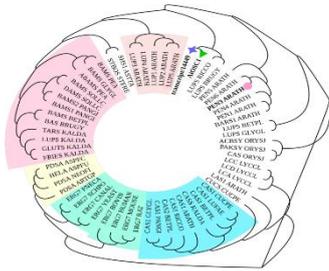


Neem Research Newsletter

Volume 5, Issue 12, 2025



WORLD NEEM ORGANISATION (WNO)



From

The Editor's Desk.....

As the year 2025 draws to a close, we look back with tremendous pride at the magnitude of interest on neem research in every possible walk of life. In this last issue of the year, we summarise in a nutshell the latest research papers on neem. In the area of agriculture, azadirachtin was shown to inhibit Rice stripe virus (RSV), a pathogen that severely threatens rice production and reduces yield, providing new insights into sustainable, eco-friendly strategies for rice protection. Use of millet-cowpea intercropping, a very common practice in the Sahelian zone of Burkina Faso, together with the application of biopesticides of Neem significantly reduced infection by the insect pest *Heliocheilus albipunctella*. Green synthesised copper oxide nanoparticles using neem leaf extract was found to be an eco-friendly, sustainable alternative to chemical fungicides for tomato wilt management

In a novel study from Bhubaneswar, a cyclone-prone city in Odisha, India, *Azadirachta indica* was identified as very highly suitable as a climate-resilient tree based on evaluation of four indices: Air Pollution Tolerance Index, Cyclone Tolerance Index, Use Value Index, and Morphometric Character Index.

Several papers have reported the medicinal properties of neem. Neem extract significantly reduced fungal adhesion to acrylic denture surfaces indicating its potential for the prevention and treatment of drug-resistant denture stomatitis. Evaluation of the antimicrobial efficacy, drug kinetics and growth factor release of Titanium platelet-rich fibrin injected with amoxicillin+clavulanic acid (amoxiclav gel), metronidazole and neem gels revealed sustained drug release. Administration of *Azadirachta indica* leaf extract demonstrated protective effects against diabetes-induced alterations in pregnancy. It improved maternal metabolic and inflammatory profiles, enhanced reproductive outcomes, and preserved the histological integrity of placental tissues in diabetic rats. The protective effect of Green-synthesised selenium nanoparticles from *Azadirachta indica* leaves extract was reported to mitigate cyclophosphamide-induced reproductive toxicity in rats via antioxidant and anti-inflammatory mechanisms. A polyherbal combination of *Azadirachta indica*, *Cymbopogon citratus* Stapf., and *Psidium guajava* demonstrated significant antimalarial activity and an excellent safety profile in preclinical models, supporting its traditional use. Nimbolide-loaded chitosan-coated poly(lactic-co-glycolic acid) nanoparticle system (NIM-CS-PLGA NPs) was shown to improve renal cell cancer targeted therapy by increasing drug absorption, drug release, and inducing death of cancer cells.

In the area of veterinary science, the ovicidal activities of ethanolic extract of neem leaf and its green-synthesized silver nanoparticles were evaluated against Fasciolosis, an important veterinary disease of livestock, that leads to health complications and substantial economic losses. The results indicate that neem nanoparticles could offer an alternative to conventional anthelmintics like triclabendazole. In another study, the efficacy of neem leaf extract as a viable alternative to antibiotics for sustainable broiler production was investigated. Neem supplementation significantly improved broiler performance due to the synergistic action of the identified bioactive compounds, making it a promising, natural, and cost-effective phyto-genic alternative to in-feed antibiotics for enhancing productivity and ensuring safe broiler meat.

I take this opportunity to wish you all a very Happy, Healthy, and Peaceful New Year. I am sure the year 2026 will unravel many more potential attributes of neem on all fronts.

S. Nagini

Core Founding Member, WNO
Chief Scientific Coordinator &
Regional Director, South India

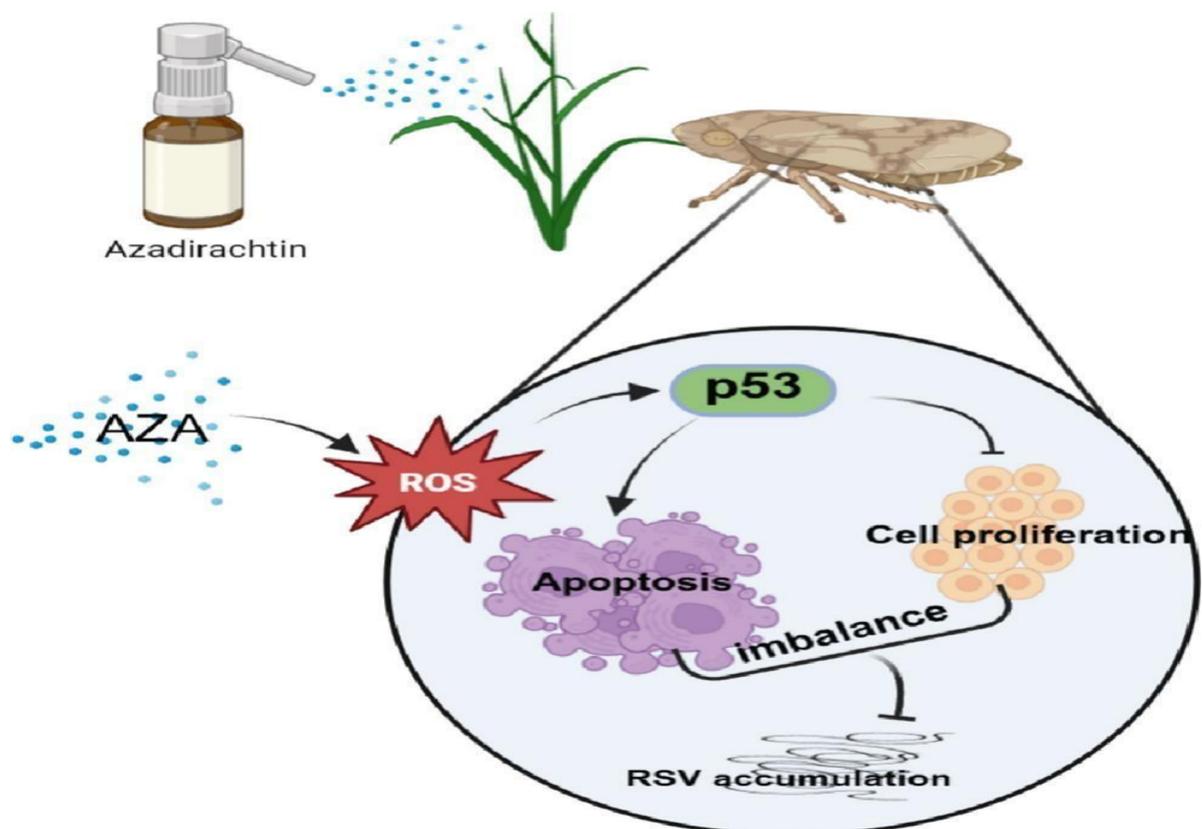


Neem in Agriculture

[Azadirachtin inhibits RSV accumulation by disrupting the proliferation-apoptosis balance in *Laodelphax striatellus*.](#)

Huang Z, Gao J, Tan Y, Hu W, Wang K, Zuo S, Liu F, Zhang L. *Pestic Biochem Physiol.* 2026 Jan;216(Pt 2):106828. doi: 10.1016/j.pestbp.2025.106828. Epub 2025 Nov 17. PMID: 41350082

Azadirachtin, a tetranortriterpenoid derived from the neem tree (*Azadirachta indica*), has potent insecticidal activity against a wide range of agricultural pests; however, its role in antiviral defense remains poorly understood. *Laodelphax striatellus*, the small brown planthopper (SBPH), vectors Rice stripe virus (RSV), a pathogen that severely threatens rice production and reduces yield. In this study, we show that RSV loads in SBPH decreased by 32 % and 74 % when they were fed on rice leaves treated with azadirachtin at LC_{30} and LC_{50} concentrations, respectively. RSV infection induced both cell proliferation and apoptosis in SBPH without disturbing the balance between these two states. However, azadirachtin exposure induced oxidative stress and activated the p53 signaling pathway, thus disrupting the balance between proliferation and apoptosis. Moreover, knockdown of p53 resulted in a 169 % increase in RSV loads in SBPH, which reversed the inhibitory effect of azadirachtin on RSV accumulation in planthoppers. Our findings extend the application potential of azadirachtin from insect control to include management of insect-borne RSV, thus providing new insights into sustainable, eco-friendly strategies for rice protection.



[Combined effect of Millet-Cowpea intercropping and biopesticide application against *Heliocheilus albipunctella* De Joannis \(Lepidoptera: Noctuidae\) in Burkina Faso.](#)

Boly A, Waongo A, Kabore A, Drabo E, Traore F, Sanon A. PeerJ. 2025 Dec 2;13:e20221. doi: 10.7717/peerj.20221. eCollection 2025. PMID: 41356439

Pearl millet, *Pennisetum glaucum* L. R. Br. (Poales: Poaceae), the main cereal crop in the Sahelian zone of Burkina Faso, is attacked by several insect pests, among which is the millet head miner, *Heliocheilus albipunctella* De Joannis (Lepidoptera: Noctuidae). Damage and yield losses caused by *H. albipunctella* on millet range from 30.00% to 85.00%. Control and management of *H. albipunctella* currently rely on synthetic insecticides, which are harmful to human and environmental health. Hence, there is a need to explore and develop alternative management strategies. Consequently, the current research, which was conducted, explored the use of millet-cowpea intercropping, a very common practice in the Sahelian zone of Burkina Faso, together with the application of biopesticides of Neem (*Azadirachta indica* A. Juss. (Sapindales: Meliaceae) seed kernels aqueous extracts. Fieldwork was carried out in Burkina Faso's Djibasso and Dori communes during the 2021 rainy period. The obtained results found that the application of Neem extracts on cowpea plants at the flowering stage, synchronized with the heading stage of millet, significantly reduced the incidence of *H. albipunctella*. When millet was intercropped with cowpea, the application of aqueous extracts of Neem indirectly led to a significant reduction of about 50.00% in the number of larvae per spike. Additionally, a reduction in the percentage of millet spikes attacked, a decrease in mine length, and a gain in grain yield of more than 40.00% were observed. Thus, the findings from the application of this agricultural practice could be a promising control option against *H. albipunctella*.

[Eco-friendly nanoparticle-based strategy for controlling Fusarium wilt in tomato using biosynthesized copper oxide nanoparticles.](#)

Mohi-Ud-Din A, Parveen M, Fatima N, Mahmood I, Rizvi R. J Environ Sci Health B. 2025 Dec 31:1-12. doi: 10.1080/03601234.2025.2609043. Online ahead of print. PMID: 41474033

Fusarium wilt, caused by *Fusarium oxysporum* f. sp. *lycopersici* (Fol), severely limits tomato productivity, while excessive use of chemical fungicides raises environmental and resistance concerns. This study reports the green synthesis of copper oxide nanoparticles (CuO NPs) using neem (*Azadirachta indica* L.) leaf extract and evaluates their antifungal and growth-promoting effects. UV-vis, FTIR, and SEM analyses confirmed successful nanoparticle formation; the slightly blue-shifted UV-vis absorption band (250-320 nm), frequently observed in plant-mediated CuO NP synthesis, is attributed to phytochemical capping effects. The absence of XRD, TEM, and Zeta potential analyses due to laboratory limitations is acknowledged and discussed. *In vitro* assays showed enhanced germination and seedling vigor at 25 ppm, while antifungal activity increased in a dose-dependent manner, reaching 97.6% disease suppression at 100 ppm. Comparative controls-including

neem extract alone and CuSO₄ solution-were included to distinguish nanoparticle-specific effects. Greenhouse trials demonstrated reduced wilt incidence, improved plant growth, and increased phenolic and proline accumulation, indicating activation of host defense pathways. Overall, neem-mediated CuO NPs functioned as dual-action agents-potent antifungals and growth stimulants-highlighting their novelty and potential as an eco-friendly, sustainable alternative to chemical fungicides for tomato wilt management.

[A novel bioassay to assess the non-target impacts of insecticide exposure on a larval endoparasitoid of the emerald ash borer.](#)

Singh P, MacQuarrie CJK, Smith SM.J Econ Entomol. 2025 Dec 18:toaf341. doi: 10.1093/jee/toaf341. Online ahead of print.PMID: 41411015

Pest management strategies for invasive species like the emerald ash borer (EAB) must combine chemical control with biological control agents to protect vulnerable hosts. When used in tandem with biological control agents, however, systemic insecticides may impact the fitness of biological control agents, thus reducing their effectiveness. Systemic insecticides are used for EAB management in urban forests across North America, while classical biocontrol with introduced natural enemies has been an important tactic for managing EAB in natural forests in North America. We tested the non-target effects of azadirachtin on *Tetrastichus planipennisi* Yang, a larval parasitoid of EAB introduced to North America. A novel bioassay protocol was developed whereby EAB larvae were initially reared on host material in the laboratory and then temporarily transferred to an artificial EAB diet containing azadirachtin followed by exposure to parasitism by *T. planipennisi*. Exposure to azadirachtin at concentrations causing 30% and 50% mortality in EAB larvae reduced EAB larval parasitism by *T. planipennisi*. Exposure to azadirachtin also reduced *T. planipennisi*'s sex ratio, adult emergence, female body size, potential fecundity, and adult longevity. These results suggest there are negative interactions between systemic insecticides and EAB biological control agents, which present challenges for the integration of tactics for long-term EAB management.

Neem for Sustainable Environment

[Evaluating urban tree species for cyclone-prone and polluted environments: evidence from Bhubaneswar Smart City, Odisha.](#)

Behera MC, Behera SS, Sahoo UK. Environ Monit Assess. 2025 Dec 6;198(1):16. doi: 10.1007/s10661-025-14867-w.PMID: 41351643

Urban forests play a vital role in sustainable cities by providing ecological, social, and climatic benefits. However, tree selection often emphasizes aesthetics and pollution control, overlooking resilience to extreme weather, particularly cyclones in coastal regions. This study proposes a climate-resilient tree selection framework that integrates ecological function and mechanical stability. Thirty-four commonly planted species in Bhubaneswar, a cyclone-prone city in Odisha, India, were evaluated using four indices: Air Pollution Tolerance Index (APTI), Cyclone Tolerance Index (CTI), Use Value Index (UVI), and

Morphometric Character Index (MCI). APTI was derived from leaf physio-biochemical traits; CTI from cyclone damage reports and UVI and MCI from ethnobotanical surveys and morphological data. These indices were normalized and combined into an Integrated Resilience and Utility Index (IRUI) to rank species suitability for urban planting. Based on IRUI values, species were categorized into five suitability classes ranging from very high to unsuitable. *Azadirachta indica* was identified as very highly suitable, while eleven species including *Mimusops elengi*, *Neolamarckia cadamba*, *Alstonia scholaris*, and *Ficus religiosa* were highly suitable for cyclone-prone polluted urban environments. Regression analysis indicated positive contributions of all four indices to IRUI, ranked as CRI > APTI > MCI > UVI. This framework provides a data-driven basis for urban planners to design multifunctional, climate-resilient green spaces, supporting Sustainable Development Goal 11 (Sustainable Cities and Communities).

Neem for Human Health

[Antifungal efficacy of *Azadirachta indica* and *Ficus benghalensis* extracts against azole resistant *Candida albicans* on denture resin.](#)

Philip JM, Mahalakshmi K, Abraham HM, Sankari Sankar L. *Sci Rep.* 2025 Dec 5;15(1):43567. doi: 10.1038/s41598-025-30708-9. PMID: 41350558

Denture stomatitis is frequently associated with *Candida* species, particularly *Candida albicans*. The emergence of drug-resistant *C. albicans* strains has highlighted the need for alternative approaches to prevent and manage denture stomatitis.

In this context, the antifungal effects of *Azadirachta indica* (neem) leaf and *Ficus benghalensis* (banyan) aerial root extracts were evaluated and compared. The minimum inhibitory concentrations (MICs) of herbal extracts from *A. indica* and *F. benghalensis* were determined against azole-resistant, azole-susceptible, and standard strains (*C. albicans* MTCC 3018) of *C. albicans* using various solvents. A fungal adhesion assay and an



evaluation of the antifungal efficacy of acrylic resin discs pre-treated with ethanolic herbal extracts were also conducted. The ethanolic herbal extracts inhibited all tested fungal strains, with a MIC of 50 µg/ml. A reduction in fungal adhesion of 72% ± 3.1% at 3 h and 76.7% ± 2.8% at 36 h was observed for the azole-resistant strain on denture base resin

discs treated with the ethanolic extract of *A. indica*. The antifungal efficacy of *A. indica*-treated denture resin was $71\% \pm 4.2\%$ against the azole-resistant strain and $100\% \pm 0.0\%$ against the azole-susceptible strain of *C. albicans*. These findings suggest that the evaluated herbal extracts possess significant antifungal properties. The reduction in viable *C. albicans* adhesion to acrylic denture surfaces indicates the potential of *A. indica* to be used as a natural alternative to conventional antifungal agents for the prevention and treatment of drug-resistant denture stomatitis.

[Behind Closed Smiles: Understanding Oral Hygiene Practices and Treatment Seeking Behaviour among Irula Tribal Population, Tamil Nadu -Qualitative Study.](#)

Alocious Sukumar MB, Mary Peter R, Joseph A. Indian J Community Med. 2025 Nov-Dec;50(6):994-1000. doi: 10.4103/ijcm.ijcm_366_24. Epub 2025 Mar 31. PMID: 41451059

Background: India, with its growing population and demographic changes, confronts substantial problems in addressing oral health inequities, particularly among the tribal population's older adults aged 60 and above. The purpose of this study is to explore oral hygiene practices and dental treatment-seeking behavior among older members of the Irula tribal people in Tamil Nadu.

Methods: A total of fifty-six participants aged 60 and above were interviewed, revealing diverse oral hygiene practices including the use of traditional remedies and limited access to professional dental care. A convenient sampling technique was employed to recruit the study participants set of 7 Focus Group Discussions was made, with 8 in each group. The samples were conveniently chosen after checking for their eligibility criteria.

Results: Older adults of the Irula tribal population primarily rely on toothbrushes, neem twigs, or traditional remedies like charcoal for oral hygiene. Common dental issues include gum bleeding and caries. Many have limited awareness of oral cancer risks. Participants often relied on self-medication for dental pain due to barriers such as cost and accessibility to healthcare facilities. Many older adults suffer in silence due to the rural locations of these villages and a paucity of dental services.

Conclusion: The results highlight the need for oral health programs to tribal cultural beliefs and socioeconomic constraints, requiring collaboration among public health agencies, tribal governments, and healthcare providers. Incorporating traditional knowledge, enhancing accessibility, and fostering community outreach can achieve long-term oral health improvements and overall well-being in tribal communities.

[Evaluating the antimicrobial efficacy, growth factor release drug kinetics of titanium platelet-rich fibrin loaded with amoxiclav, metronidazole and neem gel: an in vitro study.](#)

Gummaluri SS, Damera TK, Rampalli VC, Boyapati R, Gurumoorthy K.J Korean Assoc Oral Maxillofac Surg. 2025 Dec 31;51(6):369-383. doi: 10.5125/jkaoms.2025.51.6.369. PMID: 41466545

Objectives: The use of titanium platelet-rich fibrin (T-PRF) as a sustained drug delivery system (SDDS) has been limited. Hence present study aimed to evaluate the antimicrobial efficacy, drug kinetics and growth factor release of T-PRF injected with

amoxicillin+clavulanic acid (amoxiclav gel), metronidazole (MTZ) and neem (NE) gels separately.

Materials and methods: 12 Healthy volunteers were recruited for this *in vitro* analysis. Drug kinetics were monitored at 0, 2, 24, 48, and 72 hours. Antimicrobial efficacy was assessed at 48 hours post inoculation in culture plates and growth factor release was measured at 3, 7 and 10 days. Kruskal- Wallis test, Dunn's Post hoc test, Bonferroni's correction and Mann-Whitney U test were used to compare the drug release over time frames, inhibition zone diameters (IZDs) and growth factor release were expressed in (mean and standard deviations) millimetres, pico g/mL and nano g/mL.

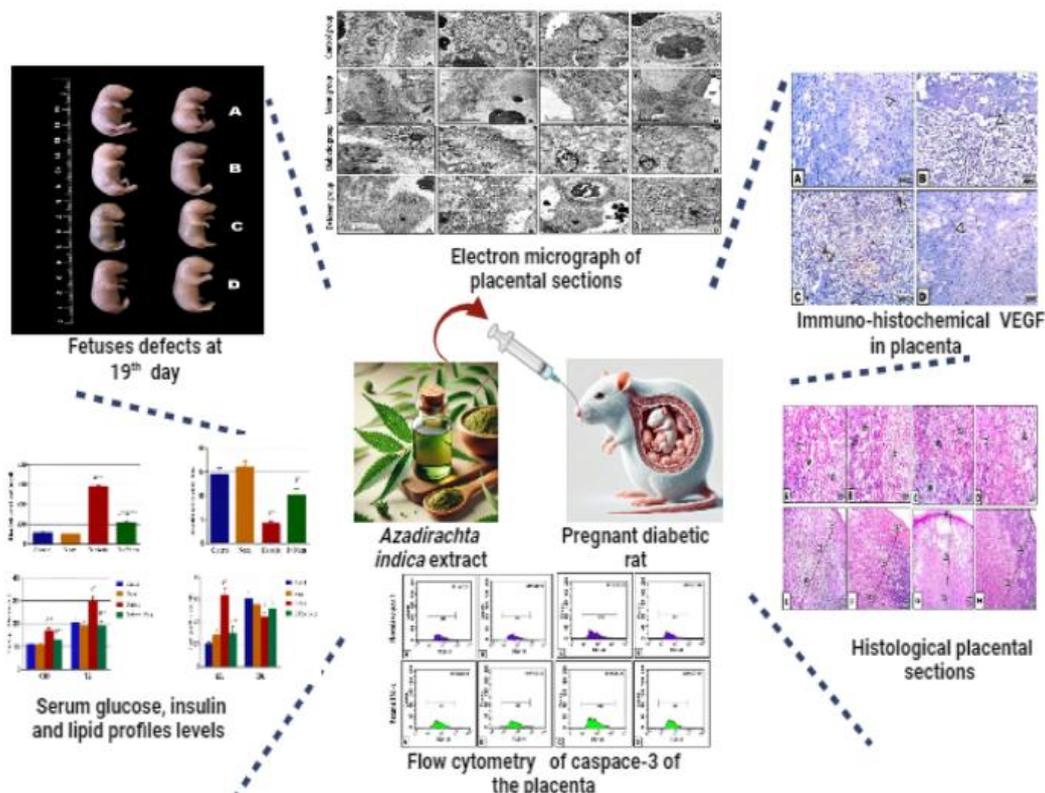
Results: In terms of drug kinetics, both T-PRF clots and collagen sponges when injected with antibiotic/ herbal gels individually there was a sustained drug release up to 72 hours and there was a greater release observed in collagen sponge. IZDs were recorded for T-PRF injected with amoxiclav/MTZ/NE gel for anti-microbial efficacy. Growth factor release was also observed for T-PRF plain and T-PRF injected with gels, with levels were numerically higher in T-PRF plain.

Conclusion: Within the limitations of the study T-PRF demonstrated sustained drug release with superior antibacterial activity. Growth factor release was not compromised, aiding in the preservation of regenerative capacity. Therefore, T-PRF can be used as a SDDS.

[Modulation of placental inflammation by Azadirachta indica in rat models of diabetes-induced maternal and fetal complications.](#)

Abou-El-Naga AM, El Ghawet HA, Abdeen SH, El-Sheikhe ZS, El-Halim Mansour HA.J Mol Histol. 2025 Dec 9;57(1):9. doi: 10.1007/s10735-025-10658-2.PMID: 41361020

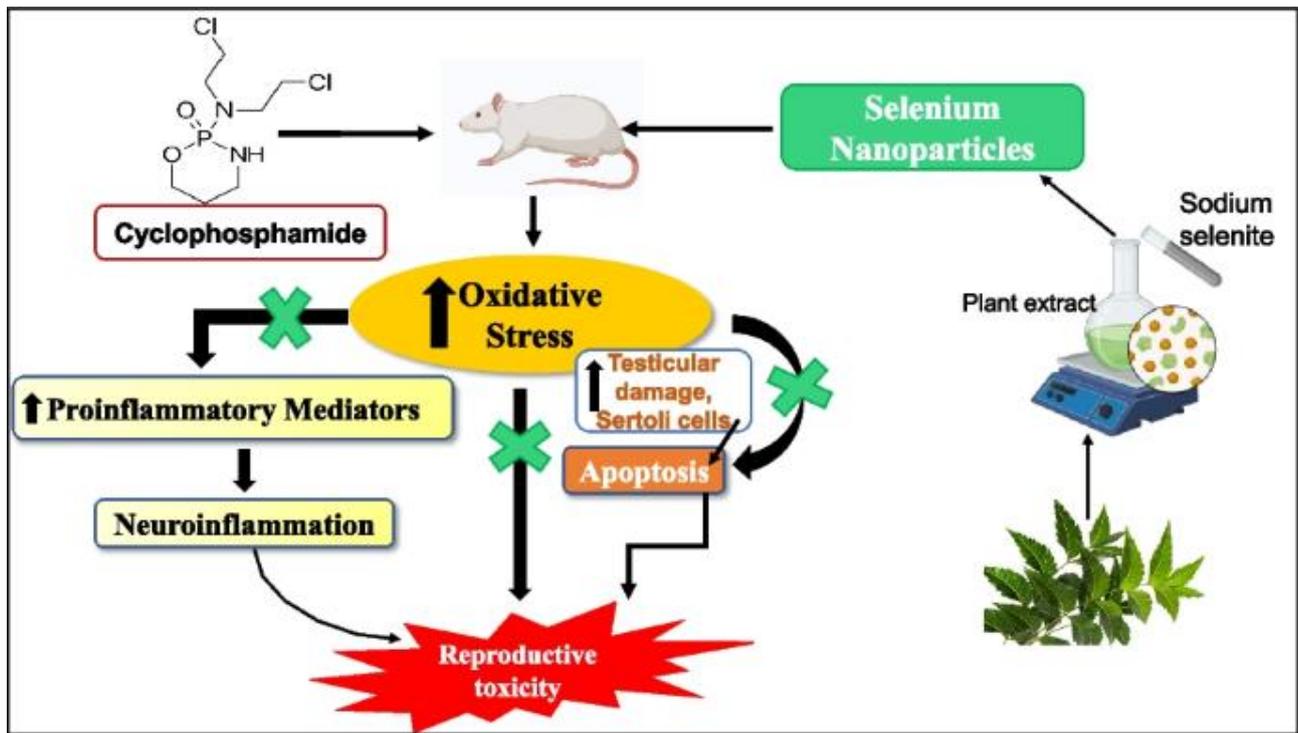
Maternal diabetes mellitus (MDM) is associated with an increased risk of fetal and placental malformations compared with normal pregnancies. The leaf extract of Azadirachta indica (neem) has been employed as a bioactive agent with proven antidiabetic potential. Beyond its hypoglycemic effects, neem extract has been reported to reduce inflammatory markers, ameliorate insulin resistance, and enhance blood circulation. In the present study, pregnant female rats were allocated into four experimental groups: (I) control (C), (II) neem-treated (N), (III) type 2 diabetes mellitus-induced (D), and (IV) diabetic pregnant rats treated with neem extract (D + N). Diabetic dams exhibited marked elevations in serum glucose, insulin, and lipid profile parameters. Moreover, a significant increase in IFN- γ and IFN- γ /IL-10 ratio, accompanied by a significant reduction in IL-10 levels, was recorded in comparison with controls. Treatment of diabetic dams with neem extract resulted in significant improvements in maternal body weight, reproductive performance, and fetal morphology relative to untreated diabetic rats. Histopathological examination of placental tissues revealed that neem supplementation normalized the decidual layer, increased its thickness, and enhanced the structure of the junctional zone (JZ) and labyrinth zone (LZ) compared to diabetic controls. In conclusion, administration of Azadirachta indica leaf extract demonstrated protective effects against diabetes-induced alterations in pregnancy. It improved maternal metabolic and inflammatory profiles, enhanced reproductive outcomes, and preserved the histological integrity of placental tissues in diabetic rats.



[Green synthesized selenium nanoparticles mitigate cyclophosphamide-induced reproductive toxicity in male Wistar rats.](#)

Aiwale BS, Maurya R, Naqvi S. Naunyn-Schmiedeberg's Arch Pharmacol. 2025 Dec 26. doi: 10.1007/s00210-025-04929-8. Online ahead of print. PMID: 41452359

Cyclophosphamide (CP), a widely used alkylating chemotherapeutic and immunosuppressive agent, is associated with significant reproductive toxicity in male patients, primarily through oxidative stress and inflammatory damage to testicular tissue. This study investigates the protective effect of green-synthesised selenium nanoparticles (SeNPs) from *Azadirachta indica* leaves extract against CP-induced reproductive toxicity in male Wistar rats. SeNPs were characterised by FTIR, XRD, DLS, SEM, TEM, and EDX, confirming crystalline structure, and mean particle sizes of 70-100 nm. Male rats (n = 30) were randomly divided into five groups consisting of six rats per group and treated with CP (15 mg/kg/week, i.p.) and/or SeNPs (0.2 mg/kg/day, oral) for 28 days. CP significantly reduced serum testosterone, LH, and FSH, impaired antioxidant enzymes, and disrupted sperm parameters and testicular histology (p < 0.05). Co-treatment with SeNPs significantly restored serum testosterone, LH, and FSH levels. Additionally, SeNP has reduced IL-1 β and TNF- α levels compared to the CP group. Results suggest SeNPs may mitigate CP-induced reproductive toxicity via antioxidant and anti-inflammatory mechanisms.



[Antimalarial potential and toxicity assessment of a polyherbal combination of *Azadirachta indica* A. Juss., *Cymbopogon citratus* \(DC.\) Stapf., and *Psidium guajava* L. in rodents.](#)

Brou SEP, Kouassi KAB, Baidoo MF, Bohui GS, Agyemang AO, Pakora GA, Adima AA, Ferrero-Gomez ML, Pereira D, Azagoh-Kouadio R, N'guessan BB, N'guessan JD.J Ethnopharmacol. 2026 Mar 1;358:120999. doi: 10.1016/j.jep.2025.120999. Epub 2025 Dec 4.PMID: 41352469

Ethnopharmacological relevance: Malaria continues to be a major public health burden in sub-Saharan Africa, particularly due to the emergence of drug-resistant *Plasmodium* strains and limited access to effective therapies. In African traditional medicine, *Azadirachta indica* A. Juss., *Cymbopogon citratus* (DC.) Stapf., and *Psidium guajava* L. are commonly used for managing malaria. However, their combined efficacy and safety as a standardized polyherbal preparation remain underexplored.

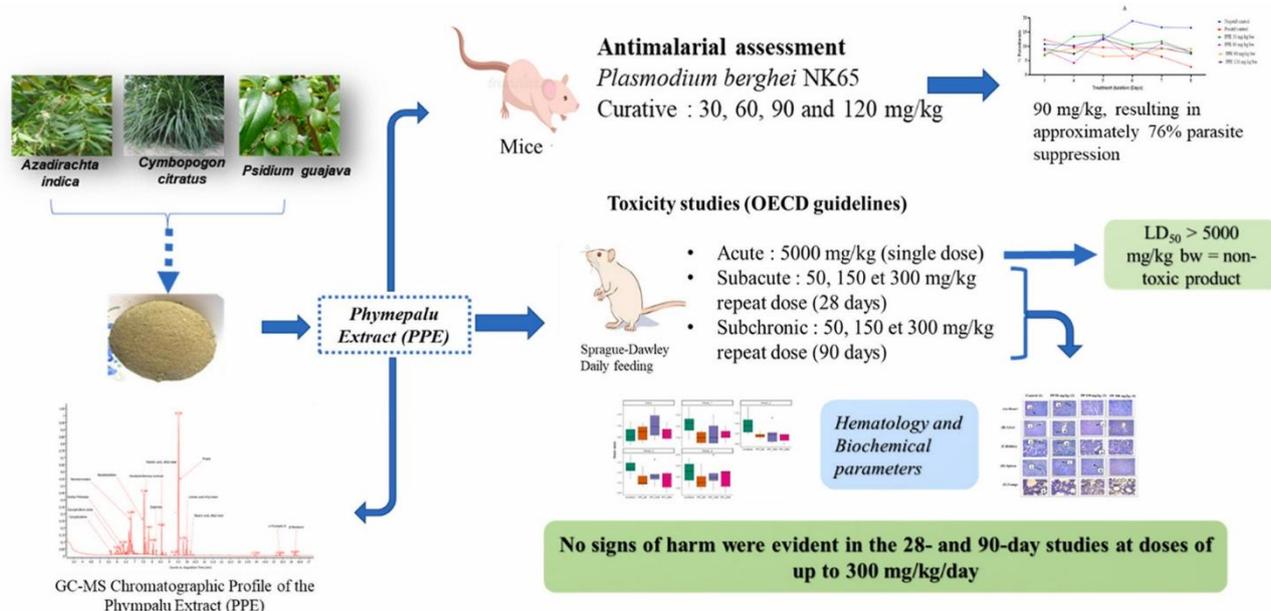
Aim of the study: This study evaluated the antimalarial efficacy and safety profile of a polyherbal formulation (Phymepalu Extract - PPE) prepared from *A. indica*, *C. citratus*, and *P. guajava* in rodent models.

Materials and methods: The antimalarial activity of the PPE extract was assessed using a 4-day curative test in *Plasmodium berghei*-infected mice at doses of 30, 60, 90, and 120 mg/kg body weight. Hydroxychloroquine (25 mg/kg) was used as a positive control. Acute oral toxicity was evaluated in rats according to OECD Guideline 423, while subacute (28-day) and subchronic (90-day) toxicity studies followed OECD Guidelines 407 and 408, respectively. Toxicological evaluations included clinical signs, body weight, haematological and biochemical parameters, and histopathological analysis of key organs.

Results: The PPE extract exhibited dose-dependent antimalarial activity, with 90 mg/kg producing the highest parasitaemia inhibition (76 %), compared to 92 % with hydroxychloroquine. No mortality or signs of acute toxicity were observed at 5000 mg/kg.

Repeated administration over 28 and 90 days did not result in significant changes in clinical, haematological, biochemical, or histopathological indices, indicating good tolerability.

Conclusion: The PPE extract demonstrated significant antimalarial activity and an excellent safety profile in preclinical models, supporting its traditional use. These findings justify further investigations toward its development as a safe and effective phytotherapeutic agent for malaria.



[Investigation of nutritional and phytochemical properties of wild medicinal plant species.](#)

Kumari M, Singh S, Puri S, Thakur N, Thakur A, Dulta K, Shukla RK, Deghani MH, Ghosh S. Sci Rep. 2025 Dec 9;15(1):43405. doi: 10.1038/s41598-025-28689-w. PMID: 41366271

Medicinal plants play a crucial role in traditional healthcare systems, particularly for rural communities that rely on them for therapeutic and nutritional purposes. The present study aims to investigate the ethnomedicinal applications, elemental composition, and nutritional content of the different plant parts of ten wild medicinal plant species—*Achyranthes aspera* L., *Aegle marmelos* (L.) Correa, *Azadirachta indica* A. Juss., *Berberis lycium* Royle, *Cassia fistula* L., *Senegalia catechu* (L.f.) P.J.H. Hurter & Mabb., *Senna tora* (L.) Roxb., *Syzygium cumini* (L.) Skeels, *Tinospora cordifolia* (Willd.) Hook.f. & Thomson, and *Vitex negundo* L.—collected from the Renukaji Wildlife Sanctuary located in the Sirmour district of Himachal Pradesh. The nutritional properties of the selected plant species were assessed using the muffle furnace and micro-Kjeldahl methods, while their mineral compositions were determined via the diacid digestion method or atomic absorption spectrophotometric technique. The quantitative analysis of *Achyranthes aspera* L. leaves, *Berberis lycium* Royle roots, and *Vitex negundo* L. leaves was carried out using UPLC-PDA, which confirmed the presence of polyphenols and flavonoids in their methanolic extracts, which contribute to the medicinal properties of these herbs. This study found that younger generations are less interested in traditional knowledge of ethnomedicinal plants due to modernization. Therefore, it is important to document these plants along with their

phytochemical and mineral content. Due to the heavy reliance of rural communities on these medicinal herbs, there is an urgent need to implement conservation strategies to prevent their depletion in the Renukaji Wildlife Sanctuary. These plants are rich in bioactive compounds such as saponins, alkaloids, and flavonoids, and also contain essential minerals like Na, N, K, P, Zn, Fe, Cu, Mn, Ca, Mg, and S. Therefore, they serve not only as traditional medicines but also as potential sources of nutritional supplements. Further research on their pharmacological properties and sustainable utilization is necessary to ensure long-term benefits for both community health and biodiversity preservation.

[Preparation and evaluation of multi-functional Nimbolide-loaded PLGA/chitosan nanoparticles as a potential therapy for renal cell carcinoma through activation of intrinsic apoptotic pathway.](#)

Han Q, Dong J, Ren W, Qu Y, Wei F. *Int J Biol Macromol.* 2025 Dec 3;337(Pt 1):149088. doi: 10.1016/j.ijbiomac.2025.149088. Online ahead of print. PMID: 41349736

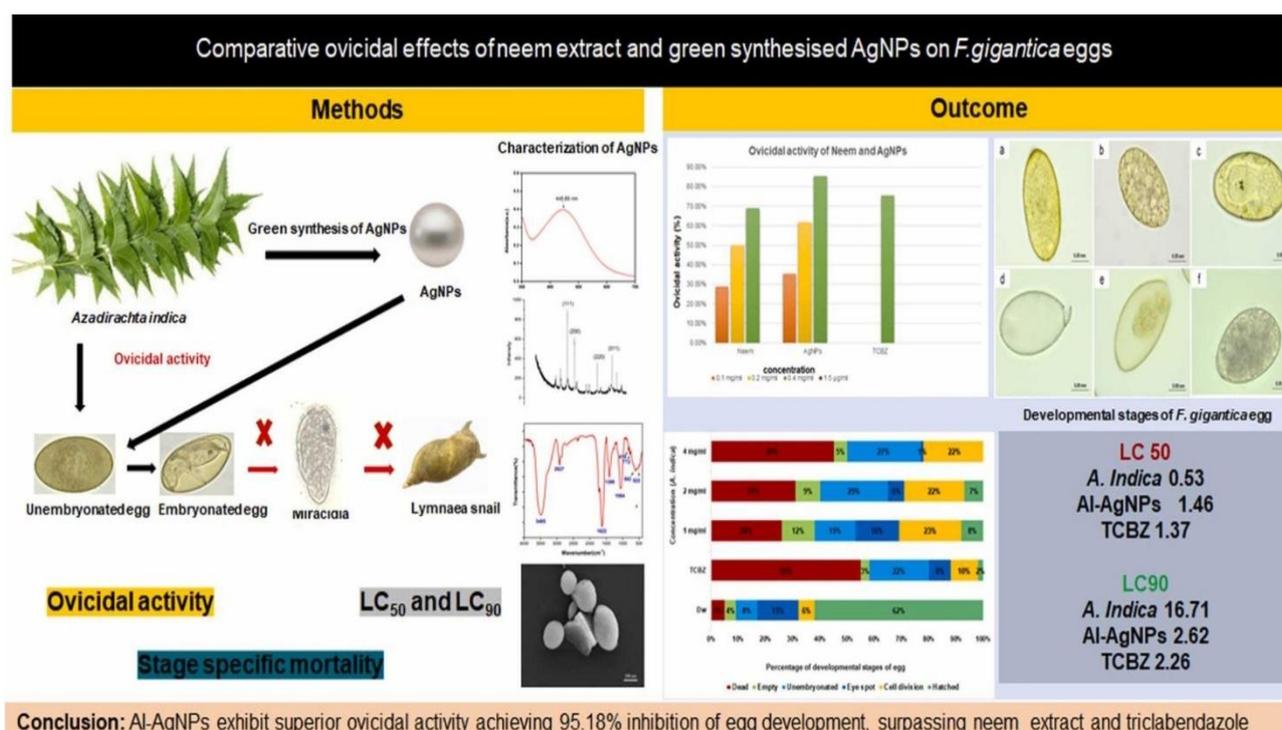
Renal cell carcinoma (RCC), a malignant tumor of the heterogeneous renal tubule epithelium, is the second most common urinary system malignancy after bladder cancer. Global RCC prevalence is rising, according to epidemiological studies. The treatment for localized renal cell carcinoma is surgical removal, however patient-specific factors like health and postoperative chronic kidney disease must be considered. Anticancer drugs have been studied to improve preoperative outcomes and expand treatment options. Due to drug resistance, standard chemotherapeutic treatments are often ineffective in RCC. Nanocarrier-based drug delivery systems can increase targeted anticancer medication administration while lowering systemic toxicity. This study developed, characterized, and evaluated a Nimbolide-loaded chitosan-coated poly(lactic-co-glycolic acid) nanoparticle system (NIM-CS-PLGA NPs) for passive targeting of RCC4 renal cancer cells. MTT experiments with NIM-CS-PLGA nanoparticles had much higher cytotoxic activity against RCC4 cells than free Nimbolide. Single-emulsion solvent evaporation was used to synthesize nanoparticles, which were physicochemically characterized using SEM, FTIR, and DLS for particle size and zeta potential assessment. Due to its positive surface charge and mucoadhesive properties, the chitosan coating increased nanoparticle uptake by contacting negatively charged cellular membranes. At the pH level 5.5 (cancer micro environment pH) the nimbolide release found to be 65%. Apoptosis, indicated by chromatin condensation, nuclear fragmentation, and membrane permeabilization, was confirmed by nuclear staining with DAPI, Hoechst 33342, and Propidium iodide analysis. Further, the cell cycle analysis confirms that treated cell groups are showing G2/M phase arrest. The NIM-CS-PLGA nanoparticle formulation effectively induces apoptosis in RCC4 cells in in vitro condition. The in vivo findings demonstrate that NIM-CS-PLGA nanoparticles (NPs) effectively attenuate Fe-NTA-induced oxidative stress, as evidenced by decreased lipid peroxidation and increased levels of both enzymatic and non-enzymatic antioxidants. Furthermore, the formulation exhibits significant antitumor-promoting potential by mitigating Fe-NTA-induced toxicity and carcinogenesis. Nimbolide-loaded chitosan-coated PLGA nanoparticle technology improves renal cell cancer targeted therapy by increasing drug absorption, drug release, and pro-apoptotic activity induction.

Neem in Veterinary Science

[Comparative evaluation of the ovicidal activity of *Azadirachta indica* and its green synthesized silver nanoparticles against *Fasciola gigantica* eggs.](#)

Ummukulsoom OP, Shareef PAA. *Vet Parasitol.* 2025 Dec 4;342:110672. doi: 10.1016/j.vetpar.2025.110672. Online ahead of print. PMID: 41380360

Fasciolosis, caused by *Fasciola hepatica* and *F. gigantica*, is an important veterinary disease of livestock, leading to health complications and substantial economic losses. The eggs produced by the adult flukes pass out of the host along with the feces that ensure the propagation of their infection and lifecycle. Therefore, targeting the eggs to control this parasite could check the snail infection and the completion of life cycle, and the spread of fasciolosis. The present study evaluated the ovicidal activities of ethanolic extract of *Azadirachta indica* leaf and its green-synthesized silver nanoparticles (AI-AgNPs) against *F. gigantica* eggs in comparison with triclabendazole (TCBZ) in vitro. *A. indica* extract and AI-AgNPs were prepared and characterized following standard protocols. The eggs were incubated in distilled water (DW) containing 1, 2 and 4 mg/ml *A. indica* leaf extract, AI-AgNPs, and 1.5 µg/ml TCBZ at 28 ± 1 °C for 24 h and then in DW for 14 days. The effects of treatment were assessed based on the inhibition of development and hatchability of eggs at various stages. The LC₅₀ and LC₉₀ for AI-AgNPs were significantly lower (0.53 mg/ml and 2.62 mg/ml, respectively) than neem extract (1.46 mg/ml and 16.7 mg/ml) and TCBZ (1.47 µg/ml and 3.54 µg/ml). AI-AgNPs showed an ovicidal activity of 95.18 % at 4 mg/ml, significantly higher than the neem extract (71.48 %) and TCBZ (75.49 %). Statistical analysis showed that AI-AgNPs had a significant impact on mortality across various developmental stages. The present study suggests that AI-AgNPs could offer an alternative to conventional anthelmintics like TCBZ.



[Bioactive components of *Azadirachta indica* \(neem\) leaf extract enhance immunity, health, and production parameters in broilers.](#)

Islam MS, Parvez MAR, Islam S, Hasan MT, Alam MA, Hoque MN. Res Vet Sci. 2025 Dec 24;200:106040. doi: 10.1016/j.rvsc.2025.106040. Online ahead of print. PMID: 41456577

This study investigated the efficacy of a chemically characterized neem (*Azadirachta indica*) leaf extract as a viable alternative to antibiotics for sustainable broiler production. Comprehensive phytochemical analysis (TLC, HPLC, GC-MS, NMR) identified and quantified key bioactive compounds—azadirachtin, nimbin, nimbolide, gedunin, and salannin—with the ethanolic extract yielding a higher concentration of these limonoids. The comparative efficacy of this standardized neem preparation was evaluated against danofloxacin (antibiotic) and butaphosphan (metabolic booster) in a 28-day trial with one hundred and fifty Lohman meat chicks (10 birds/pen, 3 pens/treatment). The results demonstrated that neem supplementation significantly improved broiler performance. Birds in the neem groups, particularly the ethanolic group, achieved significantly higher final body weight and better feed conversion ratio, performing comparably to the antibiotic and booster groups. Immunologically, neem extracts significantly increased lymphocyte counts and reduced the heterophil-to-lymphocyte ratio, confirming an immunostimulatory and anti-stress effect. Serum biochemistry revealed significantly lower levels of liver enzymes (AST and ALT), indicating a hepatoprotective benefit. Histopathological examination confirmed healthier intestinal morphology, with quantifiably increased villus height and a superior villus-height-to-crypt-depth ratio in the duodenum and more caecal folds. Additionally, carcass quality and dressing percentage were significantly higher in neem-treated birds. The study concludes that the synergistic action of the identified bioactive compounds in neem leaf extract is responsible for its multifaceted benefits, making it a promising, natural, and cost-effective phyto-genic alternative to in-feed antibiotics for enhancing productivity and ensuring safe broiler meat.