Accordingly, the items were retained for subsequent large-scale data collection.

Descriptive Findings: The descriptive analysis of the pilot responses indicates an overall favourable perception of the major constructs examined in the study. The findings provide an initial understanding of how respondents perceived consumer acceptance, perceived value, convenience, trust and safety, and customer patronage in the context of sharing-economy products and services.

Table 2. Descriptive Summary of Pilot Responses

Construct	Range of Item-level Mean	SD Range
Trust & Safety	5.5–6.2	0.80–1.40
Consumer Acceptance	5.0–5.8	0.90–1.50
Perceived Value	5.5–6.3	0.80–1.30
Convenience	5.8–6.5	0.70–1.20
Customer Patronage	5.4–6.1	0.80–1.40

The descriptive findings indicate generally favourable responses across all five constructs, with item-level mean ranges exceeding the midpoint of the seven-point scale. Convenience recorded the highest item-level mean range (5.8–6.5), while Consumer Acceptance showed the comparatively lowest range (5.0–5.8) and greater variability in responses (SD = 0.90–1.50). The results provide a preliminary overview of respondents' perceptions and are intended primarily to support assessment of the instrument rather than to draw conclusions about the wider sharing-economy consumer population.

Discussion: The pilot study provides preliminary support for the reliability and suitability of the proposed measurement instrument. All five constructs recorded Cronbach's alpha values above 0.70, indicating satisfactory internal consistency.

Convenience recorded the highest item-level mean range, suggesting that respondents generally viewed the ease, accessibility and time-saving aspects of sharing-economy services favourably. However, this finding should not be interpreted as evidence that convenience is the strongest predictor of acceptance or patronage, as such relationships require testing in the main study. Trust and Safety and Customer Patronage also received favourable responses, although the latter reflects reported intentions rather than established repeated behaviour.

Overall, the pilot findings support the continuation of the questionnaire into the main study. No measurement items were removed at the pilot stage. Further validation using the larger sample will be required to establish the final factor structure and examine relationships among the constructs.

Implications of the Pilot Study: The pilot study provides preliminary evidence of satisfactory internal consistency among the questionnaire items. It also demonstrates the importance of pilot testing before undertaking large-scale data collection. The results provide a basis for further assessment of the instrument through factor analysis and evaluation of convergent and discriminant validity in the main study.

The preliminary findings indicate that **convenience, perceived value, trust, and service reliability** are important areas for sharing-economy platforms to consider. Managers may focus on simplifying booking and payment, providing transparent information and reviews, strengthening safety measures, ensuring reliable service, communicating value beyond price, and offering flexible cancellation options.These implications should be further validated through the main study.

The pilot provides a foundation for the subsequent investigation of consumer acceptance and patronage across different demographic groups, sharing-economy categories, and consumer characteristics. The main study can further examine whether perceived value, convenience, trust, and other identified dimensions significantly influence consumer acceptance and patronage.

Limitations: The pilot study has certain limitations that should be considered while interpreting its findings. The sample was limited to **51 respondents**, which restricts the generalisability of the results to the wider population of sharing-economy consumers. The use of convenience-based participation may also have introduced sampling bias. Further, respondents were familiar with different sharing-economy categories, including shared mobility, peer-to-peer accommodation, rental clothing, and rental furniture, which may differ in terms of usage patterns, perceived risks, and consumption contexts. Since the study relied on self-reported responses, the findings may not necessarily reflect actual future behaviour. Finally, although Cronbach's Alpha indicates internal consistency, it does not independently establish construct validity. Therefore, the larger study should undertake further psychometric assessment through appropriate factor analysis and validity testing.

Conclusion: The pilot study assessed the preliminary reliability of a questionnaire measuring consumer acceptance and patronage in the sharing economy. Data from 51 respondents using a seven-point Likert scale covered five constructs: acceptance, perceived value, convenience, trust and safety, and patronage. Cronbach's alpha values ranged from 0.897 to 0.970, indicating strong internal consistency. Overall, the findings support retaining the instrument for the main study, subject to validation with a larger and more diverse sample.

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Phytochemical Profiling and Anti-Osteoarthritic Potential of Selected Indian Medicinal Plants: An In Vitro Evaluation

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Abstract: Osteoarthritis (OA) is, honestly, the most common joint disorder worldwide, and right now pharmacological care depends quite a lot on non-steroidal anti-inflammatory drugs (NSAIDs), which come with GI, renal and cardiovascular risks that are very well known especially when they are taken for a long time. Because of that, researchers have shown renewed interest in medicinal plants that were used for joint problems in Indian traditional medicine for a long while. This narrative review tries to bring together what in vitro work says about the anti-osteoarthritic capacity of six frequently studied Indian medicinal plants: Curcuma longa, Boswelliaserrata, Zingiberofficinale, Withaniasomnifera, Tinosporacordifolia, and Trigonellafoenum-graecum. A structured search across Scopus, PubMed, and Google Scholar was done to capture in vitro pharmacological studies. In the material that was reviewed, phytochemicals linked with these plants tended to reduce pro-inflammatory signals like interleukin-1β, interleukin-6, tumour necrosis factor-alpha and prostaglandin E2. They also blocked cartilage-wear enzymes such as cyclooxygenase-2, 5-lipoxygenase, and matrix metalloproteinases, plus in multiple chondrocyte and cartilage-explant setups, they kept cartilage matrix integrity markers. Still, the mechanistic strength doesn't look the same across all plants, and only a small number of studies compare standardized extracts, under basically the same assay conditions. Overall, this review lays out the evidence as it stands, points to methodological shortcomings, and considers whether these botanicals could be used in translation, either as add-ons or as an alternative to routine pharmacotherapy for osteoarthritis.
Keywords: Indian medicinal plants, in vitro, anti-inflammatory,osteoarthritis, phytochemicals.

Introduction - Walk into any orthopaedic outpatient clinic on a busy morning, and a good share of the people waiting will be there for the same reason knees, hips, or hands that ache more than they used to. Osteoarthritis has quietly become one of the largest contributors to disability in ageing populations, too. A 2024 analysis from the Global Burden of Disease Study 2021 put the worldwide prevalence of osteoarthritis at roughly 607 million people, and disability-adjusted life years have kept climbing since 1990.[1] The knee remains the joint that is most often affected, and the burden falls disproportionately on women, also on older adults. [1,2] India, with its large and rapidly ageing population, is not exempt from this trend. Joint pain also ranks among the most frequent complaints seen in both allopathic and Ayurvedic clinical practice.

At the tissue level, osteoarthritis is no longer viewed just as "wear and tear" not even close. Cartilage breakdown is now considered an active inflammatory process, and not only passive degeneration. Inflammatory mediators, including pro-inflammatory cytokines like interleukin-1β (IL-1β) and tumour necrosis factor-alpha (TNF-α), can drive the release of matrix metalloproteinases (MMPs) and aggrecanases. Those then degrade collagen, and proteoglycans in the joint. [3,4] This inflammatory framing matters because it opens the door to pharmacological strategies that go beyond pain relief, and instead target the biochemical drivers behind cartilage loss.

The trouble is that the drugs people most commonly reach for, non-steroidal anti-inflammatory drugs (NSAIDs), well they're kind of a blunt tool. They help, but not without some kind of price. If you use NSAIDs for a long time it's linked with gastric ulceration, and bleeding, also cyclo-oxygenase-2 (COX-2) selective agents seem to come with a higher risk of myocardial infarction and stroke.[5] So clinicians treating older patients (and they are the majority in the osteoarthritis crowd) end up sort of stuck between symptom control and drug safety, like juggling two uneven weights. This push-pull, is exactly why researchers have kept circling plant derived alternatives, the kind that could give anti-inflammatory activity but with a gentler side-effect profile.

India's traditional pharmacopoeia is, honestly, a pretty

obvious place to look. Ayurvedic writings mention dozens of plants for joint pain and swelling, and quite a few of them, like turmeric, boswellia, ginger, ashwagandha, guduchi, and fenugreek—these, have gotten serious pharmacological attention over time. What's shifted in roughly the last two decades is that there are now cell-based and tissue-based in vitro models that let researchers ask a more precise question than "does this herb help arthritis." Instead, they can ask: which specific cytokines, enzymes and signalling pathways are involved, and in what concentration? This review pulls together the in vitro evidence for six of the most heavily studied Indian medicinal plants, with the goal of giving readers a clear mechanism-level view of what has actually been shown in the lab, rather than relying on folklore or anecdote.

Search Methodology: A literature search was conducted across Scopus PubMed/ MEDLINE, and Google Scholar for studies published up to 2026. The search terms combined the common and botanical names of six plants (Curcuma longa / turmeric Boswelliaserrata / salaiguggul, Zingiberofficinale / ginger Withaniasomnifera / ashwagandha, Tinosporacordifolia / guduchi, Trigonellafoenum-graecum / fenugreek) along with terms such as "osteoarthritis", "chondrocyte", "in vitro", "anti-inflammatory", "cartilage", and "cytokine". Studies were included if they reported an in vitro pharmacological evaluation like a cell line, primary chondrocyte, cartilage explant, or an enzyme/protein assay, that related to osteoarthritis-associated inflammation or cartilage catabolism. In vivo animal studies and clinical trials were included only when they were necessary to contextualise the in vitro findings, and they were clearly marked as such within the text. Reviews meta-analyses, and epidemiological reports were also used for background information and burden-of-disease data. Finally, reference lists from the retrieved articles were hand searched, for extra relevant primary studies.

Osteoarthritis: Pathophysiology and the Limits of Current Pharmacotherapy: Cartilage inside a healthy joint stays in like this quiet equilibrium between making new material and breaking it down. The chondrocytes, the one cell type that really lives there, keep producing type II collagen and aggrecan , while at low levels catabolic activity quietly clears matrix that has seen better days. Osteoarthritis however tilts that balance. Mechanical loading, ageing, extra body weight, and any joint injury nudge chondrocytes along with synovial macrophages to release IL-1β and TNF-α , which then promote cyclo-oxygenase-2 (COX-2), inducible nitric oxide synthase, and a whole cascade of matrix metalloproteinases, especially MMP-13 and MMP-3, plus aggrecanases like ADAMTS-5.[3,4,6] The overall outcome is gradual loss of collagen and proteoglycan, joint space getting smaller, and the pain plus stiffness that patients really, actually feel.

In terms of guideline- recommended pharmacotherapy, most of it leans on oral and topical NSAIDs, sometimes paired with intra-articular corticosteroids or hyaluronic acid. NSAIDs work for pain, pretty effectively in the short run, but the safety picture is not great. Both selective and non-selective NSAIDs have a higher chance of gastrointestinal ulceration, and COX-2 inhibitors in particular link to increased cardiovascular risk, so strong that regulators have limited their use in people who already have cardiovascular disease.[5] Since osteoarthritis tends to affect older adults, who also more often carry cardiovascular comorbidities, there's a genuine shortage of safer long-term options for disease management. It's that shortage, more than mere tradition, that has pushed renewed interest in botanical preparations that can tone down similar inflammatory pathways without the same organ-system downsides.

Indian Medicinal Plants Studied for Anti-Osteoarthritic Potential

Curcuma longa (Turmeric): Turmeric's active curcuminoid, curcumin, is probably the most studied phytochemical across this whole area, and the in vitro results are accordingly plentiful. In a transcriptomic study on primary human osteoarthritic chondrocytes, grown from seventeen patients, curcumin down-regulated more than a hundred genes tied to the inflammatory response, including NF-kB1/2, multiple chemokines, and both COX-1 and COX-2 , while also suppressing MMP-13, MMP-1 , and ADAMTS-5 expression.[7] The same report also described curcumin activating the Nrf2 antioxidant pathway, effectively turning on genes tied to detoxification and cytoprotection within only six hours after dosing.[7] Earlier work from Mathy-Hartert and coworkers already suggested that curcumin curbed pro-inflammatory messenger release, and reduced MMP-3 production in cultured chondrocytes, which gives some mechanistic support to what clinical trials were later, and separately, observing.[8]

That clinical story is still worth saying, just a bit, because it lines up with the in vitro findings, not really standing off by itself. Systematic reviews and randomized trials have described meaningful decreases in knee pain and joint effusion when using curcumin or Curcuma longa extracts, and in a few trials the effect size came close to standard NSAIDs. [9,10,11,12,13] Of course, none of this is proof that curcumin produces the exact same mechanism seen in cell culture, but the overlap between what happens in cells and what happens in patients is, overall, more reassuring than trusting either type of evidence alone.

Boswelliaserrata (Indian Frankincense, SalaiGuggul) Boswellia pharmacology kind of turns around boswellic acids, it's a family of pentacyclic triterpenes, where 3-O-acetyl-11-keto-β-boswellic acid (AKBA) is the one that gets studied the most. Where NSAIDs are usually redox oriented in their behavior, boswellic acids work as non-redox inhibitors of 5-lipoxygenase (5-LOX) , this enzyme is involved in making pro-inflammatory leukotrienes, and they don't just block cyclo-oxygenase in a straight, direct

way.[14,15] In a test with human blood cells, a standardized Boswellia extract inhibited 5-LOX with an IC50 of about 43 µg/mL, and it toned down leukotriene B4 plus prostaglandin E2 production at concentrations that were even lower.[16] The same extract also shielded SW1353 chondrosarcoma cells from IL-1β-triggered loss of SOX-9, which is a transcription factor pretty important for keeping chondrocyte identity and cartilage matrix production, at doses as low as 1 to 5 µg/mL.[16]

Mechanistically not the same as curcumin, but still sort of complementary, boswellic acids additionally inhibit human cathepsin G, a protease associated with cartilage matrix breakdown, and they suppress NF-kB activation.[17,18] A transcriptomic check comparing Curcuma longa versus Boswelliaserrata extracts on the same batch of osteoarthritic chondrocytes suggested that both treatments reduced inflammatory and catabolic gene expression, but through mostly different routes. Curcumin seemed to run via Nrf2 and arachidonic acid metabolism, while boswelia leaned more toward Toll-like receptor down-regulation and autophagy induction, which gives a reasonable biologic logic for putting the two together.[7]

Zingiberofficinale (Ginger): Ginger's pungent phenolic substances—mostly 6-gingerol and its dehydration byproduct 6-shogaol—have been tried across a wider spread of in vitro joint tissue models than maybe any other plant mentioned in this review. A rather thorough 2024 review listed in vitro work involving fibroblast-like synoviocytes and chondrocytes, and it reported that ginger extracts and isolated single compounds consistently dampened TNF-α, COX-2, and prostaglandin E2 output in synovial cells from both osteoarthritis and rheumatoid arthritis people.[19] In one of the papers gathered there, zingerone suppressed MMP-13 levels in both SW1353 cells and in explanted pig cartilage, which really pins the compound to cartilage preserving effects rather than just symptom easing, pain relief if you will.[19]

Also, when ginger extract was applied to C28I2 human chondrocytes it lowered reactive oxygen species and lipid peroxidation triggered by IL-1β, and it also increased the cells' own antioxidant enzymes like superoxide dismutase, glutathione peroxidase, and catalase.[19] Separately, 6-shogaol decreased nitric oxide, MCP-1, and IL-6 release from human chondrocyte cultures.[19] Overall, these observations place ginger in the role of doing multiple things at once: cytokine downshifting, blocking enzyme activity, and providing direct antioxidant fortification inside the chondrocyte itself.

Withaniasomnifera (Ashwagandha): Ashwagandha root is traditionally prescribed in Ayurveda for joint pain, and its withanolide rich extracts have been tested directly on human osteoarthritic cartilage, rather than on immortalized cell lines, which kind of gives the resulting data a different flavor all together. Sumantran and colleagues used a validated explant model of cartilage damage , exposing knee cartilage taken from osteoarthritis patients to an aqueous root extract, then measuring nitric oxide and glycosaminoglycan release as markers of inflammation and matrix breakdown.[20] The extract significantly reduced nitric oxide release in roughly half of the patient samples tested, and the authors spell this out pretty candidly as patient dependent rather than universal, which honestly is refreshingly rare across this kind of literature.[20]

That patient-to-patient variability is, on its own, a useful signal. It implies that whatever mechanism ashwagandha is driving through, might be tied to the baseline inflammatory state or to genetic factors that shift from one person to another. It is a nuance that is easy to lose when studies report only group averages. It also helps explain why in vitro explant models, messy as they can be, sometimes tell us more about real world variation than a tidier immortalized cell assay would.

Tinosporacordifolia (Guduchi): Guduchi gets used in a bunch of traditional Indian arthritis formulations, and its in vitro anti-inflammatory effects are shown in a clearer way mostly in immune-, and macrophage-based settings, not so much in chondrocyte cultures by themselves. For example in THP-1 monocytic cells, a chloroform extract from Tinosporacordifolia was reported to suppress lipopolysaccharide induced NF-kB activation , and then it reduced downstream pro inflammatory cytokine output.[21] Separately, in a rat autoimmune arthritis model, giving the extract brought down joint and cartilage harm, and the authors also noted changes in immune mediator patterns, they then tied those outcomes back to the in vitro immunomodulatory activity of the same extract on cultured immune cells.[22]

Because the evidence for guduchi seems to sit more heavily on immune cell assays and adjuvant arthritis models, rather than on direct chondrocyte work or cartilage explant experiments, its anti-osteoarthritic promise is better framed as plausible. It fits the mechanistic picture that matches NF-kB driven inflammation, rather than being shown directly inside cartilage tissue. So yeah, this is a real evidence gap, not a small footnote. A more targeted chondrocyte study would really help the argument a lot.

Trigonellafoenum-graecum (Fenugreek) and Other Supporting Botanicals: Fenugreek seed extracts have shown anti-inflammatory, anti-arthritic activity in petroleum ether and mucilage fractions, mostly due to linolenic and linoleic acid content.[23] A lot of the mechanistic work that exists though, was done in adjuvant-induced arthritis models in rats, rather than in isolated chondrocyte systems, so, like guduchi, fenugreek's evidence base for osteoarthritis, is still kind of indirect. Vitexnegundo (nirgundi) shows up a lot in Ayurvedic joint-care combinations and it's traditionally associated with anti-inflammatory effects in rheumatic as well as osteoarthritic contexts, however, strong in vitro data at the chondrocyte-level that is specific to this plant, seems comparatively limited in the peer-reviewed literature. This

is still a spot where more basic primary research would really help, and it kind of stands out.

In Vitro Methods Commonly Used to Evaluate Anti-Osteoarthritic Activity: Fenugreek seed extracts show anti-inflammatory, anti-arthritic activity in petroleum ether and mucilage fractions , mainly because of linolenic and linoleic acid content. [23] A bunch of the mechanistic work that exists though, was done in adjuvant induced arthritis models in rats, not really in isolated chondrocyte systems so, like guduchi, fenugreek's evidence base for osteoarthritis is still sort of indirect.

Vitexnegundo (nirgundi) keeps appearing in Ayurvedic joint care combinations and it's historically tied to anti-inflammatory effects in rheumatic settings as well as osteoarthritic ones, but the stronger in vitro data at the chondrocyte level that is directly specific to this plant, seems a bit less robust in the peer reviewed literature. This remains one of those areas where more basic primary research could genuinely clarify things, and it kind of stands out.

These two assays are pretty cheap, they are quick and widely used for the same reason, because they basically don't need any specialised cell culture facilities, and that's also why they show up so often in early-stage screening work on Indian medicinal plants. But honestly, they are also blunt instruments. They tell you next to nothing about which exact cytokine, or enzyme pathway is going on, and if you get a positive result in a protein-denaturation assay that doesn't automatically mean you'll see activity in a living chondrocyte. The more mechanistically informative studies mentioned earlier in this review, like RNA-sequencing on primary chondrocytes, cytokine immunoassays, enzyme-specific inhibition assays, are kind of at the other end of the spectrum compared to these screening tools. So readers looking through this literature should weigh the evidence accordingly, rather than treating each single "in vitro anti-inflammatory" statement as if it were the same as the others.

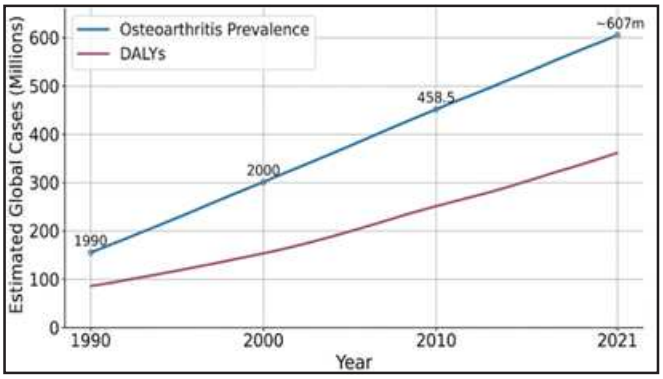

Figure 1: Global Burden of Osteoarthritis, 1990-2021

Thats chart kind of shows how global age-standardized osteoarthritis prevalence and disability-adjusted life years, (DALYs) kind of moved upward from 1990 to 2021. It uses Global Burden of Disease Study 2021 estimates, so thats the basis. On the x-axis you can see the years 1990, 2000, 2010, and 2021, and on the y-axis it shows the estimated worldwide cases in millions, and those numbers climb from a smaller starting point in 1990 to around 607 million cases by 2021. The main idea is, osteoarthritis prevalence keeps rising in step with population ageing, so it backs up the need for safer, sustainable, longer term management choices. The data comes from Li et al. Frontiers in Medicine 2024, (Global Burden of Disease Study 2021).[1]

Comparative Summary of In Vitro Findings

Table 1 summarises the plants their principal phytochemicals the in vitro models used to test them and the core anti-osteoarthritic findings reported in the literature reviewed above. If you read across the table, a sort of pattern shows up, nearly every plant seems to land on the same handful of targets, NF-êB signalling, COX/LOX enzymes, and matrix metalloproteinases. Even so, the specific phytochemicals are structurally not really related to each other. That overlap is arguably the most convincing part of this whole set of work, because it points to these plants not just doing some fuzzy, non-specific "antioxidant" thing, but rather nudging the same inflammatory machinery that conventional OA drug development already aims at.

Table 1 (see in last page)

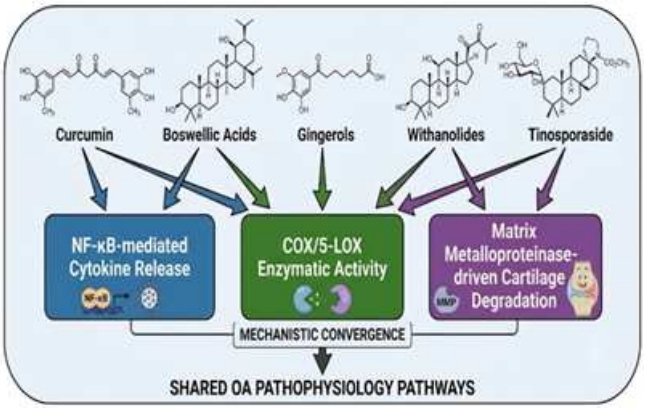

Figure 2: Convergent Molecular Targets of Indian Anti-Osteoarthritic Phytochemicals

This conceptual diagram kinda shows how phytochemicals from the six reviewed plants end up meeting at a shared set of molecular targets inside the osteoarthritic joint. Curcumin, boswellic acids, gingerols, withanolides, and tinosporaside seem to be feeding into three central nodes: NF-êB mediated cytokine release, COX/5-LOX enzymatic activity, and matrix metalloproteinase driven cartilage degradation. The key idea, as the diagram suggests, is that even if these compounds look chemically kinda different, they still largely land on the same core inflammatory and catabolic routes that are already linked to osteoarthritis pathophysiology. This is grounded in mechanistic findings put together from Sanchez et al. (2022), Alluri et al. (2020), and Szymczak et al. (2024). [7,16,19]

Discussion: Stepping back a bit from the plant-by-plant detail, a few broader observations sort of pop out. First, the quality of evidence is honestly uneven. Curcumin and

boswellic acids have been investigated in primary human osteoarthritic chondrocytes with modern transcriptomic tools, so you get a fairly granular mechanistic picture.[7] Ginger is pretty close behind, with a substantial body of synoviocyte and chondrocyte work.[19] Ashwagandha's evidence is real too, but it comes out of a single explant study, and patient response varied.[20] Guduchi and fenugreek more or less lean on immune-cell and whole-animal models rather than direct cartilage or chondrocyte data. So anyone citing this literature to claim that "Indian medicinal plants treat osteoarthritis" as one single monolithic thing, is kinda skipping over the fact that the proof is on very different footing, in a meaningful way.

Second, dose and bioavailability are still unresolved issues that in vitro data alone just cannot settle. The concentrations that work in cell culture—low single-digit micromolar for curcumin, tens of micrograms per millilitre for boswellic acids—do not automatically become achievable plasma concentrations after oral dosing, especially since curcumin has notoriously poor oral bioavailability.[7] Several studies included here tried to choose concentrations that line up with reported plasma levels after oral extract administration, which definitely helps translational relevance, but that approach is not yet consistent across the field.

Third, combination effects deserve more attention than they currently do, in my honest opinion. The one study in this review that really compared two plant extracts side by side—curcumin and boswellic acid on the same chondrocyte cultures— found that the combination outperformed either extract alone on a meaningful number of genes, also that the two extracts seemed to work through mostly non-overlapping pathways.[7] Since many traditional Indian formulations already stack multiple herbs, rather than using any single plant in isolation, this kind of head-to-head, mechanism-resolved comparison is exactly the sort of investigation the field needs more of. Not, you know, yet another single-extract screening paper with only partial context.

Finally, it is worth being clear about what in vitro data can and cannot tell us. Cell culture and explant models strip away the complexity of a living joint, systemic drug metabolism, immune cross-talk, mechanical loading. They also can't substitute for well-designed clinical trials, full stop. Where clinical data exist alongside the in vitro work, as with curcumin, the two streams of evidence broadly agree, which is reassuring. [9,10,11,12,13] Where clinical data are thin or missing, as with guduchi and fenugreek specifically for osteoarthritis, the in vitro findings should be read as hypothesis-generating, not confirmatory.

Conclusion: The in vitro evidence reviewed here makes a reasonably strong case that several Indian medicinal plants act on the same inflammatory an catabolic pathways implicated in osteoarthritis pathogenesis, chiefly NF-êB signalling, COX/5-LOX enzyme activity, an matrix metalloproteinase expression. Curcumin and boswellic acids currently have the most mechanistically detailed support, with ginger not far behind; ashwagandha, guduchi and fenugreek show promising but comparatively thinner direct chondrocyte-level evidence. None of this is a substitute for well-powered clinical trials. Still the field would benefit quite a lot from standardized extract concentrations, head-to-head comparisons, and more stress on primary chondrocyte and cartilage explant models, over less specific screening assays. With those caveats in place, these plants remain a scientifically credible, and also traditionally grounded, avenue for developing safer adjunctive therapies for osteoarthritis.

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Plant (Family)	Key Phytochemical(s)	In Vitro Model Used	Reported Anti-Osteoarthritic Finding
Curcuma longa (Zingiberaceae)	Curcumin, demethoxycurcumin	Primary human OA chondrocytes (alginate bead culture); IL-1β-stimulated chondrocytes	Down-regulated NF-κB-driven genes, COX-1/2, MMP-13, MMP-1, ADAMTS-5; reduced IL-6, CCL2 and nitric oxide release (Sanchez et al., 2022; Mathy-Hartert et al., 2009)
Boswelliaserrata (Burseraceae)	Boswellic acids (AKBA, KBA)	Human blood-derived cell 5-LOX/COX assay; SW1353 chondrosarcoma cells; primary OA chondrocytes	5-LOX inhibition (IC50 ~43 µg/mL); reduced leukotriene B4 and PGE2; protected SOX-9 expression from IL-1β depletion (Alluri et al., 2020; Sanchez et al., 2022)
Zingiberofficinale (Zingiberaceae)	6-Gingerol, 6-shogaol, zingerone	Fibroblast-like synoviocytes; C28I2 human chondrocytes; sow cartilage explants	Reduced TNF-α, COX-2, PGE2, MMP-13; lowered ROS and lipid peroxidation in chondrocytes (Szymczak et al., 2024)
Withaniasomnifera (Solanaceae)	Withanolides, withanolide glycosides	Human OA cartilage explant model	Reduced nitric oxide release and modulated glycosaminoglycan secretion in a subset of OA cartilage explants (Sumantran et al., 2007)
Tinosporacordifolia (Menispermaceae)	Tinosporaside, alkaloids, diterpenoid lactones	THP-1 cells; RAW 264.7 macrophages	Suppressed NF-κB activation and pro-inflammatory cytokine gene expression (TNF-α, IL-1β) (Sannegowda et al., 2015)

Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

मध्यप्रदेश राज्य में जनजातियों के कल्याण में शासकीय योजनाओं का प्रभाव

जगदीश उइके *

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शोध सारांश – मध्यप्रदेश भारत में सर्वाधिक जनजातीय जनसंख्यावाला राज्य है। राज्य में भील, गोंड, बैगा, भारिया और सहरिया जैसी प्रमुख जनजातियाँ निवास करती हैं। इस शोध पत्र का मुख्य उद्देश्य राज्य और केंद्र सरकार द्वारा संचालित विभिन्न कल्याणकारी योजनाओं के आदिवासियों के सामाजिक–आर्थिक जीवन पर पड़ने वाले प्रभाव का मूल्यांकन करना है।जनजातियों के अधिकांश संसाधन अविकसित व अगम्य क्षेत्रों में हैं। ये लोग दूर–दराज की बस्तियों व गाँवों में रहते हैं। आजकल, इनकी एक छोटी संख्या कस्बों, शहरों व नगरो में भी रहने लगी है। जनजातीय विकास दर की प्रक्रिया धीमी है। विभिन्न संघीय एवं राज्य कानूनों के तहत जनजातियों को कई अधिकार व रियायतें दी गई हैं। लेकिन प्रवर्तन एजेंसियों की अज्ञानता व उदासीनता के कारण, इन्हें इन कानूनों से मिलने वाले लाभों से वंचित रखा जा रहा है। विकास कार्यक्रमों को संचालित करने वाली प्रवर्तन एजेंसियों की बहुलता ने समस्या को और अधिक बढ़ा दिया है। कई बार ये ऐजेसियाँ अपने प्रयासों का समन्वय करने में असमर्थ होती हैं या फिर लंबी अवधि तक के कार्यक्रमों का पालन करने में विफल रहती हैं। वास्तव में, सरकार द्वारा किये गये प्रयासों के बावजूद भी योजनाओं का लाभ जरूरतमंद गरीब लोगों तक नहीं पहुँच पा रहा है। इसके लिये मूल समस्या संसाधनों के कमी की नहीं है, बल्कि समस्या कुप्रबंधन की है। स्वतंत्रता के पूर्व, देश के नेता व समाज सुधारकों ने भी जनजातियों के कल्याण के महत्व को समझा और देश के आजाद होने के बाद संविधान निर्माण के समय संविधान में इनके लिए विशेष प्रावधान निर्मित किये गये हैं। प्रथम पंचवर्षीय योजना से ही जनजातीय लोगों के प्रति चिंता रही है। उक्त पृष्ठभूमि में, वर्तमान अध्ययन जनजातियों के समग्र विकास पर केंद्र और राज्य सरकारों के विभिन्न विकास कार्यक्रमों के प्रभाव की समीक्षा की गई है।

शब्द कुंजी –जनजातीय कल्याण, शासकीय योजनाएँ, मध्य प्रदेश, सामाजिक–आर्थिक विकास, प्रभाव मूल्यांकन।

प्रस्तावना – जनजातिय भारतीय जनसंख्या का एक महत्वपूर्ण भाग है। किसी भी अर्थव्यवस्था का विकास जनजातियों में सकारात्मक रूप से उनके सामाजिक, सास्कृतिक एवं आर्थिक विकास से जुड़ा होता है। अर्थव्यवस्था का विकास इनके अतीत की विरासत को वर्तमान से जोड़ता है। इस शोध आलेख में जनजातियों को परिभाषित करने और भारत में उनकी महत्वपूर्ण स्थिति को स्थापित करने का प्रयास किया गया है। विश्व की दूसरी सबसे बड़ी जनजातीय आबादी भारतीय उपमहाद्वीप ने पाई जाती है। पूर्व–आर्य काल से ही. इस देश में कई तरह के जनजातीय समुदाय निवास करते रहे है। वेद, रामायण एवं महाभारत जैसे प्राचीन भारतीय साहित्यों में, हमे अनेक जनजातीय समुदायों के नाम और विवरण मिलते है। ऋग्वेद में जहाँ असुरों का उल्लेख भी मिलता है, तो वही रामायण में भी विभिन्न जनजातीय समूहों का उल्लेख है, जिनमें निषाद, गोरधराज, सबरी, नाग और यक्ष आदि शामिल है। महाभारत में किरात, मुंडाआदि का भी उल्लेख मिलता है। साथ ही भील और मुशहरों की उत्पत्ति का वर्णन भागवत पुराण में मिलता है।

यद्यपि, दुनिया भर में जनजातीय आबादी मौजूद है, फिर भी भारत में जनजातीय लोगों की संख्या सबसे अधिक है। 2011 की जनगणना के अनुसार देश की कुल आबादी में जनजातियों की कुल संख्या 104281034 है, जो देश की कुल जनसंख्या का 8.6 प्रतिशत भाग है। भारतीय संविधान की पाँचवी अनुसूची के अनुसार देश भर में लगभग 744 जनजातीय समूह है। जिन्हें भारत सरकार द्वारा औपचारिक रूप से अनुसूचित जनजाति का दर्ज मिला हुआ है। ये सभी समूह 105भाषाएँ एवं 225 सहायक भाषाएँ बोलते हैं। तुलनात्मक रूप से देखा जाय तो पिछले तीन जनगणना वर्षों के आधार पर जनजातीय जनसख्या संरचना क्रमश 1951 में, 5.6 प्रतिशत भारतीय जनजातियों थी और 2001 तक यह इनका प्रतिशत बढ़कर 8.2 प्रतिशत हो गयी। जबकि 2001 में जहाँ केवल 24 प्रतिशत जनजातियों शहरी क्षेत्रों में रहती थी, वहीं उनमें से अधिकांश कुल ग्रामीण आबादी का 10.4 प्रतिशत ग्रामीण क्षेत्रों में रहती थीं। अंततरू 2011 की जनगणना से ज्ञात होता है कि वर्तमान में जनजातीय आबादी देश की कुल जनसंख्या का 8.6 प्रतिशत है. जिसमें से 28 प्रतिशत शहरी क्षेत्रों में और 11.3 प्रतिशत ग्रामीण क्षेत्रों में रहते हैं।

संम्पूर्ण सामाजिक एवं आर्थिक व्यवस्था को विकास की सतत एवं बहुआयामी प्रक्रिया को एक अंग के रूप में पुनर्गठित और पुनर्निर्देशित किया जाना चाहिए। यूनेस्को ने विकास की अवधारणा में कहा है कि सभी देश की सरकार विकास के आयामों के घटक इस तरह तैयार करे कि सास्कृतिक पहचान ही समुदायों की पहचान हो, क्योकि विकास तब तक सफल नहीं हो सकता जब तक वह उस धारणा पर केंद्रित न हो।

इसलिए, जनजातीय विकास के बहुरूपदर्शक का विश्लेषण करते समय, जनजाति की अवधारणा को समझना अत्यंत महत्वपूर्ण हो जाता है, जो स्पष्ट रूप से उनकी छवि के संदर्भ में है। जैसा कि सर्वविदित है कि भारत के जनजातीय लोग यहाँ के मूल निवासी हैं। वह इस अर्थ में कि आर्य–

भाषीलोगों के भारत में प्रवेश करने और नदी घाटियों के किनारे देश के बड़े हिस्से में फैलने से पहले ही जनजातियाँ देश के विभिन्न भागों में लंबे समय से बसी हुई थी। अंग्रेजों का शासन काल हो जाने के बाद इन जनजातियों को धीरे-धीरे मैदानी इलाकों से जंगलों, पहाड़ियों और विशाल पर्वतों, ढलानों या कृषि आधारित असंगठित व अविकसित क्षेत्रों के किनारे स्थिति दुर्गम क्षेत्रों में जाना पड़ा। यह प्रक्रिया सदियों तक बहुत स्थिरता से चलती रही, जब तक कि हाल ही में राज्य द्धारा इन समुदायों को समाज की मुख्यधारा में वापस लाने के लिए ठोस प्रयास नहीं किये गये। जनजातियाँ अपने निवास क्षेत्र, बोली जाने वाली भाषाएँ, शारीरिक विशेषताएँ, निवास करने वाला भौगोलिक क्षेत्र, जीविकोपार्जन के तरीके, विकास के स्तर और समुदाय के आकार के आधार पर आपस में व्यापक रूप से भिन्न होती हैं।

जनजातीय विकास के लिये वैधानिक प्रावधान- संविधान के अनुच्छेद 275 (1) के अंतर्गत विशेष क्षेत्र कार्यक्रम के तहत अनुदान दिये जाने का प्रावधान है। जनजातीय कार्य मंत्रालय भारतीय संविधान के अनुच्छेद 275 (1) के अंतर्गत संवैधानिक दायित्व के अनुसार जनजातीय जनसंख्या वाले राज्य सरकारों को धनराशि प्रदान करता है। इस योजना का उद्देश्य अनुसूचित क्षेत्रों और अनुसूचित जनजातियों में प्रशासनिक स्तर पर उन्नयन कर इनके कल्याण को बढ़ावा देना है। मध्य प्रदेश राज्य के साथ देश के 29 राज्यों और केंद्र शासित प्रदेशों की सरकारों को जनजातियों के विकास के लिये अनुदान दिये जाते हैं।

देश में प्रथम पंचवर्षीय योजना 1951 में सामुदायिक विकास के एक व्यापक कार्यक्रम के साथ शुरू हुई थी। 1951 में देश के विभिन्न हिस्सों में कुल 56 सामुदायिक विकास कार्यक्रम प्रारंभ किये गये थे। इन कार्यक्रमों के द्धारा ग्रामीण क्षेत्रों के बहुआयामी विकास के लिए समन्वित कार्यक्रम पेश किये गये। 1953 में लोगों को आवश्यक बुनियादी जरूरतों एवं अल्प मात्रा में धनराशि प्रदान करनेके उद्देश्य से राष्ट्रीय विस्तार सेवा खंड स्थापित किये गये ताकि जरूरत मंद लोग मूलरूप से बुनियादी स्व-सहायता के द्धारा स्वयं अपना विकास कार्य शुरू कर सकें। सामुदायिक विकास कार्यक्रम के अतिरिक्त 1954 में पांच वर्षों के लिए 27 लाख रुपये की लागत वाली परियोजनाएँ शुरू की गई। ये परियोजनाये देश के 34 विकासखण्ड में अनुसूचित एवं जनजातीय क्षेत्रों में सचालित की गई। 1956 में बनी एल्विन समिति ने स्थिति की जांच की और समीक्षाधीन जनजातीय क्षेत्रों में विभिन्न योजनाओं को शुरू करने के लिए सतर्क दृष्टिकोण अपनाने का सुझाव दिया। 1957 में, जनजातीय विकासखंडों के लिये एक कम गहन मॉडल तैयार कर 1954 में निर्मित परियोजनाओं को बदल दिया गया। एक जनजातीय विकासखण्ड आमतौर पर 150-200 वर्ग मील तक सीमित था और इसकी आबादी लगभग 25000 थी। एक गहन विकास कार्यक्रम के तहत, इन विकासखण्डों का मुख्य उद्देश्य जनजातीय आबादी को लाभ पहुँचाना है। अप्रैल 1960 में ढेबर आयोग की सिफारिश और अक्टूबर 1961 में इसकी रिपोर्ट के अनुसार, ऐसे विकासखण्ड पहली बार कई राज्यों में जनजातीयो की सबसे अधिक सान्द्रता वाले क्षेत्रों में पायलट परियोजनाओं के रूप में स्थापित किये गये थे। समय के साथ, इस कार्यक्रम का विस्तार किया गया। इस कार्यक्रम के तहत 500 अतिरिक्त विकासखण्डों को इसमें सम्मिलित किया गया जो तीसरी पंचवर्षीय योजना के अंत तक इसमें कुल आदिवासी आबादी का लगभग 40 प्रतिशत थी। विकासात्मक पहलो और सुरक्षा उपायों के संदर्भ में, आदिवासियों की स्थिति मूलत: वही रही। 1969 में आदिवासी विकास परियोजनाओं की जाँच के लिए शीलू की अध्यक्षता में एक समिति स्थापित की गई। इस समिति ने अपने जांच प्रतिवेदन में कहा कि ढेबर आयोग की अधिकांश सिफारिशें अभी तक लागू नहीं की गई हैं और आग्रह किया कि ढेबर आयोग की सिफारिशों को बिना किसी और देरी के लागू किया जाना चाहिए। बाद में शीलू सीमित ने जनजातीय विकासखण्ड के दृष्टिकोण को अपर्याप्त बताते हुये उन सिफारिशों को अस्वीकार कर दिया और तर्क दिया कि विकासखण्ड योजना और कार्यान्वयन की एक बुनियादी इकाई के रूप में प्रभावी ढंग से कार्य करने के लिए यह बहुत छोटा है। इस संबंध शीलू समिति ने बताया कि आदिवासियों की मुख्य समस्याएँ ऋणग्रस्तता, भूमि हस्तांतरण, आर्थिक पिछड़ापन और संचार की अपर्याप्तता से संबंधित हैं।

जनजातीय उप-योजना - भारतीय योजना आयोग ने पाँचवीं पंचवर्षीय योजना लागू होने के दौरान जनजातीय स्थिति की पुन: जाँच के लिए एक कार्यबल का गठन किया। आयोग का यह माननाथा कि पिछले आयोगों व समितियों द्धारा पहचानी गई कमियों और खामियों पर ध्यान नहीं दिया गया। जबकि ऐसे आयोगों व समितियों ने केवल अनुसूचित जनजातियों और जनजातीय क्षेत्रों को विकास के बजाय कल्याण के मुद्दे के रूप में कार्य किया है, जो विकास कार्यक्रमों की विफलता का एक प्रमुख कारण रहा है। अनुसूचित जनजातियों का कल्याण सामान्य क्षेत्र के परिव्यय पर नहीं, बल्कि पिछड़े वर्ग क्षेत्र के अंतर्गत छोटे परिव्यय पर निर्भर रहा है। जनजातीय क्षेत्रों में, प्रशासनिक ढाँचे में सरलता का अभाव है, जो आदिवासियों की समझ से परे है और इसलिए इनकी ओर से कोई प्रतिक्रिया नहीं आती है। इसलिए प्रशासन की ऐसी व्यवस्था व संरचना जनजातीय क्षेत्रों के एकीकृत विकास के लिए उपयुक्त नहीं हो सकती। योजना आयोग ने सुझाव दिया कि जनजातीय क्षेत्रों के संतुलित सामाजिक-आर्थिक विकास की गारंटी के लिए पाँचवीं और बाद की योजनाओं के लिए एक एकीकृत विकास नीति की आवश्यकता होगी। परिणामस्वरूप1974 व 1975 के दौरान एक जनजातीय कार्य योजना की रणनीति विकसित की गई। जनजातीय कार्य योजना में वे क्षेत्र सम्मिलित हैं जहाँ कम से कम 50 प्रतिशत जनसंख्या जनजातीय है। इस तरह देश में पहली बार 16 राज्यों यथा आआंध्र प्रदेश, असम, बिहार, गुजरात, उत्तर प्रदेश, कर्नाटक, केरल, मध्य प्रदेश, उड़ीसा, महाराष्ट्र, राजस्थान, मणिपुर, हिमाचल प्रदेश, त्रिपुरा, तमिलनाडु व पश्चिम बंगाल जैसे राज्यों में जनजातीय कार्य योजनायें लागू की गई है। प्रारंभ में इन राज्यों की 63 प्रतिशत जनजातीय आबादी के लिये जनजातीय उपयोजना विकासित की गई है। बाद में जनजातीय उपयोजना का विस्तार कर इसमें सिक्किम, अंडमान और निकोबार द्धीप समूह, दमन और दीव, छत्तीसगढ, झारखंड और उत्तरांचल राज्यों को शामिल किया गया। वर्तमान में देश के 21 राज्य और दो केंद्र शासित प्रदेश जनजातीय उपयोजना रणनीति में शामिल हैं। विकास का यह दृष्टिकोण चार जनजातीय बहुल राज्यों अरुणाचल प्रदेश, मिजोरम, मेघालय और नागालैंड तथा दो केंद्र शासित प्रदेशों लक्षद्धीप, दादरा और नगर हवेली पर लागू नहीं किया गया है। क्योंकि इन क्षेत्रों के जनजातीय आबादी के विकास और कल्याण के लिये जनजातीय उपयोजना के निर्माण के पहले से ही कई योजनायें संचालित हैं। इसलिये इनके लिये अलग से कोई विशेष उपयोजना लागू करने की आवश्यकता नहीं थी।

एकीकृत जनजातीय विकास परियोजनाएँ - जनजातीय उप-योजना

रणनीति के कार्यान्वयन हेतु, टीएसपी क्षेत्रों को प्रारंभ में 180 एकीकृत जनजातीय विकास परियोजनाएँ में विभाजित किया गया है। वर्तमान में, राज्य एवं केंद्र शासित प्रदेशों सहित देश में 194 एकीकृत जनजातीय विकास परियोजनाएँ हैं। प्रत्येक एकीकृत जनजातीय विकास परियोजना में 50 प्रतिशत या उससे अधिक जनजातीय आबादी वाले विकासखण्ड/तहसील या यहाँ तक कि इसमें संम्पूर्ण जिले शामिल हैं। पश्चिम बंगाल, कर्नाटक, केरल और तमिलनाडु जैसे कुछ राज्यों में, जहाँ जनजातीय आबादी का संकेन्द्रण निकटवर्ती क्षेत्रों में नहीं है. वहाँ पर एकीकृत जनजातीय विकास परियोजनायों के लिये क्षेत्रों के परिसीमन में एक लचीला दृष्टिकोण अपनाया गया है।

भारतीय जनजातीय सहकारी विपणन विकास संघ लिमिटेड – सन् 1984 के बहुराज्यीय सहकारी समिति अधिनियम के तहत 1987 में ट्राइफेड को एक राष्ट्रीय सर्वोच्च निकाय के रूप में स्थापित किया गया है। ट्राइफेड का निर्माण एमएससीएस अधिनियम, 1984 के तहत किया गया है।। 2002 के बाद बहुराज्यीय सहकारी समिति एमएससीएस अधिनियम के अनुसार, ट्राइफेड को पंजीकृत अधिनियम की दूसरी अनुसूची में एक राष्ट्रीय सहकारी समिति के रूप में सूचीबद्ध किया गया है। नये एमएससीएस अधिनियम 2002 और इसके नियमो के अनुसार, ट्राइफेड के उपनियमों को अप्रैल 2003 में अत्ताद्यतन किया गया। अत्ताद्यतन उपनियमों के अनुसार, ट्राइफेड का प्राथमिक लक्ष्य विभिन्न राज्यों में अपने जनजातियों सदस्यों के हितों को संरक्षितकरने का कार्य किया जाता है।

एकलव्य आदर्श आवासीय विद्यालय – यह कार्यक्रम जनजातीय छात्रों को गुणवत्तापूर्ण शिक्षा प्रदान करने के लिए शुरू किया गया है। इससे जनजातीय बच्चों को उच्च एवं व्यावसायिक शिक्षा पाठ्यक्रमों के साथ-साथ सरकारी और सार्वजनिक क्षेत्र के उपक्रमों में उच्च स्तर की नौकरियों में आरक्षण की सुविधा का लाभ मिल सकेगा। अब तक, 24 राज्यों में ऐसे 100 स्कूल स्वीकृत और संचालित किये जा रहे हैं। यह कार्यक्रम 1997-98 से भारतीय संविधान के अनुच्छेद 275 (1) के अंतर्गत वित्ता पोपित है।

अनुसूचित जनजातियों के लिए बालिका छात्रावास – देश की तृतीय पंचवर्षीय योजना में शुरू की गई बालिका छात्रावास योजना, अनुसूचित जनजाति की बालिकाओं के बीच शिक्षा के प्रसार का एक उपयोगी साधन है। 1991 की जनगणना के अनुसार, महिलाओं की साक्षरता दर 29.23 प्रतिशत की तुलना में अभी भी 18.19 प्रतिशत है। इस योजना के अंतर्गत, राज्यों / केंद्र शासित प्रदेशों को नये छात्रावास भवनों के निर्माण अथवा मौजूदा छात्रावासों के विस्तार के लिए केंद्रीय सहायता प्रदान की जाती है। यह एक केंद्र प्रायोजित योजना है, जिसमें छात्रावास भवन के निर्माण की लागत केंद्र और राज्य के बीच 50: 50 के अनुपात में समान रूप से साझा की जाती है। जबकि, केंद्र शासित प्रदेशों के मामले में, केंद्र सरकार द्वारा भवन निर्माण की पूरी लागत वहन की जाती है।

अनुसूचित जनजातियों के लिए बालक छात्रावास – इस योजना के उद्देश्य, मदें और शर्तें तथा सहायता का स्वरूप बालिका छात्रावासों की योजना के समान ही हैं। यह योजना 1989-90 से भारत सरकार द्वारा संचालित की जा रही है। यह एक केंद्र प्रायोजित योजना है। इस योजना में छात्रावास भवन के निर्माण की लागत केंद्र एवं राज्य सरकारों के बीच 50: 50 के अनुपात में समान रूप से साझा की जाती है। जबकि, केंद्र शासित प्रदेशों के मामले में, केंद्र सरकार द्वारा भवन निर्माण की पूरी लागत वहन की जाती है।

मध्य प्रदेश राज्य में जनजातीय विकास- जनगणना वर्ष 2011 के अनुसार, मध्य प्रदेश राज्य में जनजातियों की कुल जनसंख्या 15316784 (1.53 करोड़) है। जनजातियों की यह आबादी राज्य की कुल जनसंख्या का 21.1 प्रतिशत है। राज्य सरकार द्वारा जनजातियों के कल्याण को सर्वोच्च प्राथमिकता दी गई है। हस्तक्षेपों और जवाबदेही तय करने के उद्देश्य से तथा अनुसूचित क्षेत्रों में बसे जनजातियों में सुधार लाने हेतु 2016 में विशेष विकास निधि (एसडीएफ) अधिनियम पारित किया गया है। यह सरकार को राज्य की जनसंख्या के अनुपात में इस क्षेत्र में धनराशि खर्च करने के लिए इस दिशा में एक महत्वपूर्ण कदम माना जाता है।

मध्य प्रदेश राज्य में 46 समुदायों को आधिकारिक तौर पर अनुसूचित जनजाति के रूप में वर्गीकृत किया गया है। जिनमें बैगा, सहारिया एवं भरिया जाति को विशेष रूप से कमजोर जनजातीय समूह का दर्जा दिया गया है। भारत की जनजातीय आबादी का 1. 27 प्रतिशत आबादी मध्य प्रदेश के जनजाति से बना है। राज्य की वर्तमान जनसंख्या का केवल 21.1 प्रतिशत होने के बावजूद, यहाँ की अनुसूचित जनजाति इस प्रदेश में सबसे बड़ी जनजातीय संकेन्द्रण का निर्माण करती हैं। जनजातीय उप-योजना (टीएसपी) के दृष्टिकोण से मध्य प्रदेश के कुल 89 विकासखण्डों को जनजातीय विकासखण्ड बनाया गया है। इन विकासखण्डों के जनजातीय बाहुल्य क्षेत्रों में सामाजिक-आर्थिक विकास और बुनियादी ढ़ाचे को बढ़ावा देने के लिये चुना गया है। प्रदेश के कुल भौगोलिक क्षेत्र (3.08 लाख वर्ग कि.मी.) का 31.82 प्रतिशत अर्थात 0.98 लाख वर्ग कि.मी. क्षेत्र जनजातीय उपयोजना के लिये चिन्हित है। जनजातीय विकासखण्ड मुख्य रूप से पश्चिम क्षेत्र (निमाड़, धार, झाबुआ, अलीराजपुर, बड़वानी), दक्षिणी क्षेत्र (मण्डला, बालाघाट, सिवनी, छिदवाड़ा, बैतूल) तथा उत्तर-पूर्वी क्षेत्र (शहडोल, सीधी, सिंगरौली, डिड़ौरी) में केन्द्रित है। बैगा, सहरिया तथा भरिया जनजातियों के लिये राज्य शासन द्वारा 11 विशेष अभिकरण 15 जिलों में संचालित है। विशेष रूप से कमजोर जनजातीय समूहों वाले विकासखण्डों में जनजातीय उपयोजना के तहत विशेष योजनाएँ लागू की गई हैं।

जनजातीय समुदाय के लिए मध्य प्रदेश सरकार की विकास नीतिविभिन्न जनजातियों द्वारा परिभाषित, उनकी स्वदेशी संस्कृति, परंपराओं, बोलियों और विश्वास प्रणालियों आदि की मान्यता ने सामान्य जनसंख्या के समान अनुसूचित जनजातियों के बीच समावेशी विकास के प्रयास को सरकार ने अतिरिक्त महत्व दिया है। इस दिशा में अनुसूचित जनजाति ग्राम पंचायतों में ग्राम पंचायत भवनों का निर्माण और स्वास्थ्य के क्षेत्र के अंतर्गत ग्रामीण स्थानीय निकायों को अनुदान प्रदान करना। शिक्षा व आवास योजना जैसी विकास योजनाओं की प्रतिबद्धता राज्य सरकार की नई पहल में है। इन योजनाओं का उद्देश्य आदिवासी समुदायों की आवश्यकताओं के साथ-साथ समानता को भी पूरा करना है। सड़कों से लेकर अनुसूचित जनजातियों के आवासों के लिए धनराशि आवंटित की गई है।

जनजातीय कार्य मंत्रालय ने राष्ट्रीय जनजातीय नीति का मसौदा तैयार किया है, जिसमें जनजातीय भूमि का हस्तांतरण, जनजातीय वन अंतर्वेशन, विस्थापन, पुनर्वास और पुनर्स्थापन, मानव विकास सूचकांक में वृद्धि: महत्वपूर्ण अवसंरचना का निर्माण आदि सम्मिलित किया गया है। हिंसक प्रदर्शन, विशेष रूप से कमजोर जनजातीय समूहों का संरक्षण और विकासय

टीएसपी रणनीति को अपनाना, सशक्तिकरण, लैंगिक समानता के बारे में ध्यान रखा गया है। इसके अतिरिक्त गैर सरकारी संगठनों का समर्थन प्राप्त करना, जनजातीय संस्कृति और पारंपरिक ज्ञान, जनजातीय क्षेत्रों का प्रशासनय नियामक और सुरक्षात्मक व्यवस्था, जनजातियों का निर्धारण और अप-निर्धारण जैसे विभिन्न मुद्दे इसमें शामिल हैं।

सामान्य जनसंख्या के समान जनजातियों के बीच समावेशी विकास की प्रेरणा व प्रोत्साहन, उनकी स्वदेशी संस्कृति, परंपराओं, बोलियों और विश्वास प्रणालियों की मान्यताओं के साथ सरकार की और अधिक जबादेही बन जाती है। एकीकृत आवासीय विद्यालय, जनजातीय युवा कौशल उन्नयन योजना, जनजातीय किसानों को प्रोत्साहित करने वाले कृषि योजनाएँ, प्रधानमंत्री आवास योजना, हरित ऊर्जा, गांवों में सौ प्रतिशत सौर ऊर्जा विकास योजना, गृह ज्योति योजना, जनजातीय ग्राम पंचायतों में संस्कति भवनों कानिर्माण, नगर परिषद और जिला परिषदों के अलावा स्वास्थ्य क्षेत्र के तहत ग्रामीण स्थानीय निकायों और शहरी स्थानीय निकायों को अनुदान जैसी कई प्रमुख योजनाएँ इस दिशा में राज्य की प्रतिबद्धता साबित करती हैं। ऐसी सभी योजनाएँ जनजातीय समुदायों की समानता और उनके लिये महसूस की गई जरूरतों को पूरा करने के लिए तैयार की गई हैं।

मध्य प्रदेश सरकार जनजातीय समुदायों के समग्र विकास के लिए कई प्रभावी योजनाएँ संचालित कर रही है, जो शिक्षा, स्वास्थ्य, रोजगार और बुनियादी ढांचे के विकास पर केंद्रित हैं। धरती आबा जनजातीय ग्राम उत्कर्ष अभियान के तहत 18.58 लाख जनजातीय परिवारों को शिक्षा, स्वास्थ्य, स्वच्छता और रोजगार जैसी सेवाएँ प्रदान की जा रही हैं, जिसमें मोबाइल मेडिकल यूनिट और जनजातीय बहु-विपणन केंद्र स्थापित किए गये हैं। प्रधानमंत्री जनजातीय उन्नत ग्राम अभियान 51 जिलों के 11,377 गाँवों में आवास, सड़क, पेयजल, स्वास्थ्य सेवाएँ, और डिजिटल कनेक्टिविटी जैसे क्षेत्रों में विकास को बढावा देता है। स्वरोजगार को बढ़ावा देने के लिए भगवान बिरसा मुण्डा स्वरोजगार योजना और टंट्या मामा आर्थिक कल्याण योजना केतहत 10,000 से 50 लाख रुपये तक की वित्तीय सहायता और ब्याजअनुदान प्रदान किया जाता है। शिक्षा के क्षेत्र में आकांक्षा योजना प्रतियोगी परीक्षाओं के लिए मुफ्त कोचिंग देती है, जबकि मेधावी पुरस्कार और बालिका विज्ञान प्रोत्साहन योजना उत्कृष्ट प्रदर्शन करने वाले जनजातीय छात्र-छात्राओं को प्रोत्साहित करती है। आहार अनुदान योजनाएं विशेषपिछड़ी जनजातियों के लिए आर्थिक और सामाजिक स्थिति को सशक्त बनाती हैं। 2024-25 में जनजातीय उपयोजना के लिए 40,804 करोड़ रुपये का बजट निर्धारित किया गया है, जो सरकार की प्रतिबद्धता को दर्शाता है। ये योजनाएँ जनजातीय समुदायों को मुख्यधारा से जोड़ने और उनके जीवन स्तर को ऊपर उठाने में महत्वपूर्ण भूमिका निभा रही हैं। वर्तमान में जनजातीय क्षेत्रों में बुनियादी ढाँचे जैसे सड़क, बिजली, पेयजल और डिजिटल कनेक्टिविटी पर विशेष ध्यान दिया जा रहा है। इसके साथ ही स्थानीय हस्तशिल्प, वनोपज, जैविक खेती और स्वरोजगार को बढ़ावा देकर उनकी आर्थिक स्थिति को सशक्त किया जा रहा है। राज्य सरकार की योजनाओं का उद्देश्य न केवल आर्थिक विकास है, बल्कि सांस्कृतिक संरक्षण और आत्मनिर्भरता को बढ़ावा देना भी है।

निष्कर्ष - वर्तमान में मध्य प्रदेश में 21.1 प्रतिशत आबादी जनजातियों की है जो प्रदेश के पश्चिमी क्षेत्र, दक्षिणी क्षेत्र एवं उत्तर-पूर्वी क्षेत्र में बसी हुई है। ये सभी जनजातियाँ अपने-अपने सामाजिक एवं सांस्कृतिक परिस्थितियों के अनुसार विभाजित है। तथ्यों व आंकड़ों के विश्लेषणसे स्पष्ट होता है कि सरकारी नीतियों और कार्यक्रमों का प्रभाव जनजातीय समाज पर काफी हद तक लाभकारी है। देश के कुछ राज्यों में जनजातीय समाज के लोग अब बिना किसी खतरे के अपनी संस्कृति के विकास की ओर धीरे-धीरे अग्रसर है। क्योंकि अब ये अपने सांस्कृतिक अधिकारों के संरक्षण एवं संवर्धन के प्रति जागरूक हैं। आरक्षण, वित्तीय सहायता, बुनियादी ढाँचे का विकास, कृषि सहायता एवं कौशल प्रशिक्षण कार्यक्रम जैसी सरकारी नीतियाँ बनाई गई हैं। इन नीतियों व कार्यक्रमों के द्वारा जनजातीय समुदायों को सशक्त बनाया जा सकता है। साथ ही ऐसे कार्यक्रमों से इनकी सांस्कृतिकपहचान को संरक्षित करते हुए इन्हें मुख्यधारा की अर्थव्यवस्था में एकीकृत करने के लिये ये सभी योजनायें इनके लिये अधिक कारगर हैं। हॉलांकि, इन योजनाओं की प्रभावशीलता अलग-अलग होती है, जो अक्सर इन योजनाओं के क्रियान्वयन व लोगों की स्थानीय भागीदारी पर निर्भर करती है। साथ ही इन योजनाओं की पहल जनजातीय आबादी की विशिष्ट सामाजिक, आर्थिक एवं सांस्कृतिक आवश्यकताओं के साथ किस हद तक उपयोगी है इसके लिये ध्यान दिये जाने की आवश्यकता है। मूलत: जनजाति विकास एक व्यापक प्रक्रिया है, इसलिए एक ऐसा कार्यक्रम शुरू किया जाना चाहिए जो जातीय मूल्यों को समकालीन आवश्यकताओं के साथ संतुलित कर सके। जनजातीय संस्कृति विविधता मूलक व एक जटिल संस्कृति है। क्योंकि इनको वर्गीकृत करने के लिए कोई निर्धारित मानदंड नहीं हैं। छोटे वन उत्पादों की खरीद और आवश्यक वस्तुओं की बिक्री में बिचौलियों और व्यापारियों द्वारा जनजातियों का फायदा उठाया जाता हैय इसमें भूमि हस्तांतरण, ऋणों पर अत्यधिक ब्याज दरें एवं ऋण बंधन इत्यादि सभी कुछ इसमें सम्मिलित है।

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Comparative Antimicrobial Activity of *In Vivo* and *In Vitro*-Derived Tissues of *Pterocarpus marsupium Roxb.* Against Selected Bacterial Pathogens

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Abstract: *Pterocarpus marsupium Roxb*. is a medicinally important tree of the family Fabaceae with a long history of traditional use and a diverse phytochemical profile. The present investigation was undertaken to evaluate and compare the antimicrobial potential of different in vivo plant tissues and in vitro-derived tissues of *P. marsupium* against selected bacterial pathogens. The study formed the fourth objective of a broader research programme involving mass multiplication, phytochemical profiling, pharmacological evaluation and molecular characterization of the species. Leaf, stem, bark, fresh callus, old callus and whole-plant/in vitro-derived material were evaluated against seven bacterial microorganisms, namely Bacillus subtilis, Escherichia coli, Enterobacter aerogenes, Proteus vulgaris, Pseudomonas aeruginosa, Shigella boydii and Salmonella paratyphi. Antimicrobial activity was assessed from zones of inhibition using the agar well/cup diffusion approach described in the thesis. Marked variation was observed among plant tissues, extract treatments and microorganisms. Bark and callus tissues generally demonstrated stronger activity than roots and several other tissues. Particularly high inhibition zones included 36.0 ± 0.27 mm against E. coli, 35.0 ± 0.21 mm against S. boydii and 27.0 ± 0.25 mm against B. subtilis in selected preparations. S. boydii was the most susceptible organism overall, whereas P. aeruginosa was comparatively resistant. Fresh and old callus demonstrated substantial activity, indicating that in vitro culture can retain or enhance the production of antimicrobial metabolites. Statistical analysis reported in the thesis showed significant treatment differences for several extract-organism combinations, with p-values as low as 0.0001. The antimicrobial responses are discussed in relation to the distribution of phenolics, flavonoids, tannins, saponins, quinones and other secondary metabolites documented elsewhere in the thesis. The findings support the pharmacological potential of *P. marsupium* and highlight in vitro tissues as promising material for further investigation of plant-derived antimicrobial compounds.

Keywords: *Pterocarpus marsupium;* antimicrobial activity; antibacterial activity; bark; callus; phytochemicals; agar well diffusion; medicinal plant; in vitro culture.

Introduction - Medicinal plants have historically provided important sources of therapeutic preparations and continue to attract scientific attention as reservoirs of structurally diverse natural products. The increasing interest in plant-derived antimicrobials is associated with the continuing need for new compounds capable of inhibiting pathogenic microorganisms and complementing existing antimicrobial strategies. Plant tissues synthesize numerous secondary metabolites that can participate in defense against microorganisms, herbivores and environmental stresses. Phenolics, flavonoids, tannins, quinones, terpenoids, alkaloids and saponins are among the groups frequently investigated for antimicrobial potential.

Pterocarpus marsupium Roxb., commonly known as Indian kino, Vijaysar or Bijaka, is an economically and medicinally important tree belonging to Fabaceae. It has been used traditionally in Indian systems of medicine, particularly in relation to diabetes and several other conditions. The species as possess broad spectrum of bioactive constituents, including polyphenols, flavonoids, tannins, saponins, terpenoids, alkaloids and glycosides. This chemical diversity provides a biological basis for investigating multiple pharmacological activities of the plant. The antimicrobial properties of *P. marsupium* have been reported previously. The literature provides activity of bark, leaf and stem extracts against Gram-positive and Gram-negative bacteria, with activity depending on plant part, extraction solvent and concentration. Methanol and ethyl acetate extracts have frequently shown stronger activity than less polar extracts. Such observations indicate that the antimicrobial response of *P. marsupium* is not a fixed property of the species but depends on the chemical

composition of the tested tissue and the extraction conditions.The antibacterial potential of *P. marsupium* bark has also been demonstrated in independent studies. A 2009 study evaluated an aqueous bark extract against *Staphylococcus aureus, Pseudomonas aeruginosa* and *Klebsiella pneumoniae* and reported inhibition with minimum inhibitory concentrations in the 0.04–0.08 mg range. The study also observed that susceptibility differed among the bacterial species. These findings provide external support for investigating bark as an antimicrobial tissue.

Another important aspect of the present study is the comparison between naturally occurring plant tissues and in vitro-derived tissues. Plant tissue culture is primarily used for rapid multiplication and conservation, but controlled culture conditions can also influence secondary metabolism. Callus cultures may synthesize or accumulate metabolites that are quantitatively or qualitatively different from those in mature field-grown tissues. Consequently, antimicrobial screening of fresh callus, old callus and in vitro plants can reveal whether the biosynthetic capacity for defense-related compounds is retained under controlled culture conditions.

Materials and Methods

Plant material: Plant material of *P. marsupium* was collected and processed as part of the larger research programme. The antimicrobial experiment included naturally occurring tissues and in vitro-derived materials. The tested categories included leaves, stems, bark, fresh callus, old callus and whole-plant/in vitro-derived material.

Preparation of extracts: Different plant parts were dried, processed and extracted for biological testing. The antimicrobial experiment was evaluated using the agar well/cup diffusion approach. Methanolic preparations generally provided comparatively broad recovery of bioactive constituents.

Test microorganisms: Seven bacterial microorganisms were included in the antimicrobial evaluation:

1. Bacillus subtilis
2. Escherichia coli
3. Enterobacter aerogenes
4. Proteus vulgaris
5. Pseudomonas aeruginosa
6. Shigella boydii
7. Salmonella paratyphi

The selection included both Gram-positive and Gram-negative bacteria, thereby allowing comparison of the activity of *P. marsupium* extracts across organisms with different cellular envelopes and physiological characteristics.

Antimicrobial assay: Antimicrobial activity was evaluated using the agar well/cup diffusion approach described in the thesis. Extracts were tested against the selected bacterial organisms and antimicrobial response was expressed as the diameter of the inhibition zone in millimetres. Larger zones were interpreted as greater inhibitory activity under the experimental conditions.Measurements as means with associated standard deviations, for example 36.0 ± 0.27 mm. Statistical analysis included p-values, coefficient of variation (CV), standard error and least significant difference (LSD). The statistical tables demonstrate that several extract-organism combinations differed significantly.

Statistical analysis: The antimicrobial data were subjected to statistical evaluation. General means, p-values, CV values, standard errors and LSD values. Several treatments showed highly significant differences, with p-values reported as 0.0001 or 0.0003. One comparison for Stem A was reported as non-significant (p = 0.26), illustrating that not all observed numerical differences were statistically significant.

Results

Table 1 and 2 (see in last page)

Overall antimicrobial response: The antimicrobial evaluation demonstrated marked variation among tissues and extract treatments. Bark, fresh callus and old callus generally produced stronger inhibition zones than several vegetative tissues. Bark and old callus among the strongest materials and reports particularly high inhibition against *B. subtilis, E. coli, S. boydii and S. paratyphi*.

Selected high inhibition values included 27.0 ± 0.25 mm against *B. subtilis*, 36.0 ± 0.27 mm against E. coli, 35.0 ± 0.21 mm against *S. boydii* and 23.3 ± 0.15 mm against *S. paratyphi*. These values demonstrate that some *P. marsupium* preparations were capable of producing relatively large inhibition zones.

Leaf extracts: Leaf treatments demonstrated treatment-dependent activity. Leaf A showed no detectable inhibition against the listed organisms in the summarized table. Leaf B displayed inhibition of 15.3 ± 0.32 mm against B. subtilis, 20.7 ± 0.39 mm against E. coli, 22.7 ± 0.42 mm against E. aerogenes, 22.7 ± 0.42 mm against P. vulgaris, 20.7 ± 0.47 mm against S. boydii and 17.0 ± 0.18 mm against S. paratyphi, while the response to P. aeruginosa was absent in the reported row.

Leaf C showed stronger activity, including 22.0 ± 0.37 mm against B. subtilis, 36.0 ± 0.27 mm against E. coli, 27.3 ± 0.38 mm against E. aerogenes, 25.7 ± 0.34 mm against P. vulgaris, 20.7 ± 0.17 mm against P. aeruginosa, 23.3 ± 0.12 mm against S. boydii and 23.3 ± 0.15 mm against S. paratyphi. The general mean reported for Leaf C was approximately 25.5 mm.

These results indicate substantial treatment-dependent variation within leaf material. They also demonstrate that the same plant part can show little or no activity under one treatment and pronounced activity under another.

Stem extracts: Stem treatments also displayed considerable variation. Stem A showed inhibition against B. subtilis and selected organisms but relatively limited overall activity, with a general mean of approximately 5.5 mm in the statistical summary. Stem B had a general mean of approximately 11.9 mm, whereas Stem C reached approximately 21.0–22.7 mm depending on the statistical

presentation.

One of the strongest stem responses was 27.0 ± 0.25 mm against B. subtilis in Stem C. Stem C also produced 24.0 ± 0.17 mm against E. aerogenes, 23.3 ± 0.25 mm against P. vulgaris, 15.3 ± 0.23 mm against P. aeruginosa, 35.0 ± 0.21 mm against S. boydii and 22.7 ± 0.17 mm against S. paratyphi. These results indicate that stem tissue can possess considerable antibacterial activity under favorable extraction conditions.

Bark extracts: Bark represented one of the most active natural tissues examined. Bark A showed a general mean of approximately 5.3 mm in the statistical summary, whereas Bark B had a general mean of approximately 11.4 mm and Bark C approximately 19.5 mm.

Bark C showed 25.3 ± 0.29 mm against B. subtilis, 24.0 ± 0.28 mm against E. aerogenes, 19.0 ± 0.24 mm against P. vulgaris, 24.2 ± 0.24 mm against P. aeruginosa, 25.0 ± 0.25 mm against S. boydii and 17.0 ± 0.24 mm against S. paratyphi in the reported table. The high activity of bark is consistent with its biological role as a protective tissue and with its phytochemical richness.

Fresh callus: Fresh callus showed notable antimicrobial activity, although its response varied among organisms and treatment categories. The thesis table reports inhibition of B. subtilis by Fresh Callus B and C, including 20.0 ± 0.24 mm and 30.7 ± 0.30 mm, respectively. Fresh Callus B and C also inhibited P. vulgaris at approximately 17.0 ± 0.12 mm and 19.7 ± 0.12 mm, respectively.

Against P. aeruginosa, Fresh Callus B and C showed 24.7 ± 0.19 mm and 25.3 ± 0.34 mm, respectively. Fresh Callus B and C showed strong activity against S. boydii, including 28.3 ± 0.24 mm and 35.3 ± 0.34 mm. S. paratyphi inhibition reached 22.3 ± 0.41 mm and 22.7 ± 0.25 mm in the reported treatments.

Old callus and whole-plant/in vitro-derived material

Old callus showed strong activity against several organisms. The reported values included 24.0 ± 0.15 mm and 30.0 ± 0.14 mm against B. subtilis in Old Callus B and C, respectively, and 17.0 ± 0.17 mm against E. coli in Old Callus C. Old Callus C also showed 20.7 ± 0.17 mm against E. aerogenes and 25.3 ± 0.28 mm against P. aeruginosa.

Whole-plant/in vitro-derived treatments displayed some of the strongest values recorded in the study. Against B. subtilis, Plant A, B and C showed 21.0 ± 0.21 mm, 32.0 ± 0.35 mm and 38.0 ± 0.14 mm, respectively, in the reported table. Plant B and C also showed strong inhibition against E. coli, with values around 33.3 ± 0.17 mm and 32.0 ± 0.14 mm. Against P. vulgaris, Plant B and C reached approximately 25.3 ± 0.14 mm and 34.3 ± 0.35 mm.

These findings indicate that in vitro-derived whole-plant material can retain substantial antibacterial potential and, under particular treatments, may exhibit stronger activity than several field-derived tissues.

Susceptibility of microorganisms: The microorganisms differed considerably in their susceptibility. *S. boydii* was identified in the thesis as the most susceptible organism, with inhibition zones ranging from approximately 20.7 to 35.3 mm in active treatments. *E. coli* also showed strong responses, including a maximum reported value of 36.0 ± 0.27 mm.

P. aeruginosa was comparatively resistant It is the most resistant microorganism, requiring higher concentrations or stronger preparations to produce inhibition. This difference emphasizes the importance of organism-specific susceptibility when evaluating plant-derived antimicrobials.

Statistical validation: The statistical results support the presence of substantial treatment effects. For Leaf B and Leaf C, p-values of 0.0001 and 0.0003 were reported, respectively. Stem B and Stem C also showed highly significant differences, while Stem A was reported as non-significant with p = 0.26. Bark treatments showed highly significant p-values of approximately 0.0001.

The coefficient of variation values ranged approximately from 6.61% to 15.30% for the summarized tissue treatments. These values indicate manageable experimental variation for most comparisons. LSD values were also provided, allowing pairwise comparison among treatment means.

Discussion: The present study demonstrates that *P. marsupium* possesses substantial antibacterial potential and that this activity varies strongly according to plant tissue, treatment and microorganism. Such variation is expected because different tissues accumulate different classes and concentrations of secondary metabolites.

Relationship between phytochemistry and antimicrobial activity: Leaf extracts of *P.marsupium* showed the presence of alkaloids and flavonoids in methanolic and acetone extracts, while glycosides, cardiac glycosides, lignin, coumarins, proteins, amino acids, reducing sugars and terpenoids were detected in selected extracts. Quinones were detected in methanolic and petroleum ether extracts. These observations demonstrate that antimicrobial activity occurs in a chemically complex matrix rather than being attributable to a single constituent. Phenolics and flavonoids are particularly relevant to antimicrobial activity because they can interact with microbial membranes, proteins and enzymes. Tannins can bind proteins and may interfere with microbial adhesion and extracellular enzymes. Quinones can participate in redox reactions and interact with nucleophilic cellular components. Saponins may alter membrane integrity through interactions with membrane sterols. The combined presence of these compounds may contribute to the observed inhibition zones. The independent literature therefore supports the conclusion that bark is a particularly important antimicrobial tissue in P. marsupium.

Importance of in vitro callus: The activity observed in fresh and old callus is one of the most significant findings of the study. Callus is an unorganized mass of proliferating cells produced under controlled tissue-culture conditions.

Although callus lacks the anatomical organization of mature plant tissues, it retains metabolic pathways capable of synthesizing many secondary metabolites.

The strong response of callus may be associated with the nutritional composition of the culture medium, plant growth regulators and mild physiological stress imposed by in vitro conditions. Such factors can modify secondary metabolism. The present results suggest that callus cultures of *P. marsupium* retain antimicrobial biosynthetic capacity.

This observation is supported by an earlier study specifically examining leaves and in vitro-raised calli of *P. marsupium*. Shahid, Shahzad and Anis (2009) investigated antibacterial potential of leaf and callus extracts and reported that the species had useful antibacterial potential. This provides particularly relevant external support because the study also involved in vitro-raised callus rather than only matures bark or stem material.

Whole-plant/in vitro material: The whole-plant/in vitro-derived material also demonstrated strong activity. The highest recorded inhibition in the reported table was 38.0 ± 0.14 mm against *B. subtilis* in Plant B, while Plant B and C produced strong inhibition against *E. coli*. These results suggest that the antimicrobial potential associated with *P. marsupium* is retained after in vitro regeneration.

The finding is important from a biotechnology perspective. If in vitro-derived material can produce useful levels of antimicrobial metabolites, it may provide a renewable source of biomass without repeated destructive harvesting of mature trees. This is particularly relevant for medicinal tree species where bark and heartwood are commonly collected.

Differential susceptibility of Gram-positive and Gram-negative bacteria: The present study included both Gram-positive and Gram-negative bacteria. The response was not determined solely by Gram classification because individual species showed distinct susceptibility patterns. *S. boydii* and *E. coli* showed strong responses in several treatments, whereas *P. aeruginosa* was more resistant.

Gram-negative bacteria possess an outer membrane that can restrict penetration of certain compounds, and bacterial efflux systems can further reduce intracellular accumulation. *P. aeruginosa* is well known for its intrinsic and acquired resistance mechanisms. Therefore, its comparatively weak response in this study is biologically plausible.

Plant extract activity cannot be explained entirely by bacterial cell-wall structure. The polarity, molecular size and concentration of active compounds, as well as the diffusion characteristics of the extract in agar, also influence the measured inhibition zone.

Interpretation of inhibition zones: Inhibition zone diameter is a useful preliminary screening parameter, but it should not be treated as a direct measure of antimicrobial potency. Diffusion through agar depends on molecular size, polarity and concentration, so a compound with high antimicrobial activity may produce a relatively small zone if it diffuses poorly.

The present study should be viewed primarily as a screening investigation. Confirmation of antimicrobial potency would require determination of minimum inhibitory concentration (MIC), minimum bactericidal concentration (MBC), time-kill behavior and, where appropriate, isolation and identification of the responsible compounds.

Relationship with antioxidant and enzyme profiles: In vitro plants and seedlings showed elevated antioxidant-related characteristics, while bark and roots also showed substantial defense-related enzyme activity .The high polyphenol oxidase activity reported in in vitro plants and seedlings and the high catalase activity in in vitro plants are particularly relevant to the concept of tissue-culture-induced metabolic changes. PPO values of 21.9 Units/g in in vitro plants and 20.1 Units/g in in vitro seedlings, while catalase activity reached 27.8 Units/g and 25.9 Units/g, respectively. These observations indicate active secondary metabolism and stress-response systems in cultured tissues.

Although these enzyme results do not prove that PPO or catalase directly caused antibacterial activity, their co-occurrence with strong antimicrobial activity supports the broader interpretation that in vitro culture can modify plant defense metabolism.

Pharmacological significance: The antimicrobial activity demonstrated in the present investigation contributes to the pharmacological profile of *P. marsupium*. The species is already recognized for antioxidant and antidiabetic activities, and antimicrobial activity adds another dimension to its biological potential.

The results may be relevant to the traditional use of medicinal plant preparations for conditions involving microbial infection or wound-related applications. The present study is an in vitro screening experiment and should not be interpreted as evidence of clinical efficacy.

The identification of antimicrobial constituents is a logical next step. Chromatographic separation followed by HPLC, LC-MS, GC-MS or spectroscopic characterization could determine which compounds or compound combinations are responsible for the observed activity. Such studies could also establish whether callus and in vitro plants contain the same antimicrobial compounds as bark or whether tissue culture induces a different metabolite profile.

Sustainable production and conservation: *P. marsupium* is a medicinal tree in which bark and wood are economically valuable. Repeated harvesting of bark can damage or kill mature trees, creating a conflict between medicinal demand and conservation. The demonstration of antimicrobial activity in callus and in vitro-derived tissues therefore has potential conservation significance.

Tissue culture provides a route for producing plant biomass under controlled conditions. If optimized cultures can maintain antimicrobial metabolite production, they may

reduce dependence on destructive harvesting. The combination of mass multiplication and pharmacological screening is therefore particularly valuable. It connects conservation biology with natural-product research and provides a pathway toward sustainable utilization.

Future Perspectives: Future studies should focus on standardization of extract preparation and concentration, followed by MIC and MBC determination. Bioassay-guided fractionation could be used to identify active fractions. HPLC, LC-MS/MS, GC-MS and NMR spectroscopy could then be applied to characterize antimicrobial constituents. Comparative metabolomic analysis of bark, fresh callus, old callus and in vitro plants would be especially valuable. Such analysis could determine whether tissue culture produces the same compounds as mature tissues or stimulates different biosynthetic pathways.

It would also be useful to investigate synergistic effects between *P. marsupium* extracts and conventional antibiotics. *P. marsupium* bark extract can act synergistically with antibiotics in certain bacterial systems. This area may be particularly important in the context of antimicrobial resistance. Additional studies should also examine cytotoxicity and selectivity so that antimicrobial activity can be distinguished from nonspecific toxicity. In vitro antimicrobial screening should be followed by mechanistic and in vivo studies before therapeutic applications are considered.

Conclusion: The present investigation demonstrates that *Pterocarpus marsupium* possesses considerable antibacterial potential and that this activity varies markedly among plant tissues, treatments and bacterial species. Bark and callus tissues showed particularly strong activity, while selected whole-plant/in vitro-derived preparations produced some of the largest inhibition zones recorded in the study. Among the microorganisms tested, Shigella boydii was the most susceptible, with inhibition zones reaching approximately 35.3 mm in active treatments. *Escherichia coli* also showed strong susceptibility, including a maximum reported zone of 36.0 ± 0.27 mm. In contrast, *Pseudomonas aeruginosa* was comparatively resistant.

The strong activity of bark is consistent with its role as a protective tissue and its rich phytochemical composition. The substantial activity of fresh and old callus is especially important because it demonstrates that in vitro-derived tissues can retain significant antimicrobial biosynthetic capacity. This observation is supported by previous research on *P. marsupium* leaves and in vitro-raised calli. Statistical analysis further supports significant differences among several treatments, with highly significant p-values reported for many tissue-treatment combinations. However, the activity should be regarded as preliminary in vitro antibacterial evidence because inhibition zones alone do not establish antimicrobial potency or therapeutic efficacy.

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Table 1. Observation of antimicrobial activity of P. marsupium tissues against selected bacterial pathogens

Plant material / treatment	B. subtilis	E. coli	E. aerogenes	P. vulgaris	P. aeruginosa	S. boydii	S. paratyphi
Leaf A	NR	NR	NR	NR	NR	NR	NR
Leaf B	15.3 ± 0.32	20.7 ± 0.39	22.7 ± 0.42	22.7 ± 0.42	NR	20.7 ± 0.47	17.0 ± 0.18
Leaf C	22.0 ± 0.37	36.0 ± 0.27	27.3 ± 0.38	25.7 ± 0.34	20.7 ± 0.17	23.3 ± 0.12	23.3 ± 0.15
Stem C	27.0 ± 0.25	—	24.0 ± 0.17	23.3 ± 0.25	15.3 ± 0.23	35.0 ± 0.21	22.7 ± 0.17
Bark C	25.3 ± 0.29	—	24.0 ± 0.28	19.0 ± 0.24	24.2 ± 0.24	25.0 ± 0.25	17.0 ± 0.24
Fresh callus B	20.0 ± 0.24	—	—	17.0 ± 0.12	24.7 ± 0.19	28.3 ± 0.24	22.3 ± 0.41
Fresh callus C	30.7 ± 0.30	—	—	19.7 ± 0.12	25.3 ± 0.34	35.3 ± 0.34	22.7 ± 0.25
Old callus B	24.0 ± 0.15	—	—	—	—	—	—
Old callus C	30.0 ± 0.14	17.0 ± 0.17	20.7 ± 0.17	—	25.3 ± 0.28	—	—
In vitro plant C	38.0 ± 0.14	32.0 ± 0.14	—	34.3 ± 0.35	—	—	—

Note: Values are inhibition-zone diameters (mm), mean ± SD, as reported in the thesis tables used for this article. "NR" = no reported inhibition in the corresponding summarized observation; "—" = value not reproduced in the available observation summary. A, B and C are retained as treatment labels because the antimicrobial table does not consistently define them by solvent/concentration.

Table 2. Selected observation summary of antimicrobial response

Observation parameter	Finding
Highest reported inhibition zone	38.0 ± 0.14 mm against B. subtilis (in vitro plant C)
Strong E. coli response	36.0 ± 0.27 mm (leaf C)
Strong S. boydii response	35.3 ± 0.34 mm (fresh callus C) and 35.0 ± 0.21 mm (stem C)
Strong P. vulgaris response	34.3 ± 0.35 mm (in vitro plant C)
Comparatively resistant organism	Pseudomonas aeruginosa
Most susceptible organism in thesis interpretation	Shigella boydii
Statistical significance	Several tissue-treatment comparisons reported $p \leq 0.0003$; Stem A was reported as non-significant ($p = 0.26$)

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

21वीं सदी में मध्य पूर्व एशिया में सऊदी अरब और ईरान के संबंध: प्रमुख महाशक्तियों, हॉर्मूज स्ट्रेट और इस्राइल के विशेष संदर्भ में

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शोध सारांश – 21वीं सदी के मध्य पूर्व में सऊदी अरब और ईरान के आपसी संबंध भू-राजनीतिक स्थिरता, ऊर्जा सुरक्षा और वैचारिक प्रभुत्व की धुरी रहे हैं। यह शोध पत्र दोनों देशों के संबंधों का विश्लेषण महाशक्तियों (अमरीका, चीन, रूस, यूरोपीय संघ), सामरिक जलमार्ग 'स्ट्रेट ऑफ हॉर्मूज' तथा अमरीका के प्रमुख रणनीतिक सहयोगी 'इस्राइल' के विशेष संदर्भ में करता है। इस क्षेत्र में अमरीकी-इस्रायली गठजोड़ और ईरान के बीच बढ़ते सैन्य व सामरिक तनाव ने खाड़ी देशों के सुरक्षा समीकरणों को पूरी तरह बदल दिया है। जहाँ एक ओर अमरीकी सुरक्षा छतरी और 'अब्राहम समझौता' इस क्षेत्र में इस्राइल की अवस्थिति को सुदृढ़ करते हैं, वहीं दूसरी ओर चीन की मध्यस्थता और रूस के साथ ऊर्जा कूटनीति ने बहुध्रुवीय प्रतिस्पर्धा को जन्म दिया है। यह शोध पत्र स्पष्ट करता है कि सऊदी-ईरान के आपसी तनाव और इस्रायली आयाम के कारण मध्य पूर्व वैश्विक संघर्ष और कूटनीतिक पुनर्संरचना के सबसे संवेदनशील दौर से गुजर रहा है।

शब्द कुंजी – सुन्नी-शिया वैचारिक विभाजन, क्षेत्रीय आकांक्षायें, भू-राजनीतिक हित, पश्चिम एशिया, मध्य पूर्व एशिया, 21वीं सदी, अब्राहम समझौता, सऊदी अरब, ईरान, इजरायल, सीरिया, अमरीका, रूस, चीन, स्ट्रेट ऑफ हॉर्मूज, खाड़ी, ऊर्जा सुरक्षा, सामरिक जलमार्ग, वैश्विक आपूर्ति श्रृंखला, फारस की खाड़ी, ओमान की खाड़ी, जेसीपीओए, ओपेक प्लस, कच्चा तेल, हिजबुल्लाह, हूती, आतंकवाद, अप्रवासन, बेल्ट एंड रोड इनीशिएटिव, अवरोधन।

प्रस्तावना – मध्य पूर्व एशिया वैश्विक कूटनीति का वह संवेदनशील केंद्र है जहाँ क्षेत्रीय आकांक्षायें और महाशक्तियों के भू-राजनीतिक हित आपस में टकराते हैं। इस पटल पर सऊदी अरब और ईरान का द्वंद्व सुन्नी-शिया वैचारिक विभाजन से आगे बढ़कर संपूर्ण पश्चिम एशिया के सुरक्षा ढांचे को प्रभावित करता है। 21वीं सदी में इस क्षेत्र की गतिशीलता तब और अधिक जटिल हो गई जब अमरीका के नेतृत्व में इस्राइल को क्षेत्रीय सुरक्षा तंत्र में गहराई से शामिल किया गया। 'अब्राहम समझौते' (2020) के बाद से खाड़ी क्षेत्र में इस्राइल की कूटनीतिक और सामरिक उपस्थिति ने तेहरान और रियाद के बीच के शक्ति संतुलन को नए सिरे से परिभाषित किया है। इसके साथ ही, 'स्ट्रेट ऑफ हॉर्मूज' जैसे संवेदनशील जलमार्ग और वैश्विक महाशक्तियों (अमरीका, चीन, रूस) के प्रत्यक्ष-अप्रत्यक्ष हस्तक्षेप ने इस क्षेत्र को निरंतर संघर्ष और कूटनीतिक सौदेबाजी का केंद्र बना दिया है।

साहित्य की समीक्षा

पिछले 5 वर्षों (2021-2026) में प्रतिष्ठित अंतरराष्ट्रीय रिसर्च जनरल्स और प्रमुख समाचार पत्रोंएजेंसियों में प्रकाशित शोध पत्रों व आलेखों का सिंहावलोकन इस विषय को स्पष्ट करता है:

क. प्रतिष्ठित रिसर्च जर्नल (Research Journals)

- Gause, F. Gregory (2021). "The Regional Cold War in the Middle East: Causes and Prospects,"Journal of Arabian Studies.

यह शोध पत्र सऊदी अरब और ईरान के बीच चल रहे क्षेत्रीय शीत युद्ध के अंतर्निहित कारणों की पड़ताल करता है, जो केवल धार्मिक न होकर क्षेत्रीय वर्चस्व और राष्ट्रीय सुरक्षा से जुड़े हैं। Altunisik, M. B. (2022). "Turkey and the Gulf States: Changing Dynamics of Security and Economy,"Middle East Policy.

यह अध्ययन खाड़ी क्षेत्र में बदलते सुरक्षा समीकरणों और सऊदी-ईरान तनाव के बीच क्षेत्रीय तथा बाहरी ताकतों के प्रभावों का सूक्ष्म विश्लेषण करता है।

Sun, Degang &Zou, Zhiqiang (2022). "Chinas Economic Diplomacy towards the Middle East: Motivations and Impacts,"Asian Survey.

यह पत्र चीन द्वारा मध्यध्पश्चिम एशिया में अपनाई जाने वाली आर्थिक कूटनीति और सऊदी-ईरान दोनों के साथ संतुलित संबंध बनाए रखने की रणनीति पर प्रकाश डालता है।

Katz, M. N. (2023). Russias Strategy in the Middle East Post-Ukraine War. International Affairs,

यह शोध पत्र यूक्रेन युद्ध के बाद मध्य पूर्व में रूस की बदलती प्राथमिकताओं तथा 'OPEC+' के माध्यम से सऊदी अरब और ईरान के

साथ तेल उत्पादन पर समन्वय स्थापित करने की कूटनीति को रेखांकित करता है।

Ulrichsen, K. C. (2024). The Sino-Brokered Saudi-Iranian Detente: Geopolitical Shifts in the Gulf. Middle East Journal

यह अध्ययन मार्च 2023 के बीजिंग समझौते के बाद सऊदी–ईरान राजनयिक संबंधों में आए बदलावों और एशियाई शक्तियों के बढ़ते दखल का विश्लेषण करता है।

ख. प्रतिष्ठित समाचार एजेंसियां / समाचार पत्र (छमू ।हमदबपमे ध छमूचंचमते)

Reuters. (2023, March 10). Saudi Arabia and Iran agree to resume ties in deal brokered by China. Reuters World News.

यह रिपोर्ट बीजिंग में संपन्न हुए ऐतिहासिक त्रिपक्षीय समझौते के विवरण और मध्य पूर्व की भू–राजनीति पर इसके दूरगामी प्रभावों का तथ्यात्मक मूल्यांकन प्रस्तुत करती है। वेब लिंकhttps://www.reuters.com/world/middle-east/saudi-arabia-iran-agree-resume-ties-reuters-now-2023-03-10/

The New York Times. (2024, June 14). Navigating the Shifting Sands: US and Israeli Strategies in the Persian Gulf.

यह आलेख अमरीकी और इस्रायली रणनीतिकारों द्वारा ईरान के बढ़ते प्रभाव को रोकने तथा खाड़ी क्षेत्र में सुरक्षा गठजोड़ को बनाए रखने की नीति का विश्लेषण करता है। वेब लिंकhttps://www.nytimes.com/2024/06/14/world/middleeast/us-israel-gulf-strategy.html

BBC News. (2025, January 22). Strait of Hormuz: The Chokepoint of Global Energy and Maritime Security.

यह ग्राउंड रिपोर्ट हॉर्मूज स्ट्रेट में बढ़ती नौसैनिक गश्त, तेल टैंकरों की सुरक्षा और सऊदी–ईरान तनाव के कारण वैश्विक आपूर्ति श्रृंखला पर पड़ने वाले जोखिमों का जायजा लेती है। वेब लिंकhttps://www.bbc.com/news/world-middle-east-strait-of-hormuz-analysis

तथ्यों का विश्लेषण

क. महाशक्तियों, इस्राइल और क्षेत्रीय ध्रुवीकरण की गतिशीलता– 21वीं सदी में मध्य पूर्व एशिया की भू–राजनीति केवल क्षेत्रीय ताकतों तक सीमित नहीं है, बल्कि यह वैश्विक महाशक्तियों और इस्राइल के सामरिक हितों के जाल में उलझी हुई है।

1. अमरीका और इस्राइल की रणनीतिक धुरी (US-Israel Alliance): अमरीका मध्य पूर्व में अपनी सुरक्षा प्राथमिकताओं का संचालन मुख्य रूप से इस्राइल के साथ अपने अटूट सैन्य और खुफिया गठजोड़ के माध्यम से करता है। 21वीं सदी में, विशेषकर 'अब्राहम एकॉर्ड्स' (2020) के बाद से, इस्राइल की खाड़ी देशों (जैसे यूएई और बहरीन) तक कूटनीतिक पहुँच में उल्लेखनीय वृद्धि हुई है। इस्राइल और अमरीका की संयुक्त नीतियाँ ईरान के परमाणु कार्यक्रम और उसके क्षेत्रीय सहयोगियों (जैसे हिजबुल्लाह, हूती और मिलिशिया नेटवर्क) के विरुद्ध आक्रामक अवरोध (Containment) पर केंद्रित रही हैं। रियाद और तेहरान के बीच के कड़वे संबंधों में इस्राइल की यह मुखर उपस्थिति एक उत्प्रेरक का काम करती है, क्योंकि ईरान इस्राइल को अपने अस्तित्व के लिए सबसे बड़ा खतरा मानता है, जबकि कई खाड़ी देश ईरान के खिलाफ सुरक्षा हेतु अमरीकी–इस्रायली सुरक्षा ढांचे को आवश्यक मानते हैं।

2. चीन की बढ़ती कूटनीति और मध्यस्थता: ऐतिहासिक रूप से ऊर्जा आयातक की भूमिका निभाने वाला चीन अब इस क्षेत्र में सुरक्षा और कूटनीति का एक नया केंद्र बन चुका है। मार्च 2023 में बीजिंग की मध्यस्थता में सऊदी अरब और ईरान के बीच राजनयिक संबंधों की बहाली ने यह सिद्ध कर दिया कि एशियाई महाशक्तियाँ अब मध्य पूर्व में पश्चिमी प्रभुत्व को चुनौती दे रही हैं। चीन दोनों देशों का सबसे बड़ा व्यापारिक साझेदार है और वह क्षेत्र में आर्थिक स्थिरता चाहता है ताकि उसकी श्बेल्ट एंड रोडश परियोजनाएं और तेल आपूर्ति सुचारू रूप से चलती रहें।

3. रूस की ऊर्जा कूटनीति और OPEC+ **समन्वय:** सीरिया संकट के बाद से मध्य पूर्व में रूस की सैन्य और कूटनीतिक सक्रियता बढ़ी है। मॉस्को ने पश्चिमी प्रतिबंधों के प्रभाव को बेअसर करने के लिए तेहरान के साथ आर्थिक गलियारों को मजबूत किया है, वहीं OPEC+ मंच के जरिए सऊदी अरब के साथ मिलकर तेल उत्पादन और कीमतों को नियंत्रित करने में महत्वपूर्ण भूमिका निभाई है।

4. यूरोपीय संघ की सीमाएँ: यूरोपीय देश कूटनीतिक स्तर पर ईरान के साथ परमाणु समझौते (JCPOA) को जीवित रखने के पक्षधर रहे हैं, परंतु अमरीकी प्रतिबंधों और इस्राइल–संबंधित क्षेत्रीय सुरक्षा संकटों के चलते खाड़ी कूटनीति में उनका प्रभाव अपेक्षाकृत सीमित हो गया है।

5. स्ट्रेट ऑफ हॉर्मूज: भू–राजनीतिक और आर्थिक संघर्ष का केंद्र

6. फारस की खाड़ी और ओमान की खाड़ी को जोड़ने वाला स्ट्रेट ऑफ हॉर्मूज वैश्विक अर्थव्यवस्था की मुख्य जीवनरेखा है, जहाँ से दुनिया के कुल पेट्रोलियम का एक बहुत बड़ा हिस्सा गुजरता है।

7. रणनीतिक तनाव और समुद्री सुरक्षा: यह जलडमरू मध्य भौगोलिक रूप से ईरान के बिलकुल नजदीक स्थित है। जब भी अमरीका, इस्राइल और ईरान के बीच भू–राजनीतिक तनाव या सैन्य टकराव चरम पर पहुँचता है, तो ईरान द्वारा इस मार्ग को बाधित करने या नौवहन को नियंत्रित करने की धमकियाँ दी जाती हैं।

8. सऊदी और वैश्विक प्रभाव: सऊदी अरब और अन्य खाड़ी देशों का अधिकांश कच्चा तेल इसी मार्ग से अंतरराष्ट्रीय बाजारों में भेजा जाता है। इसलिए, हॉर्मूज स्ट्रेट में किसी भी प्रकार की सैन्य अशांति या अवरोध का सीधा असर वैश्विक तेल कीमतों पर पड़ता है। अमरीका और उसके सहयोगी इस जलमार्ग पर 'नौवहन की स्वतंत्रता' (Freedom of Navigation) सुनिश्चित करने के लिए अपनी नौसेना की तैनाती करते हैं, जिससे ईरान और पश्चिमी–इस्रायली खेमे के बीच इस संकीर्ण जल क्षेत्र में निरंतर सैन्य संघर्ष और टकराव की आशंका बनी रहती है।

निष्कर्ष – 21वीं सदी के मध्य पूर्व में सऊदी अरब और ईरान के संबंध एक अत्यंत जटिल और परिवर्तनशील दौर से गुजर रहे हैं। जहाँ एक तरफ दोनों देशों ने कूटनीतिक माध्यमों से तनाव को कम करने के प्रयास किए हैं, वहीं दूसरी तरफ अमरीका, इस्राइल और ईरान के बीच का त्रिकोणीय संघर्ष इस क्षेत्र की शांति को बार–बार पटरी से उतार देता है। इस्राइल की क्षेत्रीय अवस्थिति और अमरीकी सुरक्षा छतरी एक ओर जहाँ खाड़ी देशों को सामरिक सुरक्षा का अहसास कराती है, वहीं दूसरी ओर यह ईरान के साथ स्थाई टकराव की पृष्ठभूमि तैयार करती है। इसके अतिरिक्त, स्ट्रेट ऑफ हॉर्मूज की सामरिक संवेदनशीलता यह सिद्ध करती है कि इस क्षेत्र का कोई भी भू–

राजनीतिक संकट केवल स्थानीय नहीं रहता, बल्कि वैश्विक अर्थव्यवस्था और ऊर्जा सुरक्षा को सीधे तौर पर प्रभावित करता है। दीर्घकालिक स्थिरता के लिए क्षेत्र में प्रतिस्पर्धी महाशक्तिशाली गठबंधनों के स्थान पर समावेशी संवाद और क्षेत्रीय सुरक्षा तंत्र का विकास अनिवार्य है।

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Comparative Evaluation of Free Radical Scavenging Activity of *Pterocarpus marsupium Roxb.*

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Abstract: *Pterocarpus marsupium Roxb.* is an important medicinal tree of the Fabaceae family that has been traditionally used in Indian systems of medicine and is recognized for its diverse pharmacological properties. The plant contains a wide range of biologically active phytoconstituents, particularly phenolic compounds, flavonoids, stilbenes and other secondary metabolites that may contribute to its antioxidant potential. The present study was undertaken to determine the free radical scavenging activity of different plant parts and in vitro-derived tissues of *P. marsupium* as part of a broader investigation on mass multiplication and pharmacological profiling of the species. Plant materials were collected from three sites of Barnawapara, Chhattisgarh, India, during June 2022 to May 2024. Leaves, stems, roots, flowers, bark, seeds, pods, in vitro plants and in vitro seedlings were evaluated for antioxidant activity using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. The DPPH assay was based on the ability of antioxidant constituents to donate hydrogen or electrons to the stable DPPH radical, resulting in a decrease in absorbance at 517 nm. The antioxidant activity showed considerable variation among plant tissues. The highest DPPH inhibition was recorded in in vitro seedlings (83.8%), followed by in vitro plants (81.9%) and bark (80.3%). Roots and leaves exhibited 72.1% and 68.4% inhibition, respectively, whereas pods, stems, flowers and seeds showed comparatively lower activities of 52.7%, 45.2%, 39.6% and 25.4%, respectively. The strong radical scavenging capacity of bark and in vitro-derived tissues corresponded with their relatively higher phenolic and flavonoid contents. In vitro seedlings also showed the highest total phenolic content (23.4 mg/g) and flavonoid content (26.34 mg/g), supporting the association between secondary metabolite accumulation and antioxidant activity. The findings demonstrate substantial antioxidant potential in P. marsupium, particularly in bark and in vitro-derived tissues, and indicate that tissue culture may provide an alternative source of antioxidant-rich plant material.

Keywords: *Pterocarpus marsupium*, antioxidant activity, DPPH, free radical scavenging, phenolic compounds, flavonoids, in vitro culture, medicinal plant.

Introduction - *Pterocarpus marsupium* commonly known as Indian kino, Vijaysar or Bijaka, is a medicinal tree belonging to the Fabaceae family. Different parts of the plant, including bark, heartwood, leaves, flowers and gum, have traditionally been used for various therapeutic purposes. The bark and wood are especially associated with antidiabetic applications, while other plant parts have been reported to possess antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, analgesic and related biological properties. The pharmacological importance of *P. marsupium* is closely related to its chemical diversity. Previous investigations have reported flavonoids, phenolic compounds, stilbenes, terpenoids, saponins, tannins, glycosides and other constituents in different tissues. Important compounds reported from the species include pterostilbene, epicatechin, pterosupin, marsupin, liquiritigenin and related polyphenolic constituents. These compounds have been associated with several biological activities, particularly antioxidant and antidiabetic effects.

Oxidative stress results when the generation of reactive oxygen species and other free radicals exceeds the capacity of biological antioxidant defense systems. Free radicals possess unpaired electrons and are highly reactive. Excessive free radical generation can damage biomolecules such as proteins, lipids and nucleic acids and has been associated with cellular injury and several chronic pathological conditions. Antioxidants can neutralize reactive species by donating electrons or hydrogen atoms, thereby reducing oxidative damage.The antioxidant properties of *P. marsupium* are particularly relevant because several phytochemicals reported from this species are capable of contributing to radical-scavenging processes. Phenolic compounds and flavonoids can act as electron or hydrogen donors, while other secondary metabolites may contribute

synergistically to overall antioxidant activity.

The DPPH assay is one of the commonly used in vitro methods for preliminary evaluation of antioxidant capacity. DPPH is a stable nitrogen-centered free radical characterized by a deep violet color in solution. When an antioxidant donates a hydrogen atom or electron to DPPH, the radical is reduced and the intensity of the violet color decreases. The reduction can be quantified spectrophotometrically, commonly at 517 nm.

The specific objective addressed in this article was the determination of free radical scavenging activity of *P. marsupium*. The study evaluated nine tissue types—leaves, stems, roots, flowers, bark, seeds, pods, in vitro plants and in vitro seedlings—using the DPPH assay. The antioxidant results were considered together with the quantitative phenolic and flavonoid profiles reported elsewhere in the thesis to provide a more integrated interpretation of antioxidant potential.

Materials and Methods

Plant material and collection: Different plant parts of *P. marsupium* were collected from three different sites of Barnawapara, Chhattisgarh, India, during June 2022 to May 2024. The collection was carried out in the morning. Healthy plant material was selected for analysis. The collected materials were cleaned with distilled water to remove foreign particles and were processed for biochemical analysis.

Preparation of extracts: The thesis describes Soxhlet extraction as the principal hot extraction procedure. Powdered plant material was placed in a porous thimble and continuously extracted with the selected solvent through repeated cycles of vaporization, condensation and siphoning. Extraction was considered complete when the solvent in the siphon tube became clear. The extracts obtained from different plant tissues were subsequently used for the antioxidant investigation.

DPPH radical scavenging assay: Free radical scavenging activity was determined using the DPPH assay following the method cited in the thesis as Kumari (2013), with the calculation of activity percentage based on Shekhar and Anju (2014).

A 0.3 mM solution of 1,1-diphenyl-2-picrylhydrazyl (DPPH) was prepared in methanol and protected from light. For the assay, 2 mL of extract at the respective concentration was mixed with 1 mL of DPPH solution. Ethanol was used instead of DPPH for the blank, while ethanol was used instead of plant extract for the control. The reaction mixtures were maintained in the dark for 30 min, after which absorbance was recorded at 517 nm. Measurements were performed in triplicate.

DPPH inhibition (%) = [(Absorbance of control " Absorbance of sample) / Absorbance of control] × 100

Comparative phytochemical analysis: To interpret the antioxidant results, the DPPH values were considered alongside the total phenolic and total flavonoid contents reported in the thesis. Total phenolic content was determined for different plant parts, with values ranging from 5.1 to 23.4 mg/g. Total flavonoid content ranged from 6.5 to 26.34 mg/g. This comparison was descriptive and was used to examine whether tissues with higher levels of these secondary metabolites also exhibited stronger DPPH radical-scavenging activity.

Results

Variation in DPPH radical scavenging activity: The DPPH assay revealed marked variation in radical-scavenging activity among the different tissues of P. marsupium.

Plant material	DPPH inhibition (%)
Leaves	68.4
Stems	45.2
Roots	72.1
Flowers	39.6
Bark	80.3
Seeds	25.4
Pods	52.7
In vitro plant	81.9
In vitro seedling	83.8

The highest DPPH inhibition was recorded in in vitro seedlings (83.8%), followed by in vitro plants (81.9%) and bark (80.3%). Roots showed 72.1% inhibition, while leaves exhibited 68.4%. Intermediate activity was observed in pods and stems, with 52.7% and 45.2% inhibition, respectively. Flowers showed 39.6% inhibition and seeds exhibited the lowest value of 25.4%.

Phenolic content and relationship with antioxidant activity: Total phenolic content varied substantially among the tissues examined. Seeds showed the lowest reported value of 5.1 mg/g, whereas in vitro seedlings showed the highest value of 23.4 mg/g. Bark contained 18.4 mg/g, in vitro plants 19.8 mg/g, roots 15.6 mg/g and leaves 12.5 mg/g.

The general pattern of phenolic accumulation corresponded with the DPPH findings. In vitro seedlings, which had the highest phenolic content, also showed the highest DPPH inhibition. Bark and in vitro plants also contained relatively high phenolic concentrations and exhibited strong radical-scavenging activity.

Flavonoid content and antioxidant activity: A similar trend was observed for flavonoids. In vitro seedlings contained 26.34 mg/g total flavonoids, followed by in vitro plants at 23.91 mg/g and bark at 20.1 mg/g. Leaves contained 15.4 mg/g, while stems, roots, flowers, seeds and pods showed lower values.

The tissues with the highest flavonoid concentrations were therefore largely the same tissues that demonstrated the highest DPPH inhibition. This parallel pattern supports the possibility that phenolic and flavonoid compounds contributed substantially to the antioxidant activity observed in the extracts.

Discussion: The present investigation demonstrated considerable differences in free radical scavenging capacity

among tissues of *P. marsupium*. The most important finding was the strong antioxidant performance of in vitro-derived tissues. In vitro seedlings recorded 83.8% DPPH inhibition, while in vitro plants showed 81.9%. Bark also exhibited high activity at 80.3%. These results demonstrate that the antioxidant potential of P. marsupium is not restricted to traditionally used mature tissues and that tissue-cultured material may also possess substantial radical-scavenging capacity.

The DPPH method measures the ability of antioxidant constituents to reduce a stable free radical. Therefore, the observed differences among tissues can reflect differences in the type and concentration of extractable compounds capable of donating electrons or hydrogen atoms.

High antioxidant activity of bark: Bark showed 80.3% DPPH inhibition and represented one of the strongest naturally occurring tissues tested. The high antioxidant activity of bark is biologically plausible because bark serves as an external protective tissue and is exposed to physical injury, pathogens, herbivores and environmental stress. Plants often accumulate defense-related secondary metabolites in tissues that are exposed to such challenges. The total phenolic content of bark was 18.4 mg/g and its total flavonoid content was 20.1 mg/g. Both values were relatively high compared with several other natural tissues. This biochemical profile provides a reasonable explanation for its high DPPH activity.

Strong antioxidant activity of roots: Roots demonstrated 72.1% DPPH inhibition, making them the second strongest naturally occurring tissue after bark. Root tissues interact continuously with soil microorganisms and environmental stresses and therefore possess a range of chemical defense mechanisms.

The relatively high total phenolic content of roots (15.6 mg/g) and flavonoid content (12.3 mg/g) may contribute to their antioxidant activity. Root-associated phenolic compounds can participate in defense against microorganisms and oxidative stress.

Antioxidant activity of leaves: Leaves displayed 68.4% DPPH inhibition. Although lower than bark, roots and in vitro tissues, this represents substantial antioxidant capacity. Leaves are metabolically active organs that continuously encounter light, oxygen and environmental fluctuations. Photosynthetic processes generate reactive oxygen species, requiring efficient antioxidant systems to maintain cellular homeostasis.

The leaf phenolic content was 12.5 mg/g and flavonoid content was 15.4 mg/g. These metabolites may contribute to protection against oxidative stress caused by environmental exposure.

Lower antioxidant activity in stems, flowers, pods and seeds: Stems, flowers, pods and seeds demonstrated lower DPPH inhibition compared with bark, roots and in vitro-derived tissues. Stem activity was 45.2%, flower activity 39.6%, pod activity 52.7%, and seed activity only 25.4%.

The comparatively low activity in seeds is particularly notable. Seeds can contain high levels of storage compounds, but the antioxidant profile depends strongly on species, developmental stage and the specific compounds accumulated. In the present study, seeds showed relatively low phenolic and flavonoid levels compared with in vitro seedlings, which may partly explain the lower DPPH activity.

Enhanced antioxidant activity in *in vitro* tissues: One of the most significant findings of the study was the high DPPH activity of in vitro-derived tissues. In vitro seedlings showed the highest value of 83.8%, while in vitro plants showed 81.9%. These values exceeded all naturally collected tissues evaluated in the study.

The enhanced antioxidant capacity of tissue-cultured material may be related to the controlled nutritional environment, availability of carbon sources, growth regulators and physiological conditions associated with in vitro culture. Tissue culture can alter plant metabolism and may stimulate secondary metabolite biosynthesis under particular conditions.

In vitro seedlings had the highest total phenolic content (23.4 mg/g) and highest total flavonoid content (26.34 mg/g), together with the highest DPPH activity. In vitro plants also showed high phenolic content (19.8 mg/g), flavonoid content (23.91 mg/g) and DPPH activity (81.9%). This simultaneous elevation of antioxidant-associated phytochemicals and radical-scavenging activity is an important observation.

Association between phenolics, flavonoids and DPPH activity: A clear descriptive relationship was observed between phenolic/flavonoid accumulation and DPPH activity. The highest three DPPH values were found in in vitro seedlings, in vitro plants and bark. These tissues also showed high phenolic and flavonoid concentrations.

In vitro seedlings had 23.4 mg/g phenolics and 26.34 mg/g flavonoids, with 83.8% DPPH inhibition. In vitro plants contained 19.8 mg/g phenolics and 23.91 mg/g flavonoids, with 81.9% inhibition. Bark contained 18.4 mg/g phenolics and 20.1 mg/g flavonoids, with 80.3% inhibition.

Conversely, seeds exhibited 5.1 mg/g phenolics, 6.5 mg/g flavonoids and only 25.4% DPPH inhibition. This parallel trend suggests that phenolic and flavonoid compounds may be important contributors to the radical-scavenging capacity of the species.

However, it is scientifically important not to conclude that these compounds alone are responsible for the observed antioxidant activity. Plant extracts contain complex mixtures of compounds, and interactions among phenolics, flavonoids, saponins, anthocyanins and other constituents may influence the overall response.

Pharmacological significance: The antioxidant activity demonstrated by *P. marsupium* supports its continued investigation as a source of bioactive compounds. The results are particularly relevant to the known

pharmacological importance of *P. marsupium*, including its traditional association with antidiabetic applications.

Nevertheless, the DPPH findings should be interpreted as evidence of in vitro chemical radical-scavenging capacity, rather than direct evidence of therapeutic efficacy in humans. Further studies involving additional antioxidant assays, compound isolation, mechanistic investigations, cellular models and in vivo validation would be required before pharmacological claims can be made.

Importance of *in vitro*-derived antioxidant material: The most notable implication of the study is the high antioxidant activity observed in in vitro-derived tissues. Conventional harvesting of bark and heartwood can place additional pressure on medicinal tree populations because these tissues are obtained by destructive collection. In contrast, tissue culture provides a controlled system for generating plant biomass without repeatedly harvesting mature trees. If future studies confirm that in vitro-derived tissues consistently maintain high concentrations of target antioxidant compounds, optimized tissue culture systems could potentially be developed for production of bioactive biomass.

Conclusion: The present study demonstrated substantial variation in free radical scavenging activity among different tissues of *Pterocarpus marsupium*. DPPH inhibition ranged from 25.4% in seeds to 83.8% in in vitro seedlings. The highest activities were observed in in vitro seedlings (83.8%), in vitro plants (81.9%) and bark (80.3%), followed by roots (72.1%) and leaves (68.4%). Stems, pods and flowers showed intermediate-to-low activity, whereas seeds showed the lowest antioxidant response.

The strong antioxidant activity observed in in vitro seedlings and in vitro plants was accompanied by comparatively high phenolic and flavonoid contents. In vitro seedlings, in particular, contained the highest reported phenolic and flavonoid concentrations and simultaneously demonstrated the highest DPPH inhibition. This pattern indicates a strong association between secondary metabolite accumulation and radical-scavenging capacity.

Bark also showed substantial antioxidant activity and contained high levels of phenolics and flavonoids, supporting its recognized pharmacological importance. The results further demonstrate that antioxidant potential differs markedly among tissues and that selective utilization of high-activity tissues may be more appropriate than assuming uniform pharmacological properties throughout the plant.

The findings provide experimental support for the antioxidant potential of *P. marsupium* and highlight the importance of in vitro-derived tissues as promising alternative sources of antioxidant-rich biomass. In combination with the successful in vitro propagation work reported in the thesis, these results suggest that plant tissue culture may have dual significance for conservation and sustainable production of pharmacologically valuable material.

However, DPPH activity alone cannot establish therapeutic efficacy. Future investigations should quantify individual antioxidant compounds using advanced analytical techniques such as HPLC, HPTLC, GC-MS or LC-MS, determine concentration-response relationships and IC50 values, compare multiple complementary antioxidant assays, and investigate the biological mechanisms underlying the observed activity.

Pterocarpus marsupium possesses considerable free radical scavenging potential, with particularly strong activity in *in vitro*-derived seedlings and plants. These findings contribute to the pharmacological profiling of the species and provide a basis for further research into sustainable production and utilization of its antioxidant phytochemicals.

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Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
July to September 2026, E-Journal, Vol. I, Issue LV (55), ISO 9001:2015 - E2024049304 (QMS)

Tribal Resistance and Anti-Colonial Movements in Chhattisgarh: A Historical Study

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Abstract: The history of India's struggle against British colonialism cannot be understood only through major national movements. Regional and tribal resistance also played an important role in challenging colonial authority. Chhattisgarh, with its large tribal population and rich forest resources, witnessed several movements against exploitation, land alienation, forest restrictions, and oppressive administrative policies. Tribal communities resisted colonial intervention because British rule affected their traditional rights over land, forests, and natural resources. The revolt of Veer Narayan Singh in 1857 became one of the most significant symbols of resistance in Chhattisgarh. Apart from this, different tribal communities continuously opposed external control and the destruction of their traditional social and economic systems. This paper examines the nature, causes, and significance of tribal resistance in Chhattisgarh during the colonial period.

Keywords: Chhattisgarh, Tribal Resistance, British Colonialism, Veer Narayan Singh, Forest Rights, Anti-Colonial Movement.

Introduction - Indian history contains numerous examples of resistance against foreign rule. While the Indian National Movement is generally associated with prominent leaders and nationwide organizations, many regional communities had begun resisting colonial policies much earlier. Tribal communities were among the first groups to experience the direct consequences of colonial expansion. Their traditional economic and social systems were disturbed by new laws related to forests, land revenue, administration, and private property.

Chhattisgarh has historically been home to several tribal communities whose lives were closely connected with forests, agriculture, and natural resources. The colonial administration attempted to establish greater control over these resources. As a result, traditional rights and customs were increasingly restricted. Tribal people often lost access to forests and land that had supported their livelihood for generations.

Objectives of the Study:

1. To examine the major causes of tribal resistance in Chhattisgarh during the colonial period.
2. To analyze the impact of British policies on tribal society and economy.
3. To study the contribution of Veer Narayan Singh and other regional resistance movements.
4. To evaluate the historical significance of tribal movements in the development of anti-colonial consciousness.

Research Methodology: The present study is based primarily on historical and secondary sources. Books, research articles, regional histories, and published studies related to tribal movements and the freedom struggle in Chhattisgarh have been consulted. The study follows a descriptive and analytical approach.

Colonial Policies and Tribal Discontent: British colonial expansion significantly changed the traditional relationship between tribal communities and their environment. Before colonial intervention, forests and land were generally connected with community life and customary practices. Tribal groups depended upon agriculture, forest products, hunting, and other natural resources.

The introduction of new administrative and economic policies created serious difficulties. Colonial authorities attempted to regulate forests and establish control over valuable resources. Restrictions on forest use affected the everyday lives of tribal communities. The commercialization of agriculture and the growth of moneylending also contributed to economic exploitation.

Land alienation became another major problem. Many tribal families faced increasing pressure from landlords, moneylenders, and government officials. These changes created resentment against colonial authority and its local supporters. Tribal resistance was therefore not simply a reaction to individual acts of oppression but a broader struggle to defend land, forests, livelihood, dignity, and cultural identity.

Veer Narayan Singh and the Revolt of 1857: One of the most important figures in the history of Chhattisgarh's resistance was Veer Narayan Singh of Sonakhan. He is widely remembered as an important freedom fighter associated with the uprising of 1857 in the region.

During a period of severe famine and scarcity, Veer Narayan Singh reportedly opposed the hoarding of food grains and supported the distribution of grain among hungry people. His actions brought him into conflict with colonial authorities. He became a symbol of courage and opposition to injustice.

The British administration eventually suppressed the movement, and Veer Narayan Singh was executed in 1857. However, his sacrifice gave him an important place in the history of Chhattisgarh. His contribution demonstrates that the revolt of 1857 had important regional dimensions and was not limited to major centers such as Delhi, Kanpur, Lucknow, or Jhansi.

Tribal Resistance as a Defence of Identity: Tribal movements in Chhattisgarh were closely associated with the protection of traditional identity. Colonial rule introduced administrative systems that often failed to recognize the social and cultural practices of indigenous communities.

Forests were particularly important to tribal identity and livelihood. They provided food, fuel, medicine, and other resources. Restrictions imposed by the colonial government were therefore viewed not only as economic limitations but also as interference in traditional ways of life.

These movements reveal the diversity of India's freedom struggle. Different social groups participated for different reasons. Tribal communities often focused on land rights, forest access, economic exploitation, and cultural survival. Nevertheless, their struggles contributed to the larger historical process of resistance against colonial domination.

Historical Significance of Tribal Movements: The tribal resistance movements of Chhattisgarh have great historical significance. They demonstrate that opposition to colonialism existed at regional and local levels and highlight the role of marginalized communities in India's struggle for freedom.

For a long time, mainstream historical narratives focused mainly on prominent political leaders and major national organizations. The study of tribal movements provides a more inclusive understanding of Indian history and recognizes the contribution of ordinary people and tribal communities.

Figures such as Veer Narayan Singh became symbols of bravery, sacrifice, and social justice. Their memories continue to inspire discussions about tribal rights, forests, land, and natural resources.

Conclusion: Tribal resistance and anti-colonial movements in Chhattisgarh occupy an important place in the history of modern India. These movements emerged as a response to colonial exploitation and the disruption of traditional social and economic systems. British policies related to forests, land, administration, and resources created widespread dissatisfaction among tribal communities.

The contribution of Veer Narayan Singh represents an important chapter in the regional history of resistance against British rule. His courage and sacrifice made him a lasting symbol of resistance in Chhattisgarh. The study of these movements broadens our understanding of the Indian freedom struggle and shows that resistance against colonialism was not confined to famous leaders or major political centers.

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