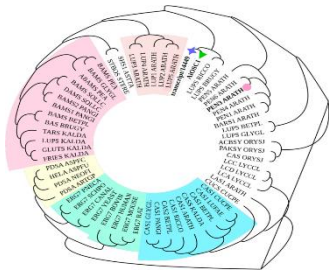


Neem Research Newsletter

Volume 6, Issue 2, 2026



WORLD NEEM ORGANISATION (WNO)



From

The Editor's Desk.....

In this Issue of the Newsletter, abstracts of several novel research findings are presented. Neem seed extracts were demonstrated to exhibit potential antifungal and anti-aflatoxigenic activities against *Aspergillus*. The effects of mixing organic nutrients such as vermicompost, compost, neem cake, or farmyard manure with foliar spray of cow urine, and vermiwash was found to be an integrative measure to enhance crop yield soil health, and nutritional quality, while reducing dependence on conventional chemical fertilizers. Another study revealed the antifeedant mechanism of azadirachtin in insect larvae. Combined dietary supplementation with neem and drumstick bark was shown to effectively mitigate aluminum toxicity in juvenile *Labeo rohita* by reducing metal bioaccumulation, preserving antioxidant defenses, and maintaining growth performance, offering a practical and sustainable strategy for protecting cultured fish in aluminum-contaminated aquaculture systems.

The total synthesis of limonoids enabled by sterically assisted boron chain-walking was reported. A polyester composite made with neem fiber and titanium nanoparticles exhibited high tensile stress, improved impact toughness, high microhardness, and reduced moisture absorption that has application potential in the automotive industry.

Inoculation of neem with a hydrocarbon-degrading bacterial consortium was used in microcosm and field trials to remediate chronically oil-contaminated soils. This treatment enhanced degradation of total petroleum hydrocarbons and polycyclic aromatic hydrocarbons up to 99%, reduced heavy metal concentrations, and neutralized soil pH, while improving organic matter, soil aggregation, and nutrient mobilization. A rapid, scalable, and eco-friendly microwave-assisted synthesis of gold nanoparticles using neem leaf extract as a dual reducing-stabilizing agent exhibited superior performance due to pollutant adsorption by phytochemical capping agents from neem. Neem-assisted silver modification enhanced the bioactivity of kaolin-derived zeolite X while preserving its crystalline framework, supporting its potential application in biomedical, food packaging, and water treatment systems.

In a systematic review, herbal dentifrices and mouthwashes containing neem were documented to exhibit antimicrobial properties and were as effective as fluoridated products in reducing plaque and gingival inflammation. In silico methods identified the potential of neem phytochemicals for cholera toxin inhibition. The phytochemicals from neem oil used in Siddha medicine were characterized and their bioactivities assessed.

Weekly administration of neem leaf extract to pregnant ewes during late gestation was reported to be a safe and effective phyto-genic strategy that enhances erythropoiesis, mitigates gestational hypoglycemia, improves protein status, and supports immune function without eliciting toxicity. A potential anthelmintic activity of *A. indica* and *C. angustidens* aqueous extracts, as natural sources of anthelmintic compounds, was detected against L3 larvae of strongyles in equines.

S. Nagini

Core Founding Member, WNO
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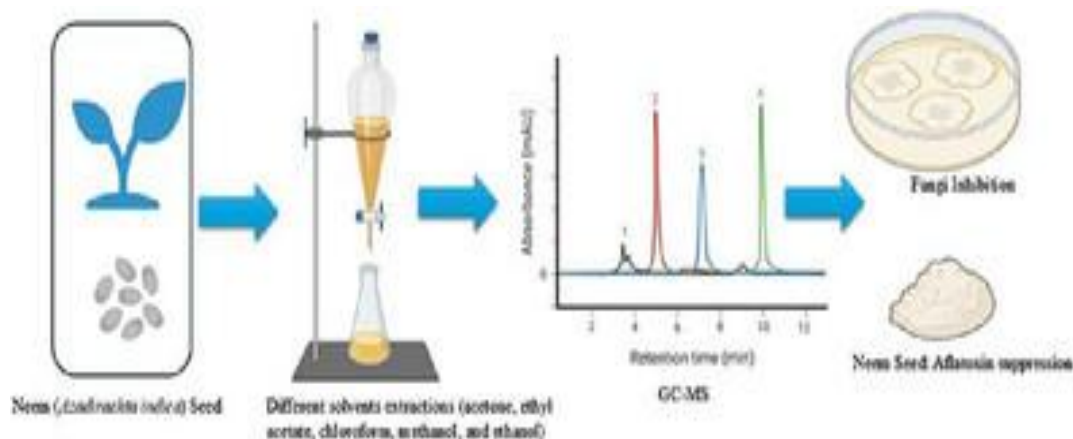


Neem in Agriculture

[Solvent-Dependent Bioactive Composition and Antifungal Potential of Neem \(*Azadirachta indica*\) Seed Extracts Against Mycotoxigenic *Aspergillus* Species.](#)

Ali J, Akram M, Zahoor M, Shah AB, Alotaibi A. *Chem Biodivers.* 2026 Feb;23(2):e03312. doi: 10.1002/cbdv.202503312. PMID: 41631781

This study investigated the bioactive composition and antifungal efficacy of neem seed extracts (NSE) prepared using acetone, ethyl acetate, chloroform, methanol, and ethanol against *Aspergillus parasiticus* and *Aspergillus flavus*. Gas chromatography-mass spectrometry (GC-MS) analysis revealed solvent-specific compounds profiles: ethanol extract contained 35 bioactive compounds (mainly esters and fatty acids), dominated by n-hexadecanoic acid (28.65%); methanol extract had 29 diketopiperazines, with 3,6-bis(2-methylpropyl)-2,5-piperazinedione (45.45%) as major; chloroform, ethyl acetate, and acetone extracts featured long-chain esters, hydrocarbons, and 2-heptadecanone



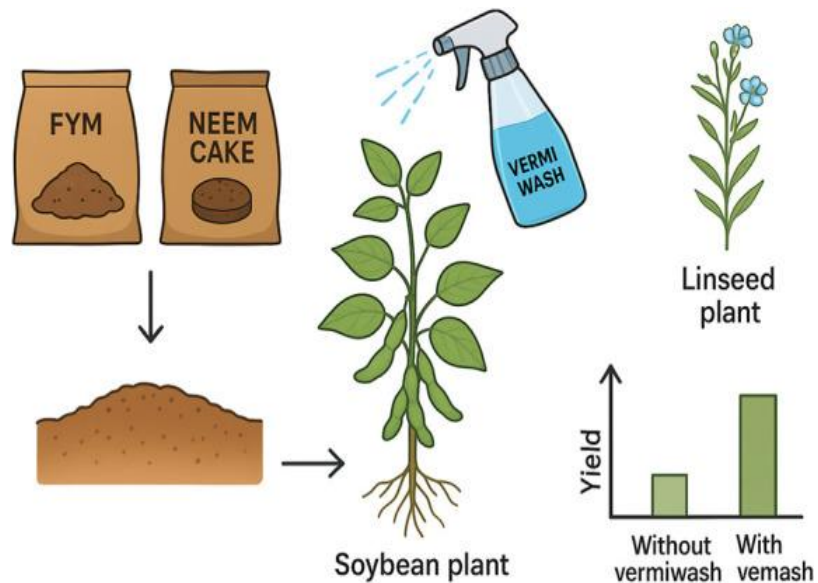
(33.15%), respectively. All extracts inhibited fungal growth at 500 mg/mL, whereas ethanol was most effective at 31.25 mg/mL, reducing mycelial biomass by 45%. Methanol and ethanol extracts (250 mg/mL) suppressed aflatoxin (AF) (AFB₁, AFB₂) production by >90%. Six-month feed trials confirmed neem seed powder (NSP) as a potent biopreservative, achieving complete AF inhibition at 30% concentration. These findings highlight neem's potential as a natural antifungal and anti-aflatoxigenic agent.

[Utilizing Organic Agri-Waste for Enhanced Soil Physicochemical and Biological Properties in Oilseeds Cropping System.](#)

Pandey SK, Alam MP, Upasani RR, Kumari M. *ACS Omega.* 2026 Jan 15;11(3):3766-3779. doi: 10.1021/acsomega.5c05562. eCollection 2026 Jan 27. PMID: 41626474

This study aimed to pursue more sustainable agriculture in a new soybean-linseed cropping system. We assessed the effects of organic nutrients by mixing natural inputs (vermicompost, compost, neem cake, or farmyard manure) with foliar spray of cow urine, and vermiwash can become an integrative measure to heightened crop yield along with sustainability. The experiment was carried out in a Randomized Block design, which was replicated thrice. The study revealed that applying 2/3 of RDN through farmyard manure

(FYM) or neem cake (NK), along with three foliar sprays of vermiwash and cow urine, achieved comparable productivity to the 100% RDN through vermicompost, neem cake, or farmyard manure only. Among the organic nutrient managements, both foliar and 2/3 soil applications recorded highest number of soil microbial population, soil nutrients (N, P, K), Grain, and stover yields. The soybean-linseed system, subjected to the integration of organic nutrients and foliar application strategies, exhibited elevated protein and oil content. Compared to absolute control treatment, soybean and linseed yield significantly increased by 167% and 101% in response to T₇ (T₄ + Foliar spray of Vermiwash 10% at branching, flowering, and pod/capsule development stage), respectively. These findings highlight the potential of 2/3 of RDN (Recommended Dose of Nitrogen) through farmyard manure (FYM) or neem cake (NK), along with three foliar sprays of vermiwash and cow urine (T₇ & T₁₀) application in enhancing both productivity, soil health, and nutritional quality, while reducing dependence on conventional chemical fertilizers.



[The neuropeptide pigment-dispersing factor enhanced food intake and alleviated antifeedant effects by azadirachtin in Spodoptera frugiperda larvae.](#)

Yao H, Hu H, Huang Y, He S, Xie X, Liu C, Sethuraman V, Zhang J, Shu B.J Econ Entomol. 2026 Feb 12:toag024. doi: 10.1093/jee/toag024. PMID: 41677180

The neuropeptide pigment-dispersing factor (PDF) is essential for the circadian rhythm of Drosophila and other insects. Spodoptera frugiperda J.E. Smith (Lepidoptera: Noctuidae) is a transcontinental pest that threatens the global agricultural supply. However, the functional study of PDF in S. frugiperda larvae remains unexamined. The study demonstrated that the Sf-PDF coding sequence spans 330 bp, and a highly conserved mature peptide sequence was found in the predicted protein. A spatiotemporal expression analysis revealed that Sf-PDF was predominantly expressed in female adults and 1st instars, with the lowest expression level noted during the pupal stage. Sf-PDF exhibited significant expression in the larval head and midgut tissues. A marked reduction in the expression of Sf-PDF was also noted in the larval midgut following azadirachtin treatments. The Sf-PDF mature peptide injection enhanced larval food consumption and weight gain during 2 days of treatment, while also mitigating the antifeedant impact caused by 1.0 µg/g azadirachtin. Our research indicates that Sf-PDF is associated with feeding behavior in S. frugiperda larvae and modulates the antifeedant effects caused by azadirachtin. These findings elucidate a novel understanding of the role of PDF protein and enhance comprehension of the antifeedant mechanism of azadirachtin in insect larvae.

Neem in Aquaculture

[Proximate body composition, elemental concentration and enzymatic activity analysis of *Catla catla* exposed to the nanoparticle \(CuO-NPs\) and Vitamin C.](#)

Rehman NU, Shah SQA, Naeem M, Naz H, Rafiq M. PLoS One. 2026 Feb 12;21(2):e0339412. doi: 10.1371/journal.pone.0339412. PMID: 41678471

Aquaculture plays a vital role in global food production, providing a significant source of protein and livelihood for millions of people worldwide. The toxicity of copper oxide nanoparticle (CuO-NPs) can severely impact the health and productivity of farmed fish species, such as *Catla catla*. This research aims to evaluate the effectiveness of Vitamin C in protecting *C. catla* from the harmful effects of CuO-NPs, thereby contributing to sustainable aquaculture practices. Fish exposed to various levels of CuO-NPs and Vitamin C exhibited varying degrees of responses for proximate body composition, elemental concentration, and digestive enzymes. A total of 540 samples of *C. catla* were collected from Bahawalpur Fish Hatchery, Punjab, Pakistan. CuO-NPs synthesized by green synthesis from neem extracts (*Azadirachta indica*) added in fish feed and exposed for 90 days in glass aquaria (Triplicate) with five experimental groups as T-I (2 mg/kg CuO-NPs), T-II (4 mg/kg CuO-NPs), T-III (2 mg/kg CuO-NPs with 250 mg/kg Vitamin C), T-IV (4 mg/kg CuO-NPs with 250 mg/kg Vitamin C) and T-V (250 mg/kg Vitamin C) and one control group (T-O). Results indicates that mean percent (%) moisture content was found 76.72 ± 1.82 , 77.31 ± 2.63 , 78.92 ± 2.12 , 77.89 ± 1.09 , 78.11 ± 1.45 and 76.50 ± 1.56 for T-O, T-I, T-II, T-III, T-IV and T-V, respectively. Lowest mean value of percent moisture content was found in T-V, while highest value was noted in T-II. The highest mean protein content (%) in *C. catla* was found in T-V (Vitamin C) while lowest in T-II (CuO-NPs 4 mg/kg). Concentrations of cadmium, lead and cobalt were non-quantifiable among all treatment groups, while the concentration ($\mu\text{g/g}$) of all other studied metals (Fe, K, Na, Zn, Cr and Cu) found below the permissible limits. Regression analysis used to examine how different treatments affected the amounts of different elements in different studied groups. The levels of Fe, K, Na, and Zn were found higher in CuO-NPs treatments (T-I, T-II) compare with Vitamin C (T-III, T-IV), while the levels were levels found higher in T-V and highest in control group. Activities of digestive enzymes in various groups showed a significant difference with maximum value of protease activity in T-V (5.734 ± 0.60 U/mL.min⁻¹), while lower in T-II (4.68 ± 0.78). Activities of amylase was found maximum value in T-V (0.74 ± 0.14 U/mL.min⁻¹), while lower in T-V (0.54 ± 0.19). Maximum activities of lipase activity were observed in T-O, while lower in T-II.

[Prophylactic dietary supplementation with *Azadirachta indica* and *Moringa oleifera* bark mitigates aluminum-induced oxidative stress in *Labeo rohita*.](#)

Debnath C. Fish Physiol Biochem. 2026 Feb 4;52(1):25. doi: 10.1007/s10695-026-01641-z. PMID: 41636905

This study investigated the prophylactic effects of dietary supplementation with *Azadirachta indica* (neem) and *Moringa oleifera* (drumstick) bark against aluminum toxicity in juvenile *Labeo rohita*. The 60-day experiment consisted of a 45-day pre-exposure

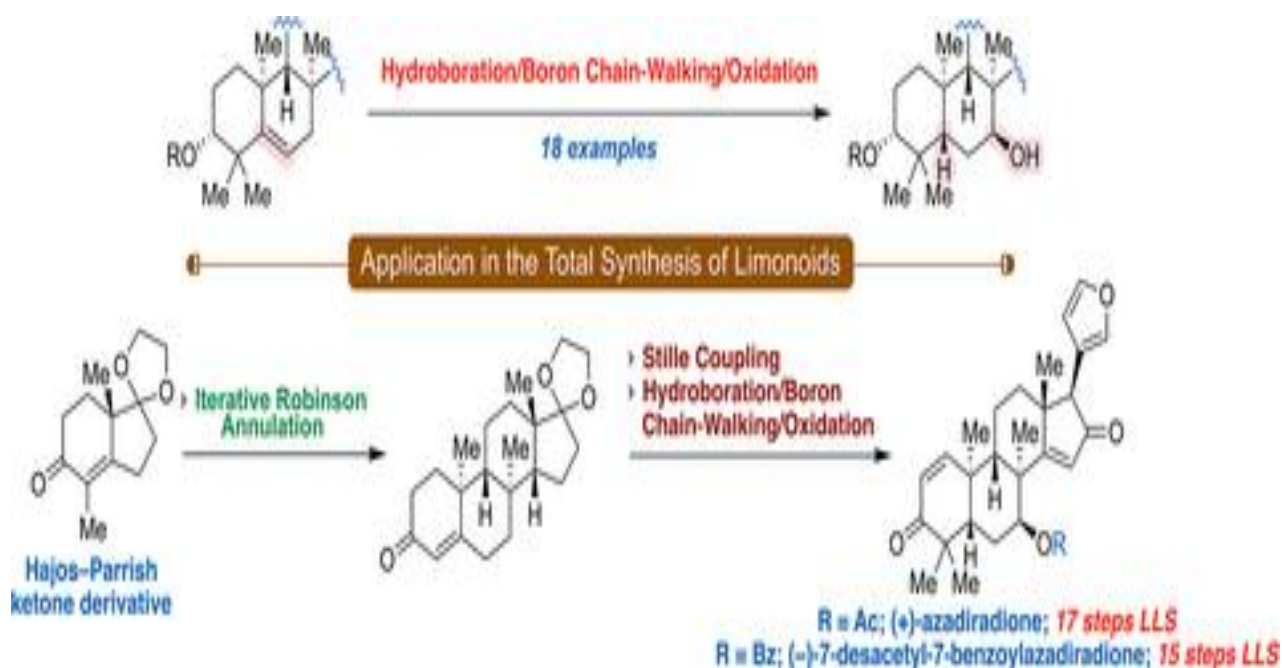
supplementation period followed by a 15-day aluminum challenge. Fish (initial weight, 12.5 ± 1.8 g) were randomly distributed into five treatment groups: a control without aluminum exposure, a control with aluminum exposure, and three experimental groups exposed to aluminum while receiving diets supplemented with either neem bark powder (1% w/w), Moringa bark powder (1% w/w), or their combination (1:1 ratio, 1% w/w). Fish were sampled on days 0, 15, 30, and 45 during pre-exposure and on days 7 and 15 during aluminum exposure (8.56 mg/L). Combined bark supplementation demonstrated superior protective effects during aluminum exposure, maintaining significantly higher specific growth rate ($2.15 \pm 0.12\%$) compared to the aluminum-exposed control ($1.12 \pm 0.15\%$). The combined treatment also preserved hemoglobin levels (7.8 ± 0.4 g/dL vs. 5.2 ± 0.4 g/dL in the aluminum-exposed control) and antioxidant enzyme activities, with superoxide dismutase maintaining near-normal levels (38.6 ± 2.1 U/mg protein vs. 15.2 ± 1.8 U/mg protein in the aluminum-exposed control) at day 15 of exposure. Combined bark treatment significantly reduced aluminum accumulation in gill (118.4 ± 10.2 $\mu\text{g/g}$ vs. 245.6 ± 18.4 $\mu\text{g/g}$), liver (75.6 ± 8.4 $\mu\text{g/g}$ vs. 158.2 ± 12.6 $\mu\text{g/g}$), and muscle (20.4 ± 3.2 $\mu\text{g/g}$ vs. 42.5 ± 4.8 $\mu\text{g/g}$) compared to the aluminum-exposed control. These findings demonstrate that prophylactic dietary supplementation with combined neem and Moringa bark effectively mitigates aluminum toxicity in *Labeo rohita* by reducing metal bioaccumulation, preserving antioxidant defenses, and maintaining growth performance, offering a practical and sustainable strategy for protecting cultured fish in aluminum-contaminated aquaculture systems.

Neem Limonoid Synthesis

[Total Synthesis of Limonoids Enabled by Sterically Assisted Boron Chain-Walking.](#)

Bhat AA, Ansari MM, Singh P, Singha C, Juyal S, Joshi A, Dethe DH. *Angew Chem Int Ed Engl.* 2026 Feb 1:e25970. doi: 10.1002/anie.202525970. PMID: 41622858

Limonoids are architecturally complex tetranortriterpenoids with diverse biological activities, yet their synthetic inaccessibility has limited detailed investigations. Here, we report an enantioselective strategy that enables efficient access to intact limonoids. Our approach begins with a readily available Hajos-Parrish ketone derivative and rapidly assembles the tetracyclic core of the target scaffold. Central to this route is a novel sterically assisted hydroboration/boron chain-walking/oxidation protocol, which achieves a challenging late-stage remote C-H hydroxylation in a highly regio- and stereoselective manner within sterically congested polycyclic scaffolds. This strategy has enabled the total syntheses of (+)-azadiradione and (-)-7-desacetyl-7-benzoylazadiradione. These studies provide a unified entry to multiple limonoid families and establish a broadly applicable solution for site-selective late-stage functionalization in complex natural product frameworks.



Neem- Industrial Applications

[Integration and mechanical and water absorption characteristics of treated natural fiber-titanium nanoparticles embedded polyester composites.](#)

Aruna M, Nagarajan N, Rathore S, Dey P, Albert HM, Ram MJ, Maranan R, Murali M, Sathiyamurthy S, Sivanraju R. *Sci Rep.* 2026 Feb 15. doi: 10.1038/s41598-026-40227-w. PMID: 41692821

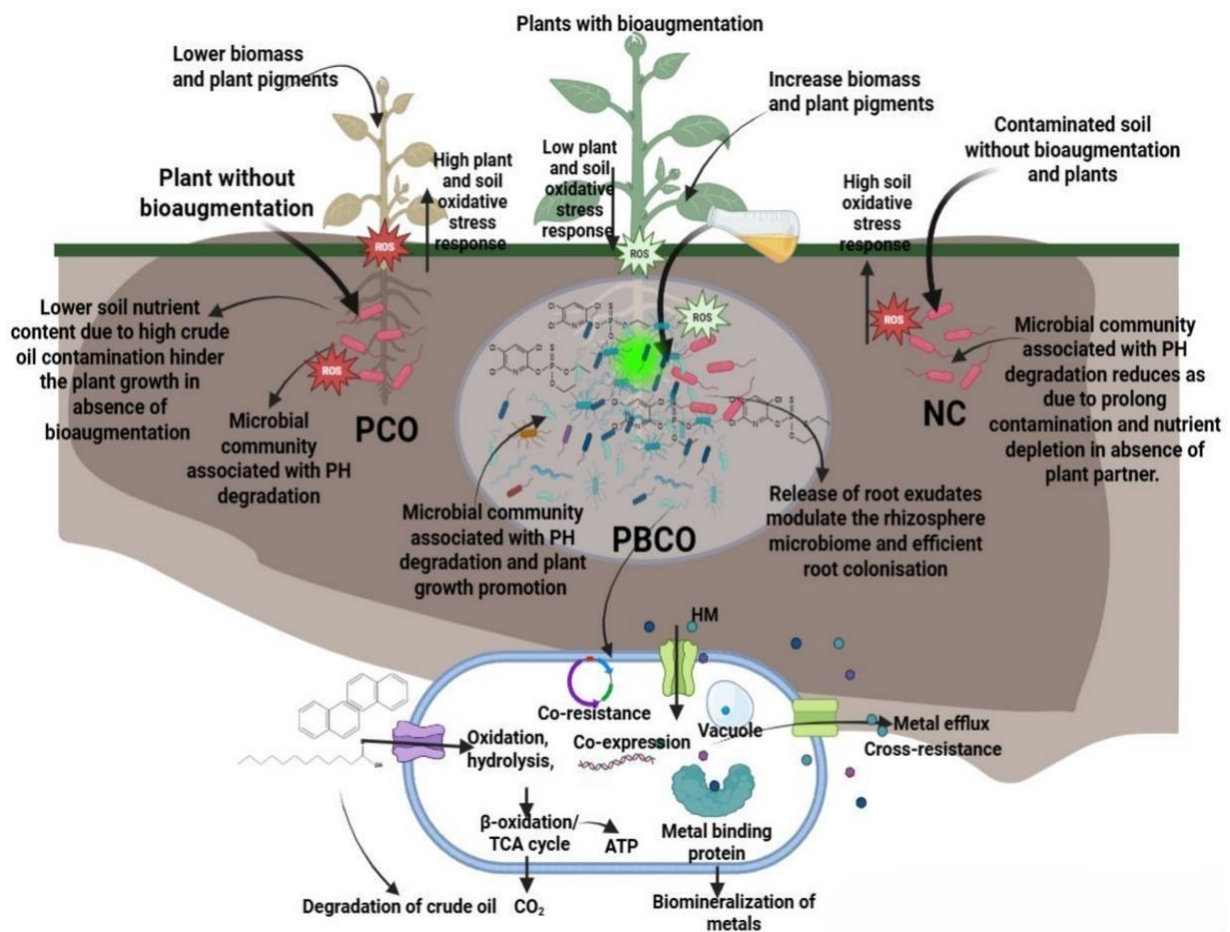
Polymer-based matrix composites are familiar in automotive applications. Due to their high strength-to-weight ratio, improved chemical resistance, and ease of processing. However, the epoxy-based composites are found to be more brittle, with reduced impact toughness and limited flexibility. This research on polymer composites is developed using a polyester matrix, embedded with 16 wt% of short neem (treated) fibers and varying wt% of titanium nanoparticles (Ti, 50 nm), via a hot compression mould process. The effectiveness of Ti nanoparticle loading on the functional properties of polyester/neem (treated) fibers is studied and compared. Given the significance of the hot-compression process, the Ti nanoparticles and neem (treated) fibers are effectively dispersed in the polyester matrix, as confirmed by transmission electron microscopy (TEM). The strong interface between the fiber/particle combination and the polyester matrix improved tensile, impact, hardness, and moisture-absorption resistance. According to the investigation results, the polyester composite made with 16 wt% neem fiber and 6 wt% Ti nanoparticles exhibits the highest tensile stress (89.6 MPa), improved impact toughness (4.3 J/mm²), high microhardness (34 HV), and reduced moisture (water) absorption (1.5% at 14 days). Moreover, the addition of Ti nanoparticles decreased the elongation from 45.5% to 39.5% and also enhanced its thermal stability 11.3% than polyester matrix (base). The novel composite sample is the trade for automotive cabinet and seat frame applications.

Neem for Sustainable Environment

[Striking a microbial balance: Rhizoremediation of crude oil-contaminated soils suppresses resistomes and reconstructs hydrocarbon-degrading microbial networks.](#)

Das N, Pandey P. *Sci Total Environ.* 2026 Feb 28;1022:181586. doi: 10.1016/j.scitotenv.2026.181586. Online ahead of print. PMID: 41764843

Integrated plant-microbe systems are crucial for restoring hydrocarbon- and heavy metal-contaminated soils. Here, *Azadirachta indica* inoculated with a hydrocarbon-degrading bacterial consortium (SynCom) was used in microcosm and field trials to remediate chronically oil-contaminated soils. SynCom treatment enhanced degradation of total petroleum hydrocarbons (TPHs) and polycyclic aromatic hydrocarbons (PAHs) up to 99%, reduced heavy metal concentrations, and neutralized soil pH, while improving organic matter, soil aggregation, and nutrient mobilization (N, P, K). Metagenomic analyses revealed a shift from Proteobacteria to Actinobacteria, with a 10-fold reduction in antibiotic resistance genes, particularly multidrug resistance and efflux pump genes. Key functional taxa (*Nocardioideae*, *Bradyrhizobium japonicum*, *Rhodopseudomonas*) were enriched, correlating with enhanced nutrient cycling, soil enzyme activity, and hydrocarbon degradation. Functional gene profiling indicated reduced oxidative stress and ecological recovery. This study demonstrates that targeted rhizoremediation effectively detoxifies soils while mitigating ARGs dissemination, offering a sustainable One Health-aligned strategy for environmental and public health protection.



[Comparative catalytic insights into green and commercial gold nanoparticles: synergistic catalytic reduction of organic pollutants.](#)

Sabur MA, Karim I, Ahmed AN. RSC Adv. 2026 Feb 26;16(13):11324-11347. doi: 10.1039/d5ra09335j. eCollection 2026 Feb 26. PMID: 41767221

The presence of toxic organic pollutants such as methyl orange (MO) and 4-nitrophenol (4-NP) in industrial effluents poses significant environmental and public health risks. This study reports a rapid, scalable, and eco-friendly microwave-assisted synthesis of gold nanoparticles (AuNPs) using *Azadirachta indica* leaf extract as a dual reducing-stabilizing agent. The synthesis parameters, including microwave power, irradiation time, and precursor concentration, were optimized to maximize catalytic activity. Comprehensive characterization *via* XRD, FTIR, TEM, FESEM, DLS, and UV-Vis spectroscopy confirmed the formation of crystalline, uniformly dispersed AuNPs (average size 11.90 ± 2.84 nm) exhibiting a distinct plasmonic resonance at 535 nm. A key novelty of this work is the direct comparison of biogenic AuNPs with commercial AuNPs for the NaBH_4 -mediated reduction of MO and 4-NP, monitored by UV-Vis spectroscopy under identical conditions. Green-synthesized AuNPs achieved about 75% MO and 70% 4-NP catalytic reduction within 10 minutes, with apparent rate constants of $0.059 \pm 0.002 \text{ min}^{-1}$ and $0.133 \pm 0.066 \text{ min}^{-1}$, respectively. The superior performance is attributed to a synergistic effect, where phytochemical capping agents from *Azadirachta indica* enhance pollutant adsorption and electron transfer between NaBH_4 and the pollutant molecules *via* the AuNP core. Kinetic studies confirmed pseudo-first-order behavior. The proposed catalytic reduction mechanism involves efficient electron shuttling from BH_4^- to pollutant molecules mediated by AuNPs, with bio-organic ligands acting as active surface sites. This comparative and mechanistic approach establishes a sustainable nanocatalyst platform for reducing hazardous organic contaminants and offers practical applicability for wastewater treatment.

Neem for Human Health

[Antimicrobial and antioxidant activities of neem assisted silver-modified zeolite X synthesized from kaolin.](#)

Kwakye R, Boakye G, Vigbedor BY, Aniagyei A, Asimeng BO, Antwi BY, Neglo D, Nanga S. PLoS One. 2026 Feb 13;21(2):e0343110. doi: 10.1371/journal.pone.0343110. eCollection 2026. PMID: 41686879

Zeolite X was synthesized from kaolin and then modified using (*Azadirachta indica*) neem together with silver nitrate solution by ion exchange. X-ray diffraction confirmed a highly crystalline FAU framework characterised by a low angle reflection, which showed that silver incorporation did not alter the zeolite structure. Scanning Electron Microscopy (SEM) revealed a well-defined polyhedral crystal for zeolite X, while the Ag-zeolite X exhibited increased surface heterogeneity and agglomeration. Fourier Transform Infrared (FT-IR) and Raman Spectroscopy further confirmed framework retention, with band broadening attributed to the partial substitution of Na^+ by Ag^+ within the zeolite lattice. The antimicrobial activity of zeolite X, Ag-zeolite X, were evaluated against *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Enterococcus faecalis*, *Candida albicans*,

Aspergillus niger strains by Minimum Inhibition Concentration (MIC) and Minimum Bacterial/fungal Concentration (MBC/MFC) Assays. The antioxidant properties were evaluated using 2,2-Diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-Azino-bis (3-ethylbenzothialine-6-sulfonic acid (ABTS) radical scavenging assays. The unmodified zeolite X showed weak activity (MIC, MBC, MFC > 1 mg/mL, R > 4) whilst the Ag-zeolite X showed strong antimicrobial activity (MIC = 0.5-1.0 mg/mL, MBC, MFC = 0.5-2 mg/mL, R ≤ 4) across all tested strains. Antioxidant activity assessed using DPPH and ABTS radical scavenging assays showed significantly enhanced antioxidant performance for Ag-zeolite X compared to unmodified zeolite X, particularly in the ABTS assay. These findings demonstrate that neem-assisted silver modification enhances the bioactivity of kaolin-derived zeolite X while preserving its crystalline framework, supporting its potential application in biomedical, food packaging, and water treatment systems.

[Traditional Oral Hygiene Practices and Their Effectiveness: A Systematic Review of the Evidence.](#)

Shahzad M, Ahmad HA, Ambadi S, Peterson S, Yang I. Oral Health Prev Dent. 2026 Feb 11;24:107-118. doi: 10.3290/j.ohpd.c_2475.PMID: 41670379

Purpose: Given the increasing interest in natural and sustainable oral hygiene options, this systematic review evaluates the efficacy of traditional oral hygiene practices, specifically miswak and oil pulling, in maintaining oral health compared with conventional practices, addressing the question: how do these practices affect plaque and gingival outcomes relative to toothbrushing and standard rinses? We hypothesized non-inferiority for short-term plaque/gingivitis control, with limited evidence for longer-term outcomes.

Materials and methods: A systematic review was conducted following PRISMA guidelines. Comprehensive literature searches were performed in PubMed, Embase.com, Global Health (CABI), Scopus, and Web of Science up to April 2024 using predefined inclusion criteria, focusing on randomized controlled trials and quasi-experimental designs that evaluated traditional oral hygiene methods against conventional practices. Data extraction, quality assessment, and risk bias analysis were conducted independently by two reviewers. Preliminary pilot searches (targeted scoping) were undertaken to refine concepts, eligibility criteria, and keywords. No formal scoping review was registered.

Results: Thirty-one studies met the inclusion criteria. Miswak statistically significantly reduced plaque accumulation and gingival inflammation, performing comparably to or better than conventional toothbrushes. Herbal dentifrices and mouthwashes containing neem, clove, turmeric, and ginger exhibited antimicrobial properties and were as effective as fluoridated products in reducing plaque and gingival inflammation. Oil pulling with sesame or coconut oil showed moderate reductions in microbial load and improved gingival health, though findings varied compared to chlorhexidine mouthwash. Indigenous methods, (e.g., finger brushing, twigs, charcoal) offered accessibility and sustainability benefits but lacked extensive clinical validation.

Conclusion: Traditional oral hygiene practices may offer benefits similar to conventional methods. Nonetheless, methodological limitations and variability among studies necessitate cautious interpretation of these findings. Further thorough research is required to confirm their efficacy and integration into modern oral care.

[Assessing anti-plaque efficiency of a herbal dentifrice.](#)

Ghosh D, Yadav V, Sharma S, A N, Komaravelli N, Singh S. *Bioinformation*. 2025 Oct 31;21(10):3828-3831. doi: 10.6026/973206300213828. eCollection 2025. PMID: 41623768

Dental plaque is a key factor in gingivitis and periodontitis, requiring effective control measures. This randomized, double-blind clinical trial compared an herbal dentifrice (neem, clove and tea tree oil), a conventional fluoride dentifrice and a placebo in 90 participants with mild gingivitis. Plaque Index (PI) and Gingival Index (GI) were recorded at baseline, 2 weeks and 4 weeks. At 4 weeks, the herbal dentifrice showed the greatest reductions in PI (60.7%) and GI (55.7%) compared to fluoride (48.6%, 41.8%) and placebo (21.4%, 13.2%), with significant intergroup differences ($p < 0.001$). The herbal dentifrice demonstrated superior anti-plaque and anti-gingivitis efficacy, supporting its role as a natural oral hygiene alternative.

[In-silico identification of anti-cholera phytochemicals from Indian medicinal plants.](#)

Rahman K, Akter Y, Reza MS, Pappu MAA, Karim MR, Sultana M, Islam MT, Alam M, Mollah MNH, Monir MM. *PLoS One*. 2026 Feb 2;21(2):e0342058. doi: 10.1371/journal.pone.0342058. eCollection 2026. PMID: 41628183

Cholera is a severe diarrheal disease caused by ingestion of food or water contaminated with pathogenic *Vibrio cholerae*. Treatment for cholera includes rehydration therapy and antibiotics to avert death and reduce bacterial burden to prevent rapid transmission of the disease. In addition, in Indian subcontinent, there is historical evidence of using plants for treating cholera. This study was designed to investigate the cholera toxin-inhibitory properties of phytochemicals sourced from Indian medicinal plants. For this, three reported genotypes of cholera toxin subunit B (ctxB) associated with 7PET *V. cholerae* O1 El Tor strains were used as targets in molecular docking. Analysis results showed strong binding affinities (≤ -7.5 kcal/mol) for 298 out of 7,607 phytochemicals, with minor variations for the ctxB genotype-specific targets. Multiple phytochemicals from the same plants were identified with high binding affinities, e.g., 101 from *Morus alba*, 24 from *Citrus aurantium*, 17 from *Embllica officinalis*, and 16 from *Capsicum annum*. However, further analyses, including drug-likeness, pharmacokinetics, and toxicity, identified five promising phytochemical candidates, namely, Abyssinone V (*Azadirachta indica*), Diosgenin (*Achyranthes bidentata*), Yamogenin (*Borassus flabellifer*), and two other unnamed phytochemicals (one from *Azadirachta indica* and one from *Morus alba*) for cholera toxin inhibition. Molecular dynamics simulation using YASARA and GROMACS showed structural stability of the ctxB-phytochemical complexes, while exhibiting adaptive rearrangements of ligand within the active binding sites of the proteins. In the simulations, MM-PBSA binding free energies showed a favorable total binding energy for the complexes. Per-residue energy decomposition analysis identified different highly contributing sets of amino acids to the binding energy with variation for both ctxB genotypes and phytochemicals, suggesting bacterial evolutionary changes may affect binding patterns of the drug candidates. This study suggests five inhibitors of cholera toxin with varying genotypes, which may have potential as an alternative medication for cholera.

[Characterization of phytoconstituents of vital herbal oils by GC-MS and LC-MS/MS and their bioactivities.](#)

Gopalakrishnan AV, Singh PK, Krishnan N, Devadasan V, Gopinath SCB, Raman P.J Food Sci Technol. 2026 Feb;63(2):238-250. doi: 10.1007/s13197-024-06148-0. Epub 2024 Dec 7. PMID: 41737715

The ancient Indian Siddha medicine system, practiced for thousands of years, is now receiving widespread recognition globally. "Siddha" system of medicine is one among the Indian traditional system of medicine that has its roots in Tamil culture. This study seeks to explore and document the diverse practices and medicinal remedies employed by Siddha practitioners. The Siddha formulations include oil-medicated herbal products and thailam, an oil formulation that contains drugs and raw extracts. *Kuzhithailam* is a specially prepared oil in the Siddha system by a destructive distillation process called the pudam process. Amukkara (*Withania somnifera*) and neem (*Azadirachta indica*) *Kuzhithailams* are two among the formulations. Neem, a popular herb for skin infections and general health because of its antibacterial, anti-inflammatory, and blood-purifying properties. Amukkara plant kizhangu helps mental health, boosts energy, and maintains hormonal balance. The current study investigates the metabolites of amukkara (AMKT) and neem *Kuzhithailams* (NMKT) by GC-MS and LC-MS/MS. Mass spectrometric analysis of AMKT and NMKT revealed the presence of metabolites belonging to different groups, including saturated and unsaturated fatty acids, phenolics, vitamins, terpenoids, and sterols. The alkaloid compounds, including withasomnine, pseudopelletierine, hygroline, and tigloidine, were detected in AMKT. Gedunin, nimbolide, 6-desacetylnimbin, 28-deoxonimbolide, azadiradione, nimbin, salannin, 2-monomyrstitin, and salannol were detected in NMKT. The *Kuzhithailams* possessed antioxidant activities, NMKT was observed to have a higher antioxidant capacity than AMKT. The bioactive compounds of neem *Kuzhithailam* have moieties like hydroxyl, ketone, conjugated double bonds, lactone etc. which stabilize the free radicals and contribute to higher antioxidant properties of NMKT compared to AMKT.

Neem in Veterinary Science

[Maternal physiological responses to oral neem leaf extract supplementation during late gestation in ewes.](#)

Elghandour MMY, García AMP, D'Alessandro AG, N Mbaba E, Istifanus EF, Ponce-Covarrubias JL, Salem AZM. Trop Anim Health Prod. 2026 Feb 24;58(2):125. doi: 10.1007/s11250-026-04939-5. PMID: 41733748

This study investigated the hematological and serum biochemical responses of pregnant ewes administered *Azadirachta indica* leaf extract (NE) during late gestation. Twenty-four pregnant ewes were assigned in a Completely Randomized Design to a 2 × 3 factorial arrangement comprising two sampling days (Day 1 and Day 30) and three Neem extract doses: 0 mL (NE0), 20 mL (NE20), and 40 mL (NE40), with three replicates per treatment. Blood samples were collected through the jugular vein on Days 1 and 30 and analyzed

using an automated hematology analyzer and spectrophotometric kits. Data were subjected to analysis of variance using SAS 9.4, and means were separated by the Duncan multiple range test. Significant treatment effects were detected from the results for erythrocytes ($P = 0.0187$), mean corpuscular volume ($P = 0.0032$), glucose ($P = 0.0002$), total blood protein ($P = 0.0269$), monocytes ($P = 0.0261$), and eosinophils ($P = 0.0453$). Treatment \times day interactions occurred for monocytes ($P = 0.0261$) and GGT ($P = 0.0101$). By Day 30, NE20 and NE40 ewes exhibited higher erythrocyte counts, reduced mean corpuscular volume, improved glucose preservation, and increased total protein relative to NE0, while liver and kidney biomarkers remained within physiological limits. These findings demonstrate that weekly administration of *A. indica* leaf extract at 20 mL/ewe is a safe and effective phyto-genic strategy that enhances erythropoiesis, mitigates gestational hypoglycemia, improves protein status, and supports immune function without eliciting toxicity during late pregnancy.

[In vitro anthelmintic activity of extracts and bioactive compounds from *Azadirachta indica* and *Cnidioscolus angustidens* on strongyles L3 larvae in horses.](#)

Díaz-Alvarado T, Alcalá-Canto Y, Elghandour MMY, Salem MZM, Mariezcurrena-Berasain MD, Salem AZM. *J Equine Vet Sci.* 2026 Feb 16;159:105807. doi: 10.1016/j.jevs.2026.105807. Online ahead of print. PMID: 41707985

Background: Gastrointestinal endoparasitic diseases, particularly those caused by some strongyles, represent one of the main health challenges in equine production. The prolonged use of synthetic anthelmintics has led to the development of resistance, which has prompted the search for more sustainable therapeutic alternatives. However, plant extracts rich in secondary metabolites are emerging as a promising option.

Aims/objectives: The objective of this study was to evaluate the in vitro anthelmintic activity of aqueous extracts and bioactive compounds (total phenols and saponins) from *Azadirachta indica* and *Cnidioscolus angustidens* against L3 larvae of strongyles in horses.

Methods: Three extracts were prepared: the first one from *A. indica*, the second one from *C. angustidens*, and the third one as a 1:1 (v/v) mixture thereof. These were characterized phytochemically by spectrophotometry and High-performance liquid chromatography (HPLC). Anthelmintic activity was evaluated by a larval inhibition assay in ELISA plates, using two doses (1200 and 1800 μ L).

Results: *A. indica* had the highest concentration of total phenols and saponins, while *C. angustidens* stood out for its tannin content and total phenols. The highest larval inhibition was recorded with the total phenols of *C. angustidens*, the saponins of *A. indica*, and crude extracts of both species. In contrast, the mixture of extracts showed a significant reduction in anthelmintic activity, evidencing a possible antagonistic interaction between their metabolites.

Conclusion: A potential anthelmintic activity of *A. indica* and *C. angustidens* aqueous extracts, as natural sources of anthelmintic compounds, was detected against L3 larvae of strongyles in equines.