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CHEMICAL EFFECTS

Short-term nitrogen deposition changes chemical composition of litter and soil organic matter in a Moso bamboo forest

2023-10-23

To investigate the effects of short-term nitrogen (N) deposition on organic matter composition of litter and soil in Moso bamboo (*Phyllostachys edulis*) forests, we established a N-addition treatments (50 kg N-hm⁻²-a⁻¹) to simulate the ambient and N deposition in a subtropical Moso bamboo forest from July 2020 to January 2022. We analyzed the organic matter composition of Moso bamboo leaf/root litter and soil by using pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS) technique. The results showed that short-term N deposition significantly increased the relative content of soil phenols by 50.9%, while significantly decreased fatty acids by 26.3%. The relative content of alkanes & alkenes and lignin in leaf litter was significantly increased by 51.9% and 33.5%, respectively, while that of phenols and polysaccharides significantly decreased by 52.2% and 56.3%. In root litter, elevated N significantly decreased the relative content of polycyclic aromatic hydrocarbons by 16.6%. Moreover, the relative content of fatty acids in soil organic matter was significantly positively correlated with the relative content of polysaccharides in leaf litter. The relative content of phenols in soil organic matter was significantly positively correlated with the relative content of lignin, and negatively correlated with the relative content of polysaccharides in leaf litter. Our results demonstrated that short-term N deposition did not change the concentration of total organic carbon, total nitrogen, and C/N of the soil, leaf litter, and root litter, but significantly altered the chemical composition of organic matter. In addition, the changes in chemical composition of organic matter in soil under short-term N deposition were affected by the composition of organic matter in leaf litter.

Authors: Yi-Huan Wang, Yi-Dan Jin, Ming-Kai Jiang, Shu-Qin Ma, You-Chao Chen, Yan-Jiang Cai

Full Source: Ying yong sheng tai xue bao = The journal of applied ecology 2023 Oct;34(10):2593-2600. doi: 10.13287/j.1001-9332.202310.008.

To investigate the effects of short-term nitrogen (N) deposition on organic matter composition of litter and soil in Moso bamboo (*Phyllostachys edulis*) forests, we established a N-addition treatments (50 kg N-hm⁻²-a⁻¹) to simulate the ambient and N deposition in a subtropical Moso bamboo forest from July 2020 to January 2022.

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First report on chemometric modeling of tilapia fish aquatic toxicity to organic chemicals: Toxicity data gap filling

2023-10-26

The Toxic Substances Control Act (TSCA) mandates the Environmental Protection Agency (EPA) to document chemicals entering the US. Due to the vast range of toxicity endpoints, experimental toxicological study for all chemicals is impossible to conduct. To address this, in silico methods like QSAR and read-across are strategically used to prioritize testing for chemicals lacking ecotoxicity data. Aquatic toxicity is one of the most critical endpoints directly related to aquatic species, mainly fish, followed by direct to indirect effects on humans through drinking water and fish as food, respectively. Therefore, we have employed the ToxValDB database to curate acute LC50 toxicity data for three Tilapia species covering two different genera, an ideal species for aquatic toxicity testing. Employing the curated dataset, we have developed multiple robust and predictive QSAR and quantitative read-across structure-activity relationship (q-RASAR) models for *Tilapia zillii*, *Oreochromis niloticus*, and *Oreochromis mossambicus* which helped to understand the toxicological mode of action (MoA) of the modeled chemicals and predict the aquatic toxicity of new untested chemicals followed by toxicity data gap filling. The best three QSAR models showed encouraging statistical quality in terms of determination coefficient R² (0.94, 0.74, and 0.77), cross-validated leave-one-out Q² (0.90, 0.67 and 0.70), and predictive capability in terms of R²pred (0.95, 0.77, and 0.74) for *T. zillii*, *O. niloticus*, and *O. mossambicus* datasets, respectively. The developed best mathematical models were used for the prediction of aquatic toxicity in terms of pLC50 for 297 untested organic chemicals across three major Tilapia species ranging from 1.841 to 8.561 M in terms of environmental risk assessment.

Authors: Siyun Yang, Supratik Kar

Full Source: The Science of the total environment 2023 Oct 26:907:167991. doi: 10.1016/j.scitotenv.2023.167991.

The Toxic Substances Control Act (TSCA) mandates the Environmental Protection Agency (EPA) to document chemicals entering the US.

ENVIRONMENTAL RESEARCH

Trophic transfer and biomagnification potential of environmental contaminants (heavy metals) in aquatic ecosystems

2023-10-27

Physical, chemical weathering and volcanic eruptions release heavy metals into soils and surface waters naturally. Contaminants from

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anthropogenic sources originated from industrial and municipality waste substantially modify and increase their contributions. They are then absorbed by fish gills, amphipod cuticles, and other sensitive organs of aquatic creatures. This article discusses the essences on the determination, potential and plausible factors of trophic transfer and biomagnification of environmental contaminants particularly heavy metals across aquatic ecosystem. In general, arsenic is found to be bio-diminished across food webs in freshwater ecosystem while it biomagnified in marine ecosystem of higher trophic level (tertiary consumer of predatory fish) and dilute its concentration from lower trophic level (from producer to bottom level of consumer, secondary and lastly to tertiary consumer (forage fish)). Early study for Cadmium shown that it has no potential for biomagnification while later studies prove that cadmium does magnify for gastropod and epiphyte-based food webs. Mercury shown obvious biomagnification potential where it can bio-magnify from trophic level as low as particulate organic matter (POM) to higher trophic of fish. These findings proved that aquatic ecosystems must be preserved from contamination not just for human benefit, but also to prevent environmental degradation and biodiversity loss.

Authors: Nadhirah B Saidon, Rita Szabó, Péter Budai, József Lehel
Full Source: Environmental pollution (Barking, Essex : 1987) 2023 Oct 27;340(Pt 1):122815. doi: 10.1016/j.envpol.2023.122815.

Application of yellow phosphorus slag in resource recovery and environmental remediation: A review

2023 Oct 26

Yellow phosphorus slag (YPS) is a byproduct in the production of yellow phosphorus, which contains several harmful components, such as phosphorus and fluorine. Approximately 8-12 tons of YPS are produced for each ton of yellow phosphorus. The accumulation of YPS causes serious environmental pollution problems with the development of the phosphorus industry. Various methods of utilizing YPS for high-value products and environmental remediation have been developed. The silicon, calcium and rare earth metals (REMs) contained in YPS can be extracted to produce high-value products. YPS, as an environmental remediation material, is generally used in wastewater treatment, soil remediation and carbon capture and utilization and is a promising method for solid waste treatment. This paper describes the physical and chemical properties of YPS. The recovery methods and mechanisms of waste heat, silicon, calcium and REMs in YPS are summarized and evaluated, and the application of YPS as an environmental remediation material is also

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described. Moreover, the currently existing problems of YPS treatment are discussed, and some suggestions for future research are provided.

Authors: Xinyue Liu, Xiaoming Liu, Zengqi Zhang
Full Source: Journal of environmental management 2023 Oct 26:349:119397. doi: 10.1016/j.jenvman.2023.119397.

Differences in nonpoint source pollution load losses based on hydrological zone characteristics: a case study of the Shaying River Basin, China

2023-10-28

Agricultural nonpoint source (NPS) pollution loss is closely related to hydrological processes. Understanding the differences in NPS pollution load loss under hydrological processes is useful for the management and prevention of NPS pollution. In this paper, hydrological and water quality data from 2016 to 2018 and monitoring data of physical and chemical indicators in 1347 field soil samples in the Shaying River Basin (SYRB) were used to analyze spatiotemporal variations in NPS pollution using the Soil and Water Assessment Tool and multifactor analysis of variance. The intensities and differences in NPS pollution losses for different soil types and land use patterns were evaluated under different hydrological zones. The annual rainfall in the SYRB decreased gradually from 1136.50 to 404.04 mm, showing a significant zoning. Areas with high loss intensities were mainly distributed in areas with steep slopes and in the 800-1000 mm rainfall zone. Cultivated land had the largest loss of NPS pollution, followed by forest land and rural residential land. Fluvo-aquic soil had the largest loss of NPS pollution, followed by cinnamon soil and lime concretion black soil. A nonlinear regression model was established for rainfall and the NPS pollution loss intensity and had a correlation coefficient of 0.60-0.99 at a 95% confidence level. Slope and rainfall were the main factors influencing the nitrogen and phosphorus losses. In the 800-1000 mm rainfall zone, the soil background nitrogen and phosphorus load was also a major factor influencing the nitrogen and phosphorus loss intensities.

Authors: Huifeng Li, Shuai Chen, Xiaohong Ruan
Full Source: Environmental science and pollution research international 2023 Oct 28. doi: 10.1007/s11356-023-30360-8.

Agricultural nonpoint source (NPS) pollution loss is closely related to hydrological processes.

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PHARMACEUTICAL/TOXICOLOGY

Copper oxide nanoparticles: An effective suppression tool against bacterial leaf blight of rice and its impacts on plants

2023-10-28

Background: In order to address the challenges of food security for the ever-increasing population, the emergent of nanotechnology is an alternate technology of choice which recently accounts for the production of safer pesticides and as a substitute for conventional fertilizer. The antidrug resistance of *Xanthomonas oryzae* pv. *oryzae* (Xoo) and build-up of chemicals in the environment has made it necessary to find alternate safe measures that are effective in diseases management. Hence, in this study, copper oxide nanoparticles (CuONPs) was green synthesized by *Hibiscus rosa-sinensis* L. flower extract.

Results: The characterization of CuONPs using UV - Vis spectrophotometer, Scanning electron microscopy (SEM) with Energy dispersive spectrum (EDS) profile, Fourier transform infrared spectroscopy (FTIR), and X-ray diffraction (XRD) ascertained the presence of CuONPs which were nanorods of 28.1 nm. CuONPs significantly obstructed growth and biofilm development of Xoo by 79.65 and 79.17 % respectively. Antibacterial mechanism of CuONPs was found to be as a result of wounding cell membrane, hence, giving rise to exodus of intracellular content and generation of oxidative reactive oxygen species which invariably, inhibited Xoo respiration and growth. The toxicity study under greenhouse conditions revealed that CuONPs significantly increased growth variables and biomass of rice and reduced bacterial leaf blight. Application of CuONPs on *Arabidopsis* improved the chlorophyll fluorescence parameters; the Φ PSII was significantly increased by 152.05 % in comparison to control.

Conclusion: Altogether, this result suggests that CuONPs in low concentration (200.0 μ g/ml) are not toxic to plants and can serve as nano-fertilizers and nano-pesticides. This article is protected by copyright. All rights reserved.

Authors: Solabomi Olaitan Ogunyemi, Jinyan Luo, Yasmine Abdallah, Shanghong Yu, Xiao Wang, Dalal Hussien M Alkhalifah, Wael N Hozzein, Fang Wang, Ji'an Bi, Chengqi Yan, Bin Li

Full Source: Pest management science 2023 Oct 28. doi: 10.1002/ps.7857.~tState of the Art and Future Perspectives of Atmospheric Chemical Sensing Using Unmanned Aerial Vehicles: A Bibliometric Analysis

Background: In order to address the challenges of food security for the ever-increasing population, the emergent of nanotechnology is an alternate technology of choice which recently accounts for the production of safer pesticides and as a substitute for conventional fertilizer.

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2023-10-11

In recent years, unmanned aerial vehicles (UAVs) have been increasingly used to monitor and assess air quality. The interest in the application of UAVs in monitoring air pollutants and greenhouse gases is evidenced by the recent emergence of sensors with the most diverse specifications designed for UAVs or even UAVs designed with integrated sensors. The objective of this study was to conduct a comprehensive review based on bibliometrics to identify dynamics and possible trends in scientific production on UAV-based sensors to monitor air quality. A bibliometric analysis was carried out in the VOSViewer software (version 1.6.17) from the Scopus and Web of Science reference databases in the period between 2012 and 2022. The main countries, journals, scientific organizations, researchers and co-citation networks with greater relevance for the study area were highlighted. The literature, in general, has grown rapidly and has attracted enormous attention in the last 5 years, as indicated by the increase in articles after 2017. It was possible to notice the rapid development of sensors, resulting in smaller and lighter devices, with greater sensitivity and capacity for remote work. Overall, this analysis summarizes the evolution of UAV-based sensors and their applications, providing valuable information to researchers and developers of UAV-based sensors to monitor air pollutants.

Authors: Diego Bedin Marin, Valentina Becciolini, Lucas Santos Santana, Giuseppe Rossi, Matteo Barbari

Full Source: Sensors (Basel, Switzerland) 2023 Oct 11;23(20):8384. doi: 10.3390/s23208384.

In recent years, unmanned aerial vehicles (UAVs) have been increasingly used to monitor and assess air quality.

OCCUPATIONAL

Exposure estimates of parabens from personal care products compared with biomonitoring data in human hair from Northeast China

2023-10-26

Parabens (PBs), a class of endocrine-disrupting chemicals (EDCs), are extensively used as additives in personal care products (PCPs); however, distinguishing between endogenous and exogenous contamination from PCPs in hair remains a challenge. We conducted a comprehensive analysis of the levels, distribution patterns, impact factors, and sources of PBs in 119 human hair samples collected from Changchun, northeast China. The detection rates of methylparaben (MeP), propylparaben (PrP), and ethylparaben (EtP) in hair samples were found to be 100%. The

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concentration of PBs in hair followed the order of MeP (57.48 ng/g) > PrP (46.40 ng/g) > EtP (6.80 ng/g). The concentration of PrP in female hair was significantly higher (65.38 ng/g) than that observed in male hair (7.82 ng/g) ($p < 0.05$). The levels of excretion rates of MeP (ERMeP) and excretion rates of PrP (ERPrP) in the hair-dyeing samples (ERMeP: 17.89 ng/day; ERPrP: 14.15 ng/day) were found to be 2.52 and 2.40 times higher, respectively, compared to the non-hair-dyeing samples (ERMeP: 7.09 ng/day; ERPrP: 6.05 ng/day). However, the system exposure dosage (SED) results revealed that although hair dyes exhibited higher PBs, human exposure was found to be lower than certain PCPs. The results of the correlation analysis revealed that toner, face cream, body lotion, and hair conditioner were identified as the primary sources of PBs in male hair. Furthermore, the human exposure resulting from the utilization of female hair dye and serum exhibited a positive correlation with hair ERMeP and ERPrP levels, indicating in the screening of samples, excluding hair samples using hair dye and haircare essential oil can effectively avoid the interference caused by exogenous contamination from PCPs.

Authors: Yunyang Li, Na Zheng, Siyu Sun, Sujing Wang, Xiaoqian Li, Jiamin Pan, Muiyang Li, Le Lang, Zelin Yue, Binbin Zhou
Full Source: *Ecotoxicology and environmental safety* 2023 Oct 26;267:115635. doi: 10.1016/j.ecoenv.2023.115635.

Occupational Exposure during Pregnancy and Effects on Newborns: A Nested Case-Control Study

2023-09-26

Background: The protection of pregnant workers should be based on evidence regarding the risks to reproductive health from exposure to specific work environments and conditions. The objective of this study was to identify the effects on mothers and newborns resulting from environmental exposure to various occupational risks.

Methods: The study cohort was composed of 399 women admitted to the Obstetrics/Postpartum ward at Hospital La Fe in Valencia, Spain. Face-to-face interviews were conducted to establish associations between workplace exposure during pregnancy and its effects on maternal and newborn health. Sex, anthropometric characteristics, and blood gas analysis in arterial and venous umbilical cord blood at delivery were collected.

Results: A total of 138 women were exposed to biological and/or chemical risks, 122 to physical risks, and 139 at no risk of exposure. In the group with chemical and/or biological risks, the frequency of women who resorted to in vitro fertilization to achieve the studied pregnancy is less than half of

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the group exposed to physical risks, with statistically significant differences ($p = 0.047$). The mean values for the arterial analysis in both exposure groups were within average values, with similar pH values between them, but the mean values of PCO₂ and PO₂ were lower in the group of neonates of mothers exposed to physical risks, with a significant difference for arterial PO₂ ($p = 0.027$).

Conclusion: Our analysis contributes evidence for planning and prioritizing preventive actions to protect women's reproductive health. The results suggest the continuation of a future project that would consider more factors and potentially increase the sample size.

Authors: Gabriele Donzelli, Beatriz Marcos-Puig, Isabel Peraita-Costa, Juan Llopis-Morales, María Morales-Suarez-Varela
Full Source: *Life (Basel, Switzerland)* 2023 Sep 26;13(10):1962. doi: 10.3390/life13101962.

Statistical Post-Processing Method for Evaluating Bioaccumulation in Fish Due to Dietary Exposure in Japan

2023-10-29

In 2018, the dietary exposure bioaccumulation fish test of the Organization for Economic Co-operation and Development Test Guideline No. 305 was introduced into Japan's Chemical Substances Control Law. The Japanese government has adopted a single definitive testing criterion for the absence of high bioaccumulation: the growth-corrected kinetic dietary magnification factor (BMFKg) must be less than 0.007. The aim of this study was to decrease regulatory restrictions in order to increase newly developed chemical substances and their subsequent approval of their manufacture and import, i.e., the present study was motivated by concerns over the criterion being too restrictive, rather than scientific concerns, such as uncertainty in criterion. We used statistical post-processing to assess the possibility of expanding the criteria for not being highly bioaccumulative. Based on our results, we proposed the criterion that the test substance should be considered not highly bioaccumulative if the following two conditions are met: (1) The ratio of the maximum to the minimum measured 5% lipid-standardized biomagnification factor at the end of the uptake phase (BMF5%, $n = 5$) for the test substance and reference substance should be less than 3.0, and (2) For the measured BMF5% of the test substance ($n = 5$), the probability that the next (the sixth) BMF5% is below 0.0334 should exceed 95% based on statistical post-processing. It is worth noting that the BMF5% values should only be applied for non-ionizable lipid soluble compounds. Application of our suggested approach to Japan implies that the criterion for chemical

In 2018, the dietary exposure bioaccumulation fish test of the Organization for Economic Co-operation and Development Test Guideline No.

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substances that are not highly bioaccumulative in the dietary exposure
bioaccumulation fish test would be increased from 0.007 to 0.0149.

Authors: Yoshiyuki Inoue, Yuka Koga, Ryoko Takeshige, Hidekazu
Murakami, Takumi Takamura

Full Source: Archives of environmental contamination and toxicology 2023
Oct 29. doi: 10.1007/s00244-023-01035-9.