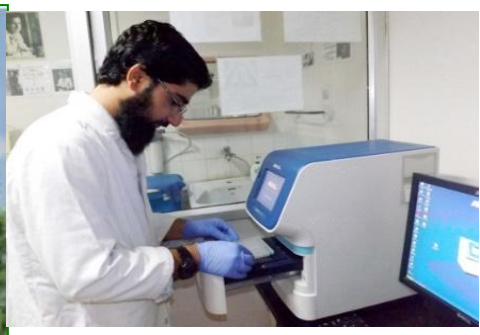
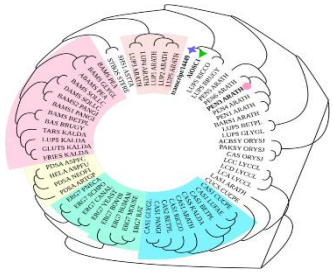
Neem Research Newsletter

Volume 6, Issue 5, 2026





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WORLD NEEM ORGANISATION (WNO)

From

The Editor's Desk……

In this Issue of Neem Newsletter, we find several interesting research findings on the potential of neem in agriculture, environment, and human and animal health. Endophytic fungal colonization of A. indica was demonstrated to suppress subterranean termite infestations that cause severe damage to forest nurseries and plantations in arid and semi-arid ecosystems. A. indica has been listed as one of the thirty-nine families of medicinal plants that exhibit potential as biopesticides against pests and diseases of maize in Africa. In another study in the EU, azadirachtin was found to be a promising candidate for sugar beet seed treatment to protect young plants against sugar beet flea beetles.

Bio-derived NiO-Carbon nanocomposites prepared using Neem leaf extract through a green combustion approach functioned as a multifunctional platform for pesticide monitoring and wastewater remediation. Neem biodiesel dielectric and a precisely manufactured 3D-printed stainless-steel electrode were shown to be essential for sustainable, precise Electric Discharge Machining of critical Ti-6Al-4 V aerospace components that can maximize material removal rate and minimize tool wear rate and surface roughness.

Nanoemulsions of A. indica and A. heterophylla leaves were found to significantly enhance larvicidal efficacy against Culex. pipiens through biochemical disruption and oxidative stress induction and offer promise as eco-friendly alternatives to synthetic insecticides for mosquito control. An ethnobotanical survey of medicinal plants traditionally used in Daulat Nagar, Punjab, Pakistan, confirmed that Neem is among the plants used for therapeutic purpose with high fidelity value. Molecular docking analysis revealed that the neem limonoid Nimbolide is a promising and safe phytochemical candidate for the development of new anti-tuberculosis therapeutics. Nimbolide was found to be effective against liver cancer induced in rats via alteration of oncogenic signalling pathways. The potential of nimbolide against breast cancer has also been highlighted in a review. Neem leaf extracts from trees grown in Homa environment that purportedly restores balance to nature and eliminates environmental pollutants were significantly more effective against cervical cancer. Green synthesis of vanadium pentoxide nanoparticles using Azadirachta indica leaf extract as a natural reducing and stabilizing agent displayed antidiabetic and anticancer properties.

In a preclinical study from Ethiopia, neem was demonstrated to be effective in the prevention and control of ticks in animals.

S. Nagini

Core Founding Member &
Chief Scientific Advisor

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Neem in Agriculture

Plant Defense Activation by Endophytic *Metarhizium anisopliae* and *Beauveria bassiana* Fungi Against Subterranean Termites.

Bhoi TK, Mahanta DK, Samal I, Jangra S.Int J Mol Sci. 2026 Apr 25;27(9):3833. doi: 10.3390/ijms27093833.PMID: 42123418

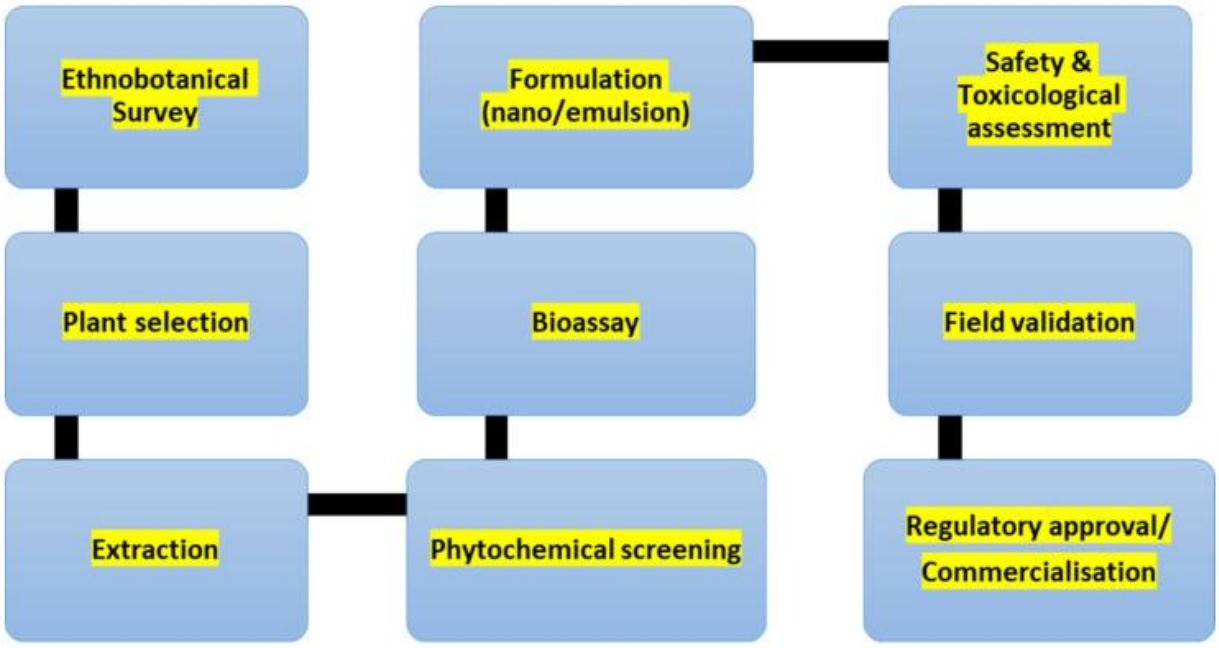
Subterranean termites, particularly *Odontotermes obesus*, cause severe damage to forest nurseries and plantations in arid and semi-arid ecosystems. This study demonstrates the dual functional role of endophytic entomopathogenic fungi, *Metarhizium anisopliae* and *Beauveria bassiana*, in termite suppression and induction of plant defense responses. Laboratory bioassays revealed significantly higher virulence of *M. anisopliae*, with a lower LT_{50} (lethal time required to cause 50% mortality) of 33.1 h compared to *B. bassiana* (46.7 h), a steeper probit slope (5.4 ± 0.3), and strong model fit (R^2 = 0.95), indicating rapid and synchronized mortality. Endophytic colonization varied across host species and application methods, with soil incorporation consistently outperforming foliar inoculation. Maximum colonization (82.5%) was recorded in *Tecomella undulata* and exceeded 80% in *Azadirachta indica* under *M. anisopliae*. Biochemical analyses revealed significant increases in protein (up to 3.5 mg g^{-1}), phenols (3.7 mg g^{-1}), and tannins (2.7 mg g^{-1}). Activity of defense enzymes was significantly enhanced, with catalase reaching 263.5 U mL^{-1}, while Phenylalanine ammonia-lyase and Tyrosine ammonia-lyase exceeded 170 and 198 U mL^{-1}, respectively, indicating activation of antioxidant and phenylpropanoid pathways. Molecular docking analysis further revealed strong interactions between fungal metabolites and termite cellulase, with Bassianin (-8.4 kcal mol^{-1}) and Tenellin (-8.1 kcal mol^{-1}) showing the highest binding affinities. These findings highlight the combined biochemical and molecular mechanisms underlying fungal-mediated termite suppression and plant defense induction, and future research should prioritize transcriptomic validation, rhizosphere microbiome interactions, formulation optimization, and long-term multi-location field evaluation to support sustainable termite management strategies.

Medicinal Plants as Biopesticides Against Pests and Diseases of Maize (*Zea mays* L.) in Africa: Ethnobotanical Insights and Challenges.

Aina FB, Buwa-Komoreng L, Heshula LUP, Mutengwa CS.Plants (Basel). 2026 May 19;15(10):1549. doi: 10.3390/plants15101549.PMID: 42197684

Maize (*Zea mays* L.) is a significant staple food crop in the developing world. Despite its significance, diseases and pests are limiting its supply. Farmers have primarily relied on synthetic chemicals as control measures; however, these chemicals are harmful to humans, animals, and the environment and exacerbate pest recurrence. Medicinal plants have shown promising potential as alternative pest- and disease-controlling agents, offering an economical, sustainable, biodegradable, and cost-effective approach. This review article synthesises phytochemical, ethnobotanical, and experimental data from relevant peer-reviewed papers published across various years to identify medicinal plants. Thirty-one unique plant families have been identified and have been used to control pests

and diseases of maize. Some families represented both antifungal and insecticidal applications. Medicinal plants such as *Senna obtusifolia*, *Euphorbia balsamifera*, *Aristolochia ringens*, *Allium sativum*, *Azadirachta indica*, *Carica papaya*, *Moringa oleifera*, and *Ficus exasperata* have shown antifungal and insecticidal properties, primarily under laboratory conditions. Most of the evidence is derived from laboratory studies, with only limited validation in real field conditions and with limited evaluation of safety for non-target organisms. Furthermore, this review highlighted the extraction methods, solvents used, plant parts, major active ingredients, and mode of action. Future prospects for integrating ethnobotanical knowledge with contemporary scientific methods to optimise biopesticide production are also discussed, along with the challenges of standardisation, formulation, and commercialisation.



Seed Treatment Alternatives with Improved Ecological Profiles for Controlling Wireworms in Maize and Early-Season Sugar Beet Pests.

Bažok R, Lemić D, Bubalo D, Kasap A, Vojvodić M.Plants (Basel). 2026 May 13;15(10):1488. doi: 10.3390/plants15101488.PMID: 42197626

The ban on neonicotinoid seed treatments in the EU has created major challenges for maize and sugar beet production, as these chemicals have been highly effective in controlling early-season pests, including wireworms (*Agriotes* spp.), sugar beet weevil (*Asproparthenis punctiventris* Germar) (SBW) and sugar beet flea beetles (*Chaetocnema tibialis* Illiger) (SBFB). However, adequate alternatives have not yet been introduced. The aim of this research was to get insights on the biological activity of insecticides with distinct modes of action and comparatively more favorable ecotoxicological profiles than neonicotinoids, chlorantraniliprole, spinosad, and azadirachtin, applied as seed treatments in maize and sugar beet against wireworms in maize and against SBW and SBFB in sugar beet. In laboratory trials, each insecticide was tested as a seed treatment at three different doses. Thiamethoxam was included as the standard treatment (positive control). Among

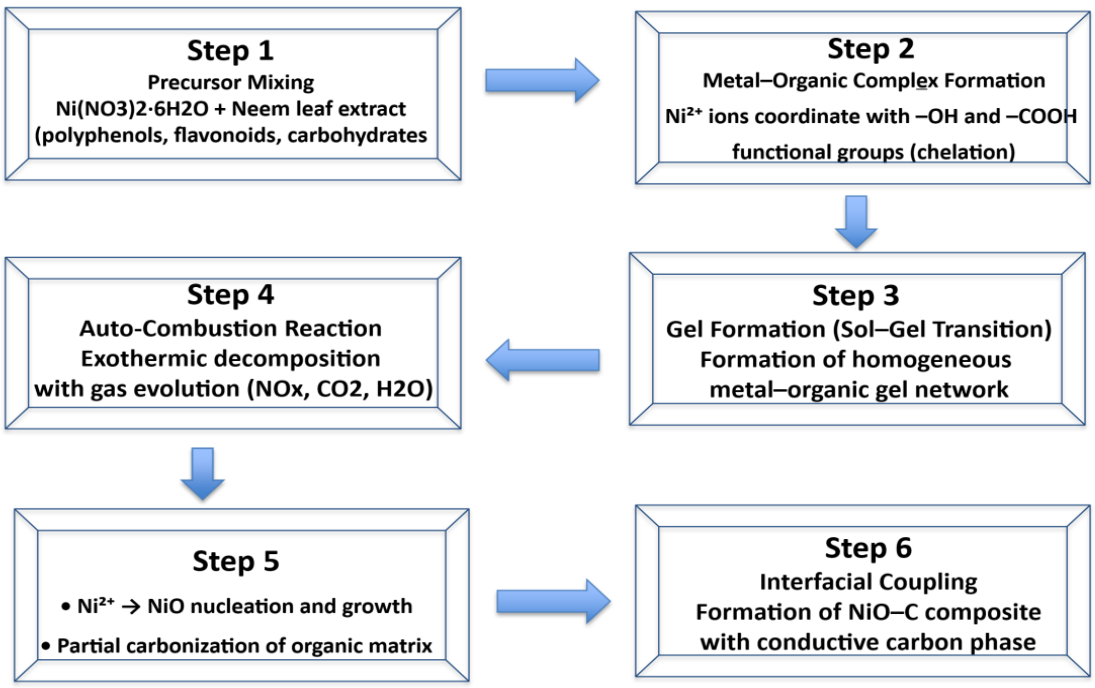
the tested insecticides, spinosad seed treatment showed the highest efficacy against wireworms and was superior to both the standard insecticide and chlorantraniliprole, while azadirachtin showed no effect. None of the tested insecticides provide satisfactory control of SBW. In contrast, SBFB responded to all three insecticide treatments, with efficacy comparable to, or even better than, the standard insecticide. These results suggest that chlorantraniliprole, azadirachtin, and spinosad may all represent promising candidates for sugar beet seed treatment to protect young plants against SBFB. Future research should focus on developing seed treatment formulations and field and semi-field trials as well as evaluating combinations of active ingredients and their suitability for integration into IPM programs. These findings provide a basis for further development of seed treatment strategies aimed at reducing dependence on neonicotinoids in maize and sugar beet production.

Neem for Environmental Sustainability

Sustainable biosynthesis of NiO-carbon nanocomposites with enhanced charge dynamics for high-performance electrochemical pesticide detection in agricultural applications and photocatalytic remediation.

Khasim S, Rashad M, Hamdalla TA, Panneerselvam C, Issa SAM, Dastager SG, Parveen H, Aljohani MM, Khan ZUH, Angadi B.Sci Rep. 2026 May 5. doi: 10.1038/s41598-026-51109-6. Online ahead of print.PMID: 42086708

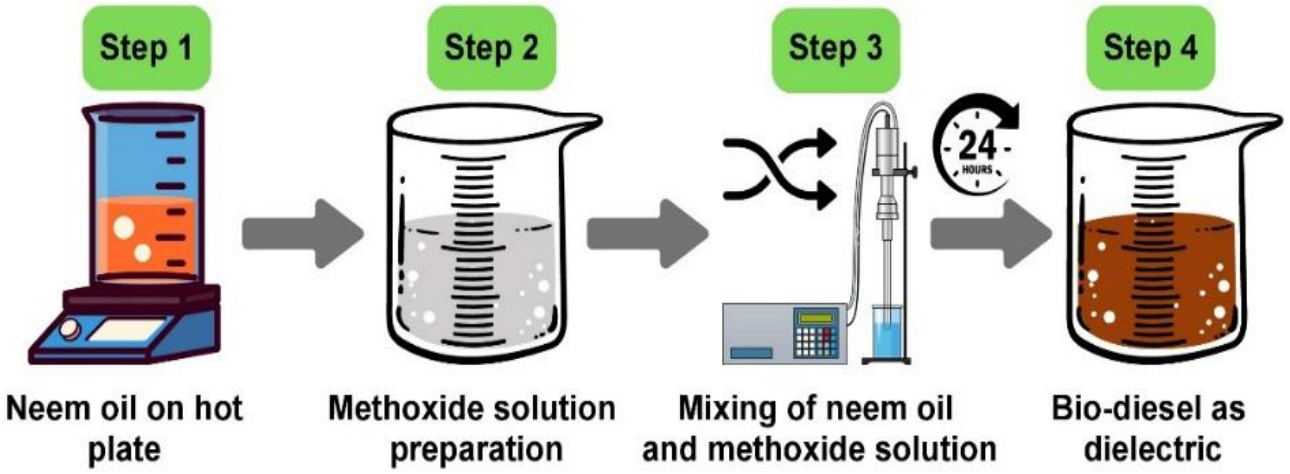
Bio-derived NiO-Carbon nanocomposites were prepared using Neem (Azadirachta indica) leaf extract through a green combustion approach. Structural analysis confirmed the formation of face-centered cubic NiO with crystallite sizes in the 25-50 nm range. The optimized 1:1 NiO: C composite demonstrated a limit of detection calculated via the 3σ/slope method in the millimolar range, along with a linear sensing response between 1 and 6 mM for glyphosate. In addition, the material achieved 98.78% degradation of Congo Red (CR dye) under UV irradiation (365 nm, 15 mW/cm²) while maintaining strong reusability and stability. The improved performance is attributed to the presence of conductive carbon, which facilitates charge transport, reduces electron-hole recombination, and increases the availability of active surface sites. Electrochemical impedance analysis further confirmed reduced charge-transfer resistance in the optimized composite, supporting its enhanced interfacial kinetics. The scalable and cost-effective synthesis, combined with stability in acidic media, highlights the potential of this composite as a multifunctional platform for pesticide monitoring and wastewater remediation.



Performance and surface integrity studies in electric discharge machining on Ti-6Al-4 V using **neem** oil dielectric and 3D Printed SS316L electrode.

Barik S, Nanda BK, Mishra SB, Satpathy MP, Debebe ST.Sci Rep. 2026 May 8. doi: 10.1038/s41598-026-51103-y. Online ahead of print.PMID: 42103882

Bio-dielectric fluids and advanced 3D printed electrodes are essential for sustainable, precise Electric Discharge Machining (EDM) of critical Ti-6Al-4 V aerospace components. In this study, neem biodiesel dielectric and a precisely manufactured 3D-printed stainless-steel electrode were used to identify optimal EDM parameters that maximize material removal rate (MRR) and minimize tool wear rate (TWR) and surface roughness (SR). The experiments were carried out using response surface methodology (RSM) with Box-Behnken design (BBD). Regression models showed high predictive accuracy ($R^2 > 0.98$). An integrated MEREC-CoCoSo multi-response optimization approach was subsequently applied to the experimental results to obtain the best output values. The results revealed the optimal setting as current (I_p) of 30 A, pulse-on time (T_{on}) of 0.3 s, and voltage gap (V_g) of 60 V. The interaction between T_{on} and V_g strongly influenced MRR, TWR, and SR. MRR first increased and then slightly decreased as V_g was raised from 60 V to 80 V. It also showed a marginal increase as T_{on} increased from 0.2 s to 0.4 s. In contrast, both TWR and SR increased sharply with higher V_g and longer T_{on}. Surface morphology analysis at the optimal setting showed fewer surface flaws, smaller craters, thinner recast layers, and lower porosity. Energy-dispersive X-ray spectroscopy (EDX) analysis confirmed the transfer of material from the 3D-printed electrode to the workpiece. This work provides a practical guide for industrial applications, demonstrating the feasibility and benefits of using novel electrode materials and eco-friendly dielectrics in sustainable EDM.



Neem for Human Health

Effect of nanoemulsions of Araucaria heterophylla and **Azadirachta indica** leaf extracts against Culex pipiens: biochemical impacts and phytochemical profile.

Alkeridis LA, Al-Shuraym LAM, Alharbi HM, Baz MM, Selim A, Elhawary EA. Sci Rep. 2026 May 6. doi: 10.1038/s41598-026-47487-6. Online ahead of print.PMID: 42091975

Botanical extracts and essential oils derived from medicinal plants have attracted increasing interest as eco-friendly alternatives to synthetic insecticides for mosquito control. In the present study, nanoemulsion formulations of Araucaria heterophylla and Azadirachta indica leaf extracts were developed to enhance their insecticidal efficacy against Culex pipiens and their biochemical impacts. Nanoemulsions were characterized using UV-Vis spectroscopy, dynamic light scattering, zeta potential analysis, and transmission electron microscopy, confirming stable nanoscale droplets with spherical morphology. Biochemical analyses revealed significant inhibition of detoxification (acetylcholinesterase, α- and β-esterases), metabolic (GABA-T, amylase, lipase), and antioxidant enzymes (SOD, GST, CAT, GSH). Elevated lipid peroxidation and protein carbonyl levels reflected severe oxidative stress, with A. indica nanoemulsion inducing the most potent effects. The phytochemical profiling of the two plants leads to the identification of 28 and 42 volatile components from the AIW and AH n-hexane extracts, respectively. The identified components belonged to the alkyl benzene and hydrocarbons in common between the two plants. However, AH-Hex was rich with sesquiterpenoids and oxygenated terpenoids such as caryophyllene, humulene, β-bisabolene, carotol, and kaurene derivatives, while AIW-Hex showed methyl esters of palmitic and stearic acids, along with long-chain branched alkanes and alcohols, as its main components. In addition, the UPLC/MS-assisted profiling of Me, Eth. Ac., and Aq. extracts revealed a vast array of metabolites, counted as 56 and 55 for AIW and AH extracts, respectively. The AH extracts were presented with a rich diterpenoid profile together with several flavonoids, fatty acids, and phenolic acids, while the AIW extracts were particularly rich with flavonoids, followed by limonoids, cinnamic acid derivatives, and fatty acids. Overall, this study demonstrates

that nanoemulsions of A. indica and A. heterophylla leaves significantly enhance larvicidal efficacy against Cx. pipiens through biochemical disruption and oxidative stress induction.

Ethnobotanical survey of medicinal plants traditionally used in Daulat Nagar, Punjab, Pakistan.

Hussain K, Sadia H, Alshaqhaa MA, Nawaz K, Shahbaz A, Arshad N, Ijaz S, Imran T, Ahsan T.J Ethnobiol Ethnomed. 2026 May 20. doi: 10.1186/s13002-026-00909-1. Online ahead of print. PMID: 42157257

Background: Traditional ethnobotanical knowledge remains a vital healthcare resource, especially in rural areas of Pakistan. However, rapid modernization and the migration of younger generations threaten the preservation of this indigenous heritage, creating a critical gap for documentation in unexplored regions. While numerous studies exist across Pakistan, the unique floristic diversity of Daulat Nagar situated between the Jhelum and Chenab Rivers, needs to be documented.
Methods: Field surveys were conducted across five villages in Daulat Nagar, using purposive and snowball sampling to interview 416 respondents through structured and semi-structured forms. Quantitative indices, including Use Value (UV), Relative Frequency of Citation (RFC), Informant Consensus Factor (ICF) and Fidelity Level (FL) were employed to determine the medicinal importance of documented species. Cultural uniqueness and knowledge retention were evaluated using Jaccard's Similarity Index (JSI) and Novelty Percentage (NP).
Results: A total of 64 plant species from 31 families were documented during this study. The results revealed that herbs (59%) and leaves (35%) were the most utilized for local preparations, primarily through juice or extract. Pluchea ovalis showed the highest Use Value (UV = 1.01), mainly used for respiratory disorders. Curcuma longa had the highest RFC (0.055) used in skin problems. Gastrointestinal disorders showed the highest consensus (ICF = 0.46). Mentha arvensis and Azadirachta indica had highest FL 96.5% and 91.6%, respectively. Analysis of intergenerational retention revealed that youth (18-28 years) comprised 16.11% of the current study, but ethnobotanical knowledge mainly for complex and specialized treatments was held by the elders aged 49-78 years. Comparative analysis indicated low similarity with other regions (JSI = 4.81 to 37.5%) and high NP values (87.5%), indicating significant novelty, such as the use of Echinochloa crus-galli in diabetes and Phragmites karka for urinary infections.
Conclusion: The study confirms that Daulat Nagar possesses a distinct ethnobotanical identity. While home remedies are successfully shared across generations, specialized therapeutic wisdom is concentrated among elders (49-78 years) with 42% retention rate. These findings provide a baseline for drug discovery and underscore the urgent need for conservation strategies to preserve specialized knowledge.

Molecular docking analysis of DprE1 from *M. tuberculosis* with phytochemicals.

Raja J, Blessy JJ.Bioinformation. 2026 Mar 31;22(3):1754-1759. doi: 10.6026/973206300221754. eCollection 2026.PMID: 42145426

Tuberculosis remains a major global health problem due to the emergence of drug-resistant strains of *Mycobacterium tuberculosis*. *Mycobacterium tuberculosis* DprE1, a key

enzyme involved in cell wall biosynthesis, was targeted to identify potential anti-tuberculosis agents. Hence, molecular docking and molecular dynamics simulations were performed to screen Indian phytochemicals against DprE1. Among the tested compounds, Nimbolide exhibited one of the strongest binding affinities (-10.3 kcal/mol), outperforming standard antibiotics. Simulation results further confirmed the stability of the DprE1-Nimbolide complex, showing minimal RMSD and RMSF fluctuations over 100 ns. Thus, Nimbolide is as a promising and safe phytochemical candidate for the development of new anti-tuberculosis therapeutics.

Chemoprotective of **Nimbolide** Against Diethylnitrosamine Induced Hepatic Cancer via Alteration of NF-kappaB and PI3K/Akt/mTOR Signaling Pathways.
Zhang S, Chen Q, Peng S, Zeng X, Ouyang J.J Biochem Mol Toxicol. 2026 May;40(5):e70767. doi: 10.1002/jbt.70767.PMID: 42121400

Hepatocellular carcinoma (HCC) is the 5th rank among all types of cancers, the incidence of the HCC increases globally. The current study was scrutinized the chemoprotective effect of nimbolide against dimethylnitrosamine (DEN) induced HCC in rats via alteration of PI3K/Akt/mTOR signaling pathways. Intraperitoneal administration of DEN (200 mg/kg) was used for the induction of HCC in the rats and rats were received the oral administration of nimbolide (10, 20, and 40 mg/kg). The body weight, liver weight, liver index, electrolyte, membrane bound enzymes, antioxidant, inflammatory cytokines, inflammatory parameters and apoptosis parameters were estimated. The mRNA expressions were estimated in the hepatic tissue. Nimbolide treatment improved the body weight and diminished the liver weight and liver index. Nimbolide treatment altered the electrolyte (sodium, potassium, calcium, magnesium), membrane bound enzymes, antioxidant parameters cytokines (tumor necrosis factor-α (TNF-α), interleukin-1β (IL-1β), interleukin-2 (IL-2), interleukin-6 (IL-6), interleukin-7 (IL-7), interleukin-10 (IL-10), interleukin-17 (IL-17), interleukin-18 (IL-18)), inflammatory parameters (cyclooxygenase-2 (COX-2), prostaglandin (PGE2), inducible nitric oxide synthetase (iNOS), nuclear factor kappa B (NF-κB), vascular endothelial growth factor (VEGF)), apoptosis parameters such as B-cell lymphoma 2 (Bcl-2), Bcl-2-associated X protein (Bax), Bcl-2:Bax ratio, cysteine-aspartic acid protease-3 (caspase-3) and C-reactive protein (CRP) level. Nimbolide treatment significantly ($p < 0.001$) altered the mRNA expression of tumor protein p53 (p53), Bax, Mechanistic target of rapamycin (mTOR), Bcl-2, Cysteine-aspartic acid protease-9 (caspase-9), caspase-3, phosphoinositide 3-kinase (PI3K), IQ motif-containing GTPase-activating protein 1 (IQGAP1), Protein kinase B (PKB) (AKT), IQ motif-containing GTPase-activating protein 2 (IQGAP2), IQ motif-containing GTPase-activating protein 3 (IQGAP3), Kirsten rat sarcoma viral oncogene homolog (KRAS) and Harvey rat sarcoma viral oncogene homolog (HRAS). The result clearly showed the chemoprotective effect of nimbolide against DEN induced HCC in rats via alteration of PI3K/Akt/mTOR signaling pathways.

Comprehensive insight into nimbolide response against breast cancer treatment: present evidence, emerging strategy and future direction.

Sarangi A, Kashyap A, Panda SS, Sahoo S, Sahoo SK. Mol Biol Rep. 2026 May 26;53(1):832. doi: 10.1007/s11033-026-11991-9.PMID: 42189294

Breast cancer(BC) is a predominant malignancy, widely spread among women globally and has poor prognosis & clinical outcomes Conventional therapeutic approaches like surgery, chemotherapy and radiation therapy become insignificant due to the development of resistant clones, resilience in stemness, leads to metastasis and further relapse. Specifically, eradication of BC metastasis is challenging due to its intrinsic property of tumour cell plasticity, self-renewal ability and resistant to therapeutic agents. Therefore, systemic and targeted therapeutic approach becomes the primary focus in treatment regimen. Nimbolide a phytochemical derived from Azadirachta indica have demonstrated its potency as an antiproliferative, antimetastatic, anti-inflammatory and proapoptotic agent against a broad spectrum of different BC cell lines. Along with that, its antitumour activity has been validated by integrating its molecular mechanism emphasising different in-vitro/in-vivo studies on BC models. In this review, we provide a comprehensive analysis of nimbolide as an intriguing therapeutic phytochemical marker for BC, with main emphasis on the in vitro and in vivo studies and on the underlying molecular mechanisms. In addition to revealing the novel insights into the process of development of phytochemical on potent anticancer agents, this review seeks to come up with a scientific justification by focusing on current breakthroughs for the use of nimbolide in BC treatment with integration to nanotechnology.

Improved anticancer efficacy of plant leaf extracts from homa environment: A preliminary study.

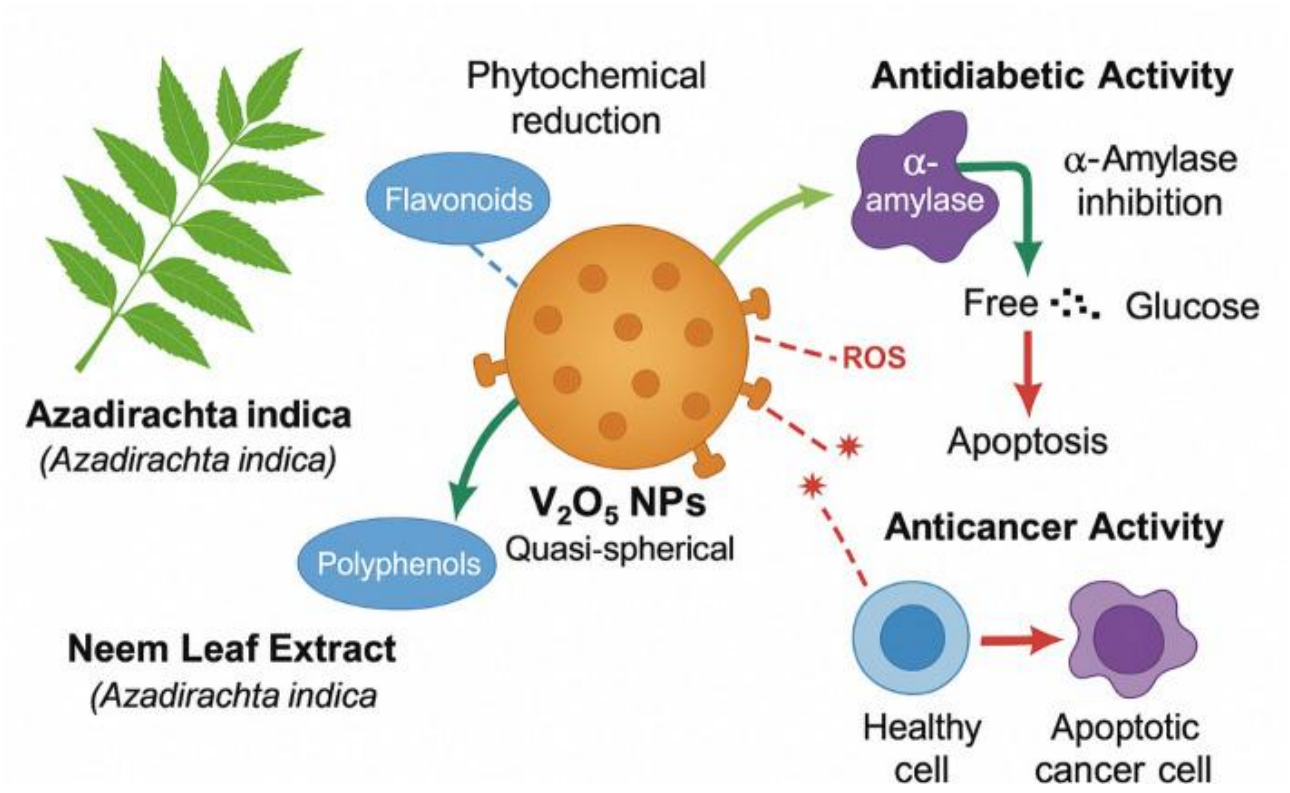
Sharad P, Masood S, Masood O, Kumari A, Berk U, Banerjee M.J Ayurveda Integr Med. 2026 May 15;17(3):101316. doi: 10.1016/j.jaim.2025.101316. Online ahead of print.PMID: 42140041

Background: Medicinal plants have been the most important component of agro-ecosystems and the natural environment from the very beginning of life. Air, water, and soil have been significantly contaminated, adversely affecting the production and development of plants. Homa therapy, based on traditional Vedic knowledge, purportedly restores balance to nature and eliminates environmental pollutants. However, this approach must be comprehended in light of current scientific findings.
Objective: This study examined the comparative efficacy of leaves extracted from plants in Homa and non-Homa (control) environments for their anticancer potential in a cervical cancer cell line.
Materials and methods: The leaves of the selected medicinal plants-Murraya koenigii (curry), Ocimum sanctum (tulsi), Aegle marmelos (bael), and Azadirachta indica (neem), were collected from both locations, subsequently dried, and extracted using Soxhlet apparatus. The leaf extracts were examined for cytotoxicity in HeLa cells using the MTT assay. The rate of cell migration was assessed with a wound healing assay. Subsequently,

intracellular reactive oxygen species (ROS) generation was evaluated using DCFDA. Additionally, gene expression was checked using quantitative polymerase chain reaction.
Results: Our findings indicate that Homa environment plants are significantly ($p < 0.05$) more effective against cervical cancer, as their IC_{50} values were comparatively low. The intracellular ROS generation assay demonstrated that Homa environment plants produced more ROS ($p < 0.05$) in cancer cells than those of non-Homa plants. Moreover, inhibited cell migration was more noticeable ($p < 0.05$) in Homa plants than non-Homa plants. The genes, SOD1, CAT, and MMP9 were found to be significantly ($p < 0.05$) downregulated in Homa grown leaf extracts. The study's findings offer promising preliminary trends that the Homa farming environment may improve certain plants' therapeutic qualities, including their capability to fight against cancer.

Phytochemical engineering of vanadium pentoxide nanoparticles via **neem** extract: a sustainable platform for dual in vitro antidiabetic and anticancer activity.
Naveen P, Mamidi G, Amancharla IP.Discov Nano. 2026 May 28;21(1):226. doi: 10.1186/s11671-026-04655-x.PMID: 42207413

This study reports a sustainable green synthesis of vanadium pentoxide nanoparticles (V_2O_5 NPs) using Azadirachta indica (neem) leaf extract as a natural reducing and stabilizing agent. The formation of V_2O_5 nanoparticles was confirmed through UV-Vis, FTIR, XRD, SEM, TEM, and zeta potential analyses. The synthesized nanoparticles exhibited an orthorhombic crystalline phase, quasi-spherical morphology with particle sizes ranging from 20 to 80 nm, and good colloidal stability (-28.6 mV). Phytochemicals such as flavonoids and polyphenols present in the neem extract played a key role in nanoparticle formation and surface stabilization. In vitro biological evaluation revealed notable α-amylase inhibitory activity (IC_{50} = 68 µg/mL), indicating potential antidiabetic relevance, along with dose-dependent cytotoxic effects against HeLa and MCF-7 cancer cell lines, where cell viability decreased to below 40% at 100 µg/mL. The observed biological responses are discussed in relation to nanoparticle surface chemistry and redox-active vanadium species; however, mechanistic pathways such as reactive oxygen species (ROS) involvement are inferred based on existing literature rather than directly measured. Overall, the findings highlight the potential of neem-mediated V_2O_5 nanoparticles as a promising material for future in vitro biomedical investigations.

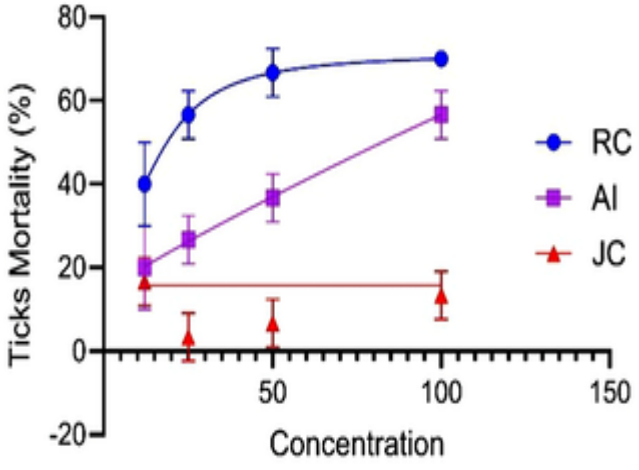


Neem in Veterinary Science

Acaricidal activity of plant extracts against Amblyomma variegatum in Waghimra, Northeastern Ethiopia.

Yitbarek T, Tibebu A, Bahiru A, Assefa A.PLoS One. 2026 May 11;21(5):e0348007. doi: 10.1371/journal.pone.0348007. eCollection 2026.PMID: 42113795

Ticks are blood-feeding ectoparasites that cause significant economic losses by reducing animal productivity and damaging hides and skins. Ticks control and prevention strategies primarily rely on the regular use of synthetic acaricides. However, the widespread misuse of these commercial acaricides has led to the emergence of acaricide-resistant ticks, compromising their sustainable effectiveness. Therefore, this study aimed to evaluate alternative plant-based acaricides and determine their effective dose levels. Crude ethanol extracts from six plant species, previously reported to possess acaricidal activity, were initially screened at a concentration of 100 mg/mL using the adult immersion test. Based on the prescreening results, Ricinus



communis, Azadirachta indica, and Jatropha curcas, which showed promising acaricidal effects, were subsequently tested at concentrations of 12.5, 25, 50, and 100 mg/mL. Tick mortality and oviposition inhibition were monitored over seven days at 3-hour intervals. Ricinus communis produced the highest acaricide efficacy (70 ± 1.8%) at 100 mg/mL. In comparison, 100 mg/mL of Azadirachta indica and Jatropha curcas resulted in 56.7 ± 2.2% and 16.7 ± 3.02% acaricide activity, respectively. The minimum lethal doses required to kill 50% (LD_{50}) and 90% (LD_{90}) of the tested ticks were 18.47 mg/ml and 184.3 mg/ml for Ricinus communis and 83.4 mg/ml and 431.8 mg/ml for Azadirachta indica, respectively. Ricinus communis exhibited the highest mean oviposition inhibition (98.5%), followed closely by Azadirachta indica (96.57%), while Jatropha curcas demonstrated comparatively lower inhibition (68.05%). A statistically significant dose-dependent oviposition inhibition effect was observed for Ricinus communis and Azadirachta indica ($p < 0.05$). In conclusion, Ricinus communis and Azadirachta indica demonstrated strong potential as botanical acaricide alternatives and warrant further evaluation in clinical trials.