Sher-e-Bangla Agricultural University

SDG Activity Report
on

SDG 03:
Good Health and Wellbeing

Contents

Is beudantite a stable host phase of arsenic and lead? New insights from molecular-scale kinetic analyses

Author: A.S.M. Fazle Bari
Year:2024
Abstract:
Beudantite, an As-Pb containing Fe(III) sulfate secondary mineral, is formed via the oxidation of sulfide-rich tailings in mining-impacted regions. The geochemical stability of beudantite plays a key role in controlling the cycling and transport of As and Pb in mine sites. However, the fate of beudantite under dynamic pH conditions and its effect on As and Pb mobility remain elusive. We investigated the mobility dynamics of As and Pb during the dissolution of beudantite under variable pH conditions (2−8) relevant to mine sites by using a complementary suite of analytical methods. Results demonstrate that under acidic pH conditions, aqueous As and Pb content increased slightly, with just 0.7 % and 6.7 % of As and Pb partitioned from the beudantite crystal structure over 56 days. Notably, the rate at which the dissolution of beudantite led to solubilization of elements followed the order Fe > As > Pb within the first 2 h of dissolution. In contrast, the order shifted to Pb > Fe > As after 2 h. Arsenic K-edge X-ray absorption spectroscopy analyses revealed no shifts in As speciation or secondary mineralogical transformation. Here, we show for the first time that beudantite could be considered a relatively stable mineral host for As and Pb over a broad spectrum of environmental conditions. Beudantite can be expected to immobilise metals liberated by the primary weathering of sulfide-rich mine wastes, thereby lowering the risk to the environment and human health resulting from their discharge into the surrounding environment and aquifer.

Impact of anthropogenic activities and the associated heavy metal pollution in Sundarbans waterways: threats to commercial fish and human health

Author: Mir Mohammad Ali

Year:2024

Abstract:
The exposure of fish to heavy metals is a significant concern for human health and natural ecosystems. Despite being a critical issue, the extent of contamination in tropical fish from developing countries like Bangladesh remains somewhat unexplored. In this study, ten economically vital fish species (Osteogeneiosus militaris, Arius gagora, Harpadon nehereus, Mugil ephalus, Pseudapocryptes elongates, Apocryptes bato, Labeo bata, Tenualosa toil, Notopterus notopterus, and Pampus chinensis) from the Pasur River, Bangladesh, were analyzed by atomic absorption spectrometer for the concentrations of four concerned heavy metals, viz., As, Cr, Cd, and Pb, and the associated human health risks. The mean concentrations (mg/kg) followed the order of As (3.30 ± 1.43) > Pb (2.32 ± 0.73) > Cr (0.63 ± 0.29) > Cd (0.37 ± 0.24). Additionally, the bioaccumulation factor of the metals in the investigated fish species followed a decreasing trend of As (824.75) > Cr (781.25) > Cd (744) > Pb (385.83). While most species fell below the minimum bioaccumulation line, a few exceptions were noted for some species specific to metals. Health risk assessments indicated no significant carcinogenic and non-carcinogenic risks for both children and adults, although children exhibited greater vulnerability to both types of health effects. Multivariate analysis and local perceptions supported the conclusion that heavy metals primarily originated from anthropogenic sources related to development activities adjacent to the riverine areas

The Novel Study On Arsenic Contamination, Health Risk, and Approaches to Its Mitigation From Water Resource of a Developing Country: A potential review

Author: Mir Mohammad Ali
Year:2024
Abstract:
The pollution and contamination by arsenic (As) in the water resources is a worldwide concern due to its adverse toxic effects on the environment and public health. The current study aimed to investigate arsenic levels in the groundwater system with the possible health risk, and sustainable mitigation strategies. The data on arsenic in the water system were collected from the Web of Science and Scopus databases. The published data showed that arsenic concentration (0.0002–19.0 mg/kg) in the water system in Bangladesh was higher than the permissible standards and data from other countries, indicating severe contamination of water resources by arsenic. The study concluded that the water resource in Bangladesh is not safe for human consumption. The review has also identified the research gaps in various strategies for controlling the arsenic problem and their impact on the ecosystems. The present study suggested future research directions on sustainable intervention, impacts assessment of arsenic on humans, and formulating existence policy that helps to combat arsenic contamination.

Pre-emergence herbicides used in urban and agricultural settings: dissipation and ecological implications

Author: Aney Parven, Islam Md Meftaul

Year:2024
Abstract:
Herbicides are widely recognized as the most cost-effective solution for weed control, but their extensive use in both urban and agricultural settings raise serious concerns about nontarget effects. We assessed the possible hazards associated with pre-emergence herbicides such as dimethenamid–P, metazachlor, and pyroxasulfone, which are frequently applied in both urban and agricultural soils. The dissipation rate constant values (k day−1: 0.010–0.024) were positively linked to total organic carbon (TOC), silt, clay, soil pH, and Al and Fe oxides, but negatively correlated with sand content. In contrast, half-life values (DT50: 29–69 days) of the herbicides showed negative correlations with TOC, clay, silt, soil pH, and Fe and Al oxides, while sand content showed a positive impact. The selected herbicides showed minimal impact on soil dehydrogenase activity (DHA). Mostly, soils with higher organic matter (OM) content exhibited increased DHA levels, highlighting the role of OM in influencing this soil enzyme across different soils. Assessment of environmental indicators like groundwater ubiquity score (GUS:1.69–6.30) and leachability index (LIX: 0.23–0.97) suggested that the herbicides might reach groundwater, posing potential risks to nontarget biota and food safety. Human non-cancer risk evaluation, in terms of hazard quotient (HQ < 1) and hazard index (HI < 1), suggests minimal or no risks from exposure to soil containing herbicide residues at 50% of the initial concentrations. Our data thus help the stakeholders and regulatory agencies while applying these pre-emergence herbicides in soils and safeguarding human and environmental health.

From stress to resilience: Unraveling the molecular mechanisms of cadmium toxicity, detoxification and tolerance in plants

Author: Mirza Hasanuzzaman
Year:2024
Abstract:
Soil contamination with cadmium (Cd) has become a global issue due to increasing human activities. Cd contamination poses threats to plant growth as well as jeopardizing food safety and human health through the accumulation of Cd in edible parts of plants. Unraveling the Cd toxicity mechanisms and responses of plants to Cd stress is critical for promoting plant growth and ensuring food safety in Cd-contaminated soils. Toxicological research on plant responses to heavy metal stress has extensively studied Cd, as it can disrupt multiple physiological processes. In addition to morpho-anatomical, hormonal, and biochemical responses, plants rapidly initiate transcriptional modifications to combat Cd stress-induced oxidative and genotoxic damage. Various families of transcription factors play crucial roles in triggering such responses. Moreover, epigenetic modifications have been identified as essential players in maintaining plant genome stability under genotoxic stress. Plants have developed several detoxification strategies to mitigate Cd-induced toxicity, such as cell-wall binding, complexation, vacuolar sequestration, efflux, and translocation. This review provides a comprehensive update on understanding of molecular mechanisms involved in Cd uptake, transportation, and detoxification, with a particular emphasis on the signaling pathways that involve transcriptional and epigenetic responses in plants. This review highlights the innovative strategies for enhancing Cd tolerance and explores their potential application in various crops. Furthermore, this review offers strategies for increasing Cd tolerance and limiting Cd bioavailability in edible parts of plants, thereby improving the safety of food crops.

Survival analysis of early intention of antenatal care among women in Bangladesh

Author: Maruf Khan, Iqramul Haq

Year:2024

Abstract:
This study focuses on the importance of early and regular Antenatal Care (ANC) visits in reducing maternal and child mortality rates in Bangladesh, a country where such health indicators are a concern. The research utilized data from the Bangladesh Demographic and Health Survey (BDHS) conducted in 2017–18 and employed the Cox proportional hazard model to identify factors influencing women's intention of ANC services. The results revealed that 40.4% of women engaged in at least one ANC activity during the first trimester, which, although higher than in other countries, falls below the global average. Notably, women between the aged of 25 and 29 years took 15% less time for their first ANC visit compared to their younger counterparts, suggesting higher awareness and preparedness in this age group. Education, both for women and their partners, had a significant influence on the intention to visit ANC early. Women in the poor wealth quantile exhibited lower odds of seeking timely ANC, whereas those with a planned pregnancy were more likely to do so. Moreover, access to mass media decreased the timing of ANC visits by 26% compared to women who were not exposed. Moreover, living in rural areas was linked to a 17% delay in the timing of the first ANC visit compared to urban areas. These findings underscore the importance of addressing these determinants to improve the timeliness and accessibility of ANC services, thereby enhancing maternal and child health outcomes in Bangladesh.

Copper stress in rice: Perception, signaling, bioremediation and future prospects

Author: Debu Kumar Bhattacharjya
Year:2024

Abstract:
Copper (Cu) is an indispensable micronutrient for plants, animals, and microorganisms and plays a vital role in different physiological processes. However, excessive Cu accumulation in agricultural soil, often through anthropogenic action, poses a potential risk to plant health and crop productivity. This review article provided a comprehensive overview of the available information regarding Cu dynamics in agricultural soils, major sources of Cu contamination, factors influencing its mobility and bioavailability, and mechanisms of Cu uptake and translocation in rice plants. This review examined the impact of Cu toxicity on the germination, growth, and photosynthesis of rice plants. It also highlighted molecular mechanisms underlying Cu stress signaling and the plant defense strategy, involving chelation, compartmentalization, and antioxidant responses. This review also identified significant areas that need further research, such as Cu uptake mechanism in rice, Cu signaling process, and the assessment of Cu-polluted paddy soil and rice toxicity under diverse environmental conditions. The development of rice varieties with reduced Cu accumulation through comprehensive breeding programs is also necessary. Regulatory measures, fungicide management, plant selection, soil and environmental investigation are recommended to prevent Cu buildup in agricultural lands to achieve sustainable agricultural goals.

Comparative analysis of high-fat diets: Effects of mutton, beef, and vegetable fats on body weight, biochemical profiles, and liver histology in mice

Author: Mst. Sharifa Jahan
Year:2024

Abstract:

High-fat diets are associated with metabolic syndrome, cardiovascular diseases, and liver disorders. Beef and mutton, both widely consumed meats, are significant sources of animal fat, while soybean oil, a commonly used cooking oil, is a prominent source of plant-derived fat. This study aimed to compare the effects of regular consumption of beef fat, mutton fat, and soybean oil in mice to assess

Field Screening for Low Levels of Toxic Inorganic Arsenic in Dry-Season Rice Varieties from Bangladesh

Author: Md Tofail Hosain
Year:2024
Abstract:

Rice varieties with low arsenic content (As) could address some aspects of human health risks linked to As-tainted rice consumption. This study evaluated 46 rice cultivars from Bangladesh for their total and speciated As (inorganic and organic) in grains. The rice varieties were cultivated under a continuously flooded irrigation system with As-tainted groundwater. The study revealed notable varietal effects on total and speciated As concentrations. The levels of total As in unpolished rice ranged from 219 to 562 μg kg–1 among different rice cultivars, with BRRI dhan47 exhibiting the lowest and BR7 showing the highest concentrations. In brown rice, inorganic As was the dominant form, contributing 54–91% of total As. Nevertheless, a 10% polishing process can significantly diminish the levels of total As (14–39%), inorganic As (12–46%), and DMA (12–36%) found in brown rice. Grain As revealed a negative relationship between the rice grain yield and some beneficial micronutrients. Based on grain As levels, a couple of low As accumulating rice varieties have been identified, which could be promoted to grow in As-prone areas as a low-cost mitigation strategy. Consequently, screening low-accumulation rice cultivars could minimize the As load in humans,

Therapeutic Potential of Water Chestnut Fruit Extract (Trapa bicornis) against Ovariectomy-Induced Climacteric Symptoms in Mice

Author: Dr. Md. Mohibbullah
Year:2024
Abstract:

Climacteric symptoms, as well as postmenopausal estrogen deficiency, have been associated with many psychological problems and the risk of osteoporosis and heart disease. Therefore, in this study, we aimed to evaluate, for the first time, the dose-dependent effect of water chestnut (WC), also known as Trapa bicornis, a fruit extract, on ovariectomy (OVX)-induced menopause in ICR mice. After bilateral OVX surgery, 200, 100, and 50 mg/kg of WC and 200 mg/kg of pomegranate concentrate powder (PCP) were administered orally for 84 days from 4 weeks after OVX operation. Then, anti-climacteric activities were evaluated in five groups: (1) estrogenic, (2) anti-obesity, (3) hypolipidemic, (4) hepatoprotective, and (5) anti-osteoporosis effects. Different biochemical assays, histopathological and morphological inspections, and mRNA expression findings showed that OVX-induced estrogen deficiency-related AMPK decrease was associated with climacteric symptoms such as obesity, hyperlipidemia, hepatic steatosis, and osteoporosis in ICR mice. However, these climacteric effects were reversed in OVX rats by treating them with WC at a dose relative to the same dose of PCP in OVX-ICR mice (200 and 100 mg/kg). Water chestnut fruit extract demonstrated promise as a complementary treatment for menopausal symptoms, indicating possible uses in the health of women through supplements or prescription drugs.

Actualizing the worldwide distribution and main uses of Parkinsonia aculeata L., Sp. Pl

Author: Mirza Hasanuzzaman

Year:2024

Abstract:

The palo verde (Parkinsonia aculeata L. Sp. Pl.) (Ulibarri 2008), although it is native to a semidesert region, it has been distributed throughout various regions worldwide, adapting to favorable and unfavorable environmental conditions. Starting from isolated, although abundant, studies on this species and its uses, an investigation was carried out with the aim of actualizing the international distribution and its main uses. The findings showed that palo verde is distributed on all continents, with a greater presence in America, Africa, and Australia. The palo verde can be found above sea level from 8.6 to 1310 m. Palo verde adapts to heat, drought, salinity, and waterlogging but is sensitive to cold conditions. There is only a single find from its habitat in North Asia. The main international uses of palo verde are natural reserve, medicinal, industrial, biocontrol and biofuel applications. Only in India and Mexico are these six uses given, together with their use as biocontrol agents of plant diseases, in Mexico. Most countries use verde nuts as natural reserves and medicinal and biofuel fines. Among the uses for medicinal purposes, the most diverse is to reduce diabetes mellitus.

Seasonal Changes of Nutrient Stoichiometry in the Tidal Mangroves Estuary, Bangladesh

Author: Koushik Chakroborty

Year:2024

Abstract:

In the current study, the stoichiometry of dissolved nutrients was addressed in the Pasur River estuary (PRE) mangrove ecosystems of Bangladesh to characterize the ecological and nutrient state of the inter-tidal mangroves in light of rising human disturbances from January to December 2019. The findings suggest excess phosphorus (P) relative to nitrogen (N) in these systems, indicating that mangrove coastal habitats along the PRE are severely N-constrained. Since the silica(Si): N ratio in the PRE mangrove estuary was greater than 1, it was concluded that the estuarine mangrove waters receive a significant amount of silica from terrestrial weathering. P can limit primary production in some systems; therefore, managing both N and P is recommended for an optimal management of coastal eutrophication, even though N is likely the main source of eutrophication in most coastal systems in the tropical zone. Excess P in estuaries can also combine with nitrogen (N) and silica (Si) availability to destabilize ecosystems. Through mechanisms such as enhanced Si fluxes, decreasing P in upstream freshwater habitats can also benefit coastal marine ecosystems. These intricate relationships are important while devising strategies to reduce nutrient pollution in coastal areas.

Toxoplasmosis in animals and humans: a neglected zoonotic disease in Bangladesh

Author: Delower Hossain

Year:2024

Abstract:

Toxoplasmosis, caused by Toxoplasma gondii, is a zoonotic disease that affects a wide range of warm-blooded animals, including humans. The parasite undergoes both sexual and asexual reproduction in intermediate hosts (humans and animals) and definitive hosts (cats). Transmission in humans occurs through consuming oocyst-contaminated water, fruits, vegetables, and raw or undercooked meats. In Bangladesh, several factors contribute to an increased risk of contracting toxoplasmosis. The parasite is reported to cause diseases among livestock such as goats and sheep in this country, and it has also been associated with some human illnesses. Toxoplasmosis prevalence varies significantly worldwide, with developing countries like Bangladesh experiencing higher rates. Diagnostic methods include both

conventional non-DNA-based tests and molecular detection techniques, while treatment options involve using antiparasitic drugs like sulfadiazine and pyrimethamine. To control toxoplasmosis, essential steps include improving sanitation, promoting safe food handling, and educating the public about risks related to cat ownership and undercooked meat consumption. Implementing prenatal screening and treatment is also important. With the growing popularity of pet ownership in urban areas, it becomes essential to emphasize the veterinary and public health significance of toxoplasmosis in Bangladesh. This article comprehensively reviews various aspects of toxoplasmosis, with a specific focus on the situation in Bangladesh.

Distribution, source identification, and contamination level of trace metals in the sediment of the Shari-Goyain River in Bangladesh: Implications for ecological health risks
Author: Mir Mohammad Ali
Year:2024
Abstract:
The major issue associated with coal mine drainage is its contribution to river pollution, which occurs at the local, regional, and global levels. The pollution of surface sediment by heavy metals is a major environmental and health concern in coal mining and downstream areas. This study explored the concentrations of eight metal components in the sediments from the Shari-Goyain River of Bangladesh. The trend of decreasing metal concentration was identified as Fe > Mn > Ni > Zn > Cu > Cr > Pb > Cd in sediment. The level of metal pollution in the study area was assessed by using various indicators like geo-accumulation index (Igeo), pollution load index (PLI), contamination factor (CF), potential ecological risk factor, and risk index (RI). The sediment in the river exhibited PLI values ranging from 0.133 to 0.543, suggesting a low level of pollution from the evaluated heavy metals (PLI < 1). The mean Igeo showed that the study area was unpolluted whereas Ni showed unpolluted to moderately polluted status. For most of the metals, the sediment samples recorded a low degree of contamination (CF < 1) except Pb, Cd, and Ni which exhibited moderate degree of contamination ($1 \leq CF < 3$). Through the application of various statistical analyses, coal mine drainage has been identified as the possible source of pollution of the analyzed metals in the Shari-Goyain River. However, the risk index and RI suggested a low risk of metal pollution in the studied areas. To improve the environmental conditions of the Shari-Goyain River, it is crucial to construct permanent sediment quality monitoring stations and conduct extensive ecological investigations.

Insights from tuberose farmers: A survey study in Jashore District, Bangladesh
Author: Rabita Zaman, Abu Noman Faruq Ahmmed
Year:2024
Abstract:

To obtain information on the cultivation of tuberoses in Bangladesh's Jashore district, a study has been carried out to evaluate the economic and social standing of cultivators and examine the methods employed in production and farmers' attitudes towards field disease. The majority of surveyed farmers were men, aged between 30 and 40 years. Only 7.41% had a high level of education, and most had less than five years of experience in tuberose cultivation. On an annual basis, the total production cost amounted to Tk. 27,200 (bigha/year), yielding a net profit of Tk. 1,20,000 (bigha/year). 31.48% of farmers expressed the belief that diseases affecting tuberose originated from contaminated planting materials. A significant proportion (64.81%) of farmers used PGR to combat diseases affecting tuberose production. Government Agriculture Officers played a crucial role in assisting farmers with knowledge and guidance. Yet, most participants highlighted that the key to preventing diseases lies in the effective application of pesticides. The findings of this study can guide policymakers in implementing measures to enhance tuberose production and fortify the floriculture industry in Bangladesh.

Pre-emergence herbicides widely used in urban and farmland soils: fate, and potential human and environmental health risks

Author: Md. Rezwan Sarker, Jasim Uddain, Md Nazrul Islam, Md Abdur Rahim, Md. Saidur Rahman, Sohely Parvin, Md. Mofizur Rahman, Banalata Das, Mohammad Humayun Kabir, Shormin Choudhury

Year:2024

Abstract:

We determined the distribution, fate, and health hazards of dimethenamid-P, metazachlor, and pyroxasulfone, the effective pre-emergence herbicides widely used both in urban and agricultural settings globally. The rate-determining phase of sorption kinetics of these herbicides in five soils followed a pseudo-second-order model. Freundlich isotherm model indicated that the herbicides primarily partition into heterogeneous surface sites on clay minerals and organic matter (OM) and diffuse into soil micropores. Principal component analysis revealed that soil OM (R^2, 0.47), sand (R^2, 0.56), and Al oxides (R^2, 0.33) positively correlated with the herbicide distribution coefficient (Kd), whereas clay (R^2, – 0.43), silt (R^2, – 0.51), Fe oxides (R^2, – 0.02), alkaline pH (R^2, – 0.57), and EC (R^2, – 0.03) showed a negative correlation with the Kd values. Decomposed OM rich in C=O and C–H functional groups enhanced herbicide sorption, while undecomposed/partially-decomposed OM facilitated desorption process. Also, the absence of hysteresis (H, 0.27–0.88) indicated the enhanced propensity of herbicide desorption in soils. Leachability index (LIX, < 0.02–0.64) and groundwater ubiquity score (GUS, 0.02–3.59) for the soils suggested low to moderate leaching potential of the herbicides to waterbodies, indicating their impact on water quality, nontarget organisms, and food safety. Hazard quotient and hazard index data for human adults and adolescents suggested that exposure to soils contaminated with herbicides via dermal contact, ingestion, and inhalation poses minimal to no non-carcinogenic risks. These insights can assist farmers in judicious use of herbicides and help the concerned regulatory authorities in monitoring the safety of human and environmental health. Graphical abstract

Knowledge, attitudes, and factors determining the willingness for COVID-19 vaccination among students in Bangladesh: An online-based cross-sectional study

Author: Iqramul Haq

Year:2024

Abstract:

Aim

The most effective way to avoid COVID-19 is through immunization against the virus that causes the disease. The primary objective of this study was to assess the extent of knowledge, attitudes, acceptability, and factors influencing COVID-19 vaccination acceptance among higher secondary and university students in Bangladesh.

Subject and methods

A structured questionnaire-based online survey was conducted among 451 students residing in Khulna and Gopalganj cities from February to August, 2022. The willingness to accept the COVID-19 vaccine was compared with a few covariates using the chi-square test, and we then used binary logistic regression to identify the determinants that led Bangladeshi students to receive the COVID-19 vaccine.

Organic Amendments: Enhancing Plant Tolerance to Salinity and Metal Stress for Improved Agricultural Productivity

Author: Prof. Dr. Mirza Hasanuzzaman
Year:2024
Abstract:

Salinity and metal stress are significant abiotic factors that negatively influence plant growth and development. These factors lead to diminished agricultural yields on a global scale. Organic amendments have emerged as a potential solution for mitigating the adverse effects of salinity and metal stress on plants. When plants experience these stresses, they produce reactive oxygen species, which can impair protein synthesis and damage cellular membranes. Organic amendments, including biochar, vermicompost, green manure, and farmyard manure, have been shown to facilitate soil nitrogen uptake, an essential component for protein synthesis, and enhance various plant processes such as metabolism, protein accumulation, and antioxidant activities. Researchers have observed that the application of organic amendments improves plant stress tolerance, plant growth, and yield. They achieve this by altering the plant's ionic balance, enhancing the photosynthetic machinery, boosting antioxidant systems, and reducing oxidative damage. The potential of organic amendments to deal effectively with high salinity and metal concentrations in the soil is gaining increased attention and is becoming an increasingly popular practice in the field of agriculture. This review aims to provide insights into methods for treating soils contaminated with salinity and heavy metals by manipulating their bioavailability through the use of various soil amendments.

Nutritional health of the Rohingya refugees in Bangladesh: Conceptualizing a multilevel action framework focusing the COVID-19

Author: Islam Md Meftaul
Year:2024
Abstract:
The Rohingya refugees are among the most vulnerable victims of COVID-19 pandemic in Bangladesh. In refugee camps, they frequently lack access to safe and nutritious foods, drinking water, and a healthy environment. Despite the fact that numerous national and international organizations are sincerely collaborating to meet their nutritional and medical needs, the pace of work has slowed due to COVID-19. Combating COVID-19 demands a robust immune system, which relies heavily on a nutritious diet. The development of strong immunity to protect Rohingya refugees, particularly children and women, through the provision of nutrient-dense foods is thus highly necessary. Consequently, the current commentary focused on the nutritional health status of Rohingya refugees in Bangladesh during COVID-19. In addition, we provided a multilevel implementation framework that could assist stakeholders and policymakers in taking effective measures to recover their nutritional health.

Heavy metal quantification in chicken meat and egg: An emerging food safety concern

Author: Aolad Hossain, Md Wadud Ahmed, Mominul Haque Rabin, Abdul Kaium, Md. Abdur Razzaque, Sheikh Shawkat Zamil
Year:2024
Abstract:
Heavy metal contamination in widely consumed foods is a significant safety concern. This study aimed to determine heavy metals (Pb, Cd, Cr, and Mn) in different parts of chicken meats (variety: Poultry and Sonali) and eggs (n = 180) collected from different local markets of Dhaka, Bangladesh. The analysis of heavy metals was carried out using atomic absorption spectroscopy. Alarmingly, 75% of the poultry bone and 60% of the egg albumens and yolks exceeded the maximum allowable concentration (MAC) of Pb set by the Codex Alimentarius. Moreover, 40% of the poultry bone and 89% of the egg samples surpassed the MAC of Cd. The estimated daily intake (EDI) values for Pb and Cd exceeded the respective provisional tolerable daily intake (PTDI) levels. The incremental lifetime cancer risks (ILCR) of Pb and Cd in the detected samples exceeded the threshold risk limit (ILCR>10−4) for adult and child consumers, indicating carcinogenic health risks. The hazard index (HI) values of poultry bone for adults (4.1) and children (7.8) exceeded the benchmark (HI=1), indicating non-carcinogenic health effects. This study might help policymakers and regulatory authorities identify non-compliance and apply control measures to produce safe meat and eggs for safeguarding public health.

Exploring the potential human pathogenic bacteria in selected ready-to-eat leafy greens sold in Dhaka City, Bangladesh: Estimation of bacterial load and incidence

Author: Raihan Ferdous, Nazneen Sultana, Md. Belal Hossain, Rifat Ara Sultana, Sanzida Hoque
Year:2024
Abstract:
This study was designed to investigate the presence of potential human pathogenic bacteria, bacterial load, and their incidence in ready-to-eat leafy greens viz., coriander, lettuce, and mint leaves sold at diverse marketplaces in Dhaka City. Multiple identification methods including cultural, morphological, biochemical, and molecular analysis were employed in the Plant Pathology Laboratory of Sher-e-Bangla Agricultural University to identify the human pathogenic bacteria. In molecular analysis, the DNA samples were put through PCR using bacterial primer 27F: AGAGTTTGATCMTGGCTGAG and universal primer

1942R: CGGTTACCTTGTTACGACTT. Initially, nine different bacterial genera viz. Bacillus, Escherichia, Pseudomonas, Neisseria, Klebsiella, Enterobacter, Shigella, Vibrio, and Staphylococcus were detected, and their incidence was 93%, 67%, 44%, 30%, 26%, 26%, 11%, 7%, and 7% respectively. A total of twelve bacteria have been identified from these genera out of which 7 bacteria viz. Bacillus cereus, Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoniae, Enterobacter aerogenes, Staphylococcus aureus, and Shigella spp., were reported as human pathogenic bacteria in several pieces of literature. The highest colony-forming units per gram were shown in mint ($4.27 \pm 2.35 \times 109$) followed by lettuce ($2.87 \pm 0.76 \times 109$) and coriander ($2.43 \pm 1.32 \times 109$). Considering marketplaces, the highest colony-forming units per gram were observed in the samples of street markets ($5.0 \pm 1.72 \times 109$) and the lowest was in supermarkets ($1.87 \pm 0.46 \times 109$) followed by local markets ($2.7 \pm 0.91 \times 109$). All the leafy green samples crossed the acceptable level of bacterial load (106 CFU/g). The findings of the study highlight the urgency for improved food safety protocols in their production and distribution in Dhaka city.

Potential renoprotective effects and possible underlying mechanisms of angiotensin receptor-neprilysin inhibitors in cardiorenal syndrome

Author: Md. Moshiur Rahman

Year:2024

Abstract:

Angiotensin receptor-neprilysin inhibitors (ARNIs) represent a novel class of medications characterized by their dual action on major cardiorenal regulators, specifically the renin–angiotensin system (RAS) and the natriuretic peptide (NP) system. Sacubitril/valsartan, a pioneering ARNI, has demonstrated strong antihypertensive effect as well as superior efficacy in preserving renal function compared to RAS inhibitors in heart failure patients with reduced ejection fraction. Here, we gathered evidence on the impact of sacubitril/valsartan on the preservation of kidney function in patients with cardiorenal syndrome (CRS). In particular, we present a comprehensive summary of the latest advancements and findings from clinical trials, studies, and meta-analyses on the impact of ARNIs in maintaining or improving renal function. We also discussed the pre-clinical evidence supporting the use of sacubitril/valsartan for improving renal function, along with the underlying molecular mechanisms in animal models mimicking various clinical scenarios. Altogether, the analysis of published data from both pre-clinical and clinical studies provides substantial support for the usefulness of ARNIs in enhancing renal protection in subjects with CRS.

EFFICACY OF SOME BOTANICALS AGAINST INFESTATION OF LEAFHOPPER (AMRASCA BIGUTTULA BIGUTTULA) IN BRINJAL

Author: Nur Mohal Akhter BANU

Year:2024

Abstract:

Brinjal (Solanum melongena) is a popular vegetable crop in Bangladesh cultivated all the year

round. Infestation of different insect pests is a serious issue which hampers the production of brinjal. As the farmers in Bangladesh applying different chemical insecticides without following proper dosage or pre-harvest interval to control insect infestation, pesticide residue remains even after harvest and different health hazards are increasing after consuming these vegetables. The present study was conducted to assess some non-toxic botanicals against leafhopper (Amrasca biguttula biguttula) in brinjal which is one of the most devastating sucking insect pest in both summer and winter. Infestation of leafhopper was observed highest during vegetative stage. Application of neem oil performed best to reduce the mean number of leafhopper

5.73/plant in this experiment. Highest 57.73%, 50.83% and 49.19% reduction over control regarding to the number of leafhopper per plant was observed in case of neem oil application, tobacco leaf extract application and neem leaf extract application respectively. Application of neem oil and tobacco leaf extract gave 59.13% and 43.19% percent reduction over control regarding to the leaf infestation by leafhopper per plant respectively. Application of garlic extract, mustard seed extract and papaya leaf extract also observed effective to control the infestation of leafhopper in brinjal. As incidence of leafhopper has a negative impact on the yield of brinjal, use of botanicals can be a good alternative to control this insect.

Identification of Virulence Genes and Multidrug Resistance in Shiga-Toxin Producing Escherichia coli (STEC) from Migratory and Captive Wild Birds

Author: Mirza Synthia Sabrin

Year:2024

Abstract:

Multi-drug resistant-Shiga toxin producing Escherichia coli (MDR-STEC), poses considerable health risks for human, animals and birds. Migratory and captive wild birds are known carriers of this pathogen. This study aimed to investigate prevalence of MDR-STEC along with its associated virulence genes from migratory and captive wild birds in Bangladesh. A total of 247 fecal specimens were obtained from both migratory (119) and captive wild birds (128) for the isolation and characterization of E. coli. Standard microbiological and biochemical methods were used for identification and Polymerase Chain Reaction (PCR) was employed for confirmation of E. coli isolates followed by disc diffusion method to determine antibiotic susceptibility. The overall E. coli prevalence was 80.97% (200/247; 95% CI: 75.5185.67), with a prevalence of 77.31% (92/119) in migratory birds and 84.38% (108/128) in captive wild birds. Among the 200 E. coli isolates, 53 (26.5%; 95% CI: 20.5-33.2) were identified as multidrug-resistant (MDR), with 21.7% (20/92) of MDR isolates originating from migratory birds and 30.6% (33/108) from captive wild birds. Only 24 (12%) isolates were positive for virulent gene stx2 whereas 167 (83.50%) isolates were positive for fimC. Among the β-lactamase resistant genes, blaTEM (91.50%; 183/200) was found significantly ($p<0.0001$) higher than blaSHV (9.00%; 18/200). Among the antimicrobial resistant genes, 175 (87.50%) isolates were found positive for qnrS resistant gene. E. coli isolates of birds exhibited diverse phenotypic AMR patterns, with complete (100%) resistance to several antibiotics (ampicillin, ceftazidime, cefuroxime, and tetracycline) while being entirely sensitive to others (ceftriaxone, amikacin and aztreonam). This research underscores the concerning prevalence of E. coli strains having various virulent genes and resistant to multiple drugs among the wild birds. It emphasizes the immediate requirement for bridging wildlife and public health domains to address the threats posed by the antibiotic-resistant pathogens.

EXPLORING WATER QUALITY AS A DETERMINANT OF THE EXISTENCE OF SOFT SHELL CRAB (SCYLLA OLIVACEA) IN DIFFERENT HABITATS OF THE LARGE MARINE ECOSYSTEM IN THE BAY OF BENGAL.

Author: Md. Abdul Hannan, A.M. Shahabuddin, Shahrear Hemal, Antara Ghosh, Jakir Hossain, Roksana Jahan, Zubyda Mushtari Nadia

Year:2024

Abstract:

The present study determined the concentration of semicarbazide (SEM) in water and soil samples from diverse habitats of mud crabs encompassing natural breeding grounds, mangrove-associated rivers,

different commercial farms and the tissue samples in soft-shell crabs. Semicarbazide is a residue of banned veterinary drug nitrofurazone that can be found in some natural crustaceans that have never been exposed to nitrofurazone. Analysis of water and soil sediment confirmed the presence of SEM in natural habitat, however the concentrations was very low as <0.1 ng/g throughout the study. The extraction and analysis of nitrofuran metabolites was conducted by using liquid chromatography-tandem mass spectrometry (LCMS/MS) methods. The commercial farms of mud crabs were also exhibited the lowest levels of SEM in both water (0.0003 ng/g) and soil sediment (0.0005 ng/g). Tissue-specific SEM analyses encompassing muscle, shell-muscle composite, and shell revealed a distinct spatial gradient in which shell tissues exhibiting the highest concentration of SEM (3.51±0.03 ng/g) in commercial farms, surpassing those observed in muscle tissues (0.33±0.01 ng/g). Remarkably, crabs from commercial farms exhibited higher SEM concentrations across all tissue types compared to those from natural breeding grounds. However, no SEM was detected in crab feed snail and tilapia fish in commercial farms, suggesting feed composition may not be a major contributor. The lowest concentrations of SEM in water and soil sediments towards physiological processes rather than environmental contamination as the source. This study highlights limitations of SEM as a sole nitrofuran abuse marker, advocating for broader regulatory frameworks and calls for reevaluating regulations to ensure public health and responsible aquaculture.

Role of Plants in Fluorides and Fluorocarbons Toxicity Remediation

Author: Sheikh Muhammad Masum, Tanvir Ahmad Sourav, A. S. M. Fazle Bari, Md. Hasanuzzaman

Year:2024

Abstract:

Fluorine and fluorocarbons, emitted from natural and human-made sources like brick kilns, industrial manufacturing, and agricultural production, are found throughout the natural environment. The overabundance of fluorine and fluorocarbons, which pose a significant threat to various forms of life, including plants, through soil and water pollution and disruption of soil composition, is a cause for concern. The accumulation of this substance in plants has the potential to significantly impede their growth and development while also presenting a substantial threat to human health. This chapter highlights the crucial role of plants in effectively removing fluoride and fluorocarbons from polluted environments through phytoremediation. By studying how various plant species absorb, translocate, and detoxify these pollutants, we elucidate the potential of phytoremediation as a sustainable and eco-friendly approach to mitigate fluoride and fluorocarbon pollution. Through a comprehensive review of recent research findings, this chapter highlights the effectiveness of different plant species in the remediation process, emphasizing their suitability for diverse environmental conditions. The synergistic effects of plant–microbe interactions and the implications for ecosystem health are discussed. Overall, this study underscores the significance of harnessing the natural capabilities of plants in addressing pressing environmental challenges posed by fluoride and fluorocarbon contamination.

Challenges, Health Risks and Recommendations on Meat Handling Practices in Africa: A Comprehensive Review

Author: Delower Hossain

Year:2024

Abstract:

Meat handling is a crucial aspect of public health as it forms complex interactions among humans, animals, and the environment. African meat handlers continue to face various challenges in slaughterhouses that significantly impact their lives and the general public during meat processing. This paper reviews the

challenges meat handlers encounter and the associated risks of improper meat handling in various African slaughterhouses. A comprehensive literature search was performed on Science Direct, Web of Science, PubMed, Scopus and Google Scholar. Articles published to investigate the challenges and health risks of meat handling practices in Africa from 1961 to 2022 were included in this review. African meat handlers face socio-economic difficulties, including inadequate returns, unpredictable working environment, market, security, and limited healthcare access. Many meat handlers work informally in unregistered facilities and are not trained by experts on proper meat handling. This results in improper meat handling, raising the possibility of meat contamination by foodborne pathogens like Salmonella sp. and E. coli on slaughter and contact surfaces, hence posing a threat to meat safety and public health. We recommended that governmental, institutional and community-level actions should be used to address the health challenges associated with improper meat handling in Africa. Government and institutional bodies play an important role in supporting and upholding the laws that guide proper meat handling and processing. Meat handlers must be educated on meat safety, handling and storage to ensure meat is safe for consumption.

Evaluating Soil-Vegetable Contamination with Heavy Metals in Bogura, Bangladesh: A Risk Assessment Approach

Author: Sadia Samma, Md. Sirajul Islam Khan, Md. Tazul Islam Chowdhury, Mohammed Ariful Islam

Year:2024

Abstract:

This study quantified hazardous heavy metals (Cu, Cr, and Pb) in soil and vegetables (potato, tomato, pepper, cauliflower, and cabbage) across six upazilas (Kahaloo, Bogura Sadar, Shajahanpur, Shibganj, Nandigram, and Dupchanchia) in Bogura district, Bangladesh, assessing their health and environmental impacts. The detection method was validated for its accuracy and precision with QC samples. Results indicated that Cu levels in all samples were within safe limits set by BFSA and FAO/WHO, whereas Cr and Pb in vegetables exceeded permissible levels, though soil concentrations remained within limits. Pb contamination was particularly severe in vegetables ($CF > 6$), and all vegetables showed significant contamination degrees (CD), highlighting extensive heavy metal pollution. The Pollution Load Index (PLI) identified Kahaloo and Bogura Sadar as the most polluted, whereas Nandigram and Dupchanchia were the least. Bioaccumulation factors (BF) for all metals were <1, suggesting minimal transfer to edible parts. However, the ecological risk index (ERi) and potential ecological risk index (PERI) suggested low ecological risks, but health risk assessments indicated that vegetable consumption poses significant carcinogenic and non-carcinogenic risks ($CHR > 10^{-4}$, $HI > 1$) across all upazilas. The findings underscore the urgent need for measures to mitigate heavy metal pollution in these areas to safeguard environmental and public health.

Editorial: Agrochemicals in agricultural and non-agricultural settings: fate, distribution, and potential human and environmental health hazards

Author: Md Asaduzzaman

Year:2024

Abstract:

Global concerns over the extensive use of agrochemicals, including pesticides, herbicides, and fertilizers, have intensified due to their significant impacts on ecological and human health (Parven et al., 2024). Agrochemicals are widely used in agricultural and non-agricultural settings to enhance productivity and manage pests, but their improper use and persistence in the environment pose serious risks (Ramakrishnan et al., 2019). The articles in this Research Topic delve into various aspects of agrochemical use, highlighting the need for innovative approaches to mitigate their adverse effects.

He et al. presents an evolutionary game approach to promoting the reduction of pesticide and fertilizer use by agricultural enterprises. This study analyses the decision-making processes of different stakeholders, including the government, agricultural enterprises, and consumers, under varying influencing factors. The findings suggest that reward measures by the government significantly impact the adoption of sustainable practices by agricultural enterprises. This research provides valuable insights into policy mechanisms that can encourage the reduction of agrochemical use, contributing to food safety and environmental protection.

Chen et al. focus on the residue determination and dietary risk assessment of mesotrione, nicosulfuron, atrazine, and its metabolites in maize. Using advanced analytical methods, this study evaluates the residues of these herbicides in maize from different locations in China and assesses the chronic dietary risks. The results indicate that the residues are within acceptable limits, guiding the rational use of these herbicides to ensure safe maize production. This research underscores the importance of monitoring and managing agrochemical residues to protect human health.

Dione et al. investigate the levels of pesticide residues in tomatoes sold in urban markets of Ouagadougou, Burkina Faso. This study reveals significant contamination, with a high percentage of samples containing residues of commonly used pesticides, some exceeding maximum residue levels. The findings highlight the urgent need for better pesticide regulation and consumer safety measures to address the health risks associated with pesticide residues in vegetables. This research emphasizes the importance of stringent monitoring and regulation of pesticide use in urban agriculture.

Phan et al. examine the pesticide regulatory environment for pollinator protection across different geographical regions. Comparing approaches in the United States, the European Union, and selected Asian countries, this perspective highlights the diverse regulatory frameworks and their effectiveness in safeguarding pollinators. The study advocates for comprehensive and proactive pesticide regulations to mitigate non-target risks and protect pollinator populations. This research is crucial for informing global pesticide policies and promoting sustainable agricultural practices.

The articles in this Research Topic collectively address the complex challenges associated with agrochemical use in various settings. They emphasize the need for integrated pest management practices, innovative policy mechanisms, and robust regulatory frameworks to ensure the safe and sustainable use of agrochemicals. By understanding the fate and distribution of these chemicals and their potential health and environmental impacts, we can develop strategies to mitigate risks and promote a healthier future for both humans and ecosystems.

In conclusion, while agrochemicals have played a vital role in enhancing agricultural productivity, their widespread use presents significant challenges. The research presented in this Research Topic provides valuable insights into the risks associated with agrochemicals and offers potential solutions to address these challenges. It is imperative to continue exploring sustainable alternatives and regulatory measures to safeguard human health and the environment.

Sources and impacts of microplastic on the world's longest sea beach of the Bay of Bengal coasts: a review on microplastic management

Author: Mir Mohammad Ali
Year:2024
Abstract:
The toxic impact of microplastics (MPs) in the terrestrial and aquatic environment has recently become a global problem. The Bay of Bengal coasts is an important bio-diverse ecosystem, which help the people for their sound living and gather natural resources. However, the distribution, impact, source and transport mechanism, and policy to take initiatives for MPs pollution control at the Bay of Bengal coasts' have received less attention. Therefore, this review summarizes MPs' distribution and their source in the Bay of Bengal coasts' ecosystems. Current knowledge extends the impacts of MP on this vital ecosystem, existing policy, and further recommendations to mitigate MPs contamination are critically assessed in this study. Furthermore, mechanisms of MP on human health are also highlighted with the identification of current research gaps and future study suggestions. Given the escalating plastic usage and the prevalence of important sea products globally, there is a pressing need to prioritize research efforts on the impacts of MPs on the Bay of Bengal coasts from a long-term perspective. Knowledge obtained in this way would inform the scientists, stakeholders, and policy makers in such a way as to help them mitigate impacts of the micro- and nano-plastic legacy at this region.

Bioaccumulation and sources of metal(loid)s in fish species from a subtropical river in Bangladesh: a public health concern

Author: Mir Mohammad Ali
Year:2024
Abstract:
Toxic metals and freshwater fish's metalloid contamination are significant environmental concerns for overall public health. However, the bioaccumulation and sources of metal(loids) in freshwater fishes from Bangladesh still remain unknown. Thus, the As, Pb, Cd, and Cr concentrations in various freshwater fish species from the Rupsha River basin were measured, including Tenualosa ilisha, Gudusia chapra, Otolithoides pama, Setipinna phasa, Mystus vittatus, Glossogobius giuris, and Pseudeutropius atherinoides. An atomic absorption spectrophotometer was used to determine metal concentrations. The mean concentrations of metal(loids) in the fish muscle (mg/kg) were found to be As (1.53) > Pb (1.25) > Cr (0.51) > Cd (0.39) in summer and As (1.72) > Pb (1.51) > Cr (0.65) > Cd (0.49) in winter. The analyzed fish species had considerably different metal(loid) concentrations with seasonal variation, and the distribution of the metals (loids) was consistent with the normal distribution. The demersal species, M. vittatus, displayed the highest bio-accumulative value over the summer. However, in both seasons, none of the species were bio-accumulative. According to multivariate statistical findings, the research area's potential sources of metal(loid) were anthropogenic activities linked to geogenic processes. Estimated daily intake, target hazard quotient (THQ), and carcinogenic risk (CR) were used to assess the influence of the risk on human health. The consumers' THQs values were < 1, indicating that there were no non-carcinogenic concerns for local consumers. Both categories of customers had CRs that fell below the permissible range of 1E − 6 to 1E − 4, meaning they were not at any increased risk of developing cancer. The children's group was more vulnerable to both carcinogenic and non-carcinogenic hazards. Therefore, the entry of metal(loids) must be regulated, and appropriate laws must be used by policymakers.

Application of biochar and humic acid improves the physiological and biochemical processes of rice (Oryza sativa L.) in conferring plant tolerance to arsenic-induced oxidative stress

Author: Mirza Hasanuzzaman, Farzana Nowroz, Ayesha Siddika, Md. Mahabub Alam,
Year:2024
Abstract:
Biochar (BC) and humic acid (HA) are well-documented in metal/metalloid detoxification, but their regulatory role in conferring plant oxidative stress under arsenic (As) stress is poorly understood. Therefore, we aimed at investigating the role of BC and HA (0.2 and 0.4 g kg−1 soil) in the detoxification of As (0.25 mM sodium arsenate) toxicity in rice (Oryza sativa L. cv. BRRI dhan75). Arsenic exhibited an increased lipid peroxidation, hydrogen peroxide, electrolyte leakage, and proline content which were 32, 30, 9, and 89% higher compared to control. In addition, the antioxidant defense system of rice consisting of non-enzyme antioxidants (18 and 43% decrease in ascorbate and glutathione content) and enzyme activities (23–50% reduction over control) was decreased as a result of As toxicity. The damaging effect of As was prominent in plant height, biomass acquisition, tiller number, and relative water content. Furthermore, chlorophyll and leaf area also exhibited a decreasing trend due to toxicity. Arsenic exposure also disrupted the glyoxalase system (23 and 33% decrease in glyoxalase I and glyoxalase II activities). However, the application of BC and HA recovered the reactive oxygen species–induced damages in plants, upregulated the effectiveness of the ascorbate–glutathione pool, and accelerated the activities of antioxidant defense and glyoxalase enzymes. These positive roles of BC and HA ultimately resulted in improved plant characteristics with better plant-water status and regulated proline content that conferred As stress tolerance in rice. So, it can be concluded that BC and HA effectively mitigated As-induced physiology and oxidative damage in rice plants. Therefore, BC and HA could be used as potential soil amendments in As-contaminated rice fields.

The path of microplastics through the rare biodiversity estuary region of the northern Bay of Bengal

Author: Mir Mohammad Ali
Year:2024
Abstract:
Due to its harmful effects on ecosystems and human health, microplastic (MP) pollution has become a significant environmental problem on a global scale. Although MPs' pollution path and toxic effects on marine habitats have been examined worldwide, the studies are limited to the rare biodiversity estuary region of Hatiya Island from the northern Bay of Bengal. This study aimed to investigate the MP pollution path and its influencing factors in estuarine sediments and water in rare biodiversity Hatiya Island in the northern Bay of Bengal. Sixty water and sediment samples were collected from 10 sampling sites on the Island and analyzed for MPs. The abundance of MPs in sediment ranged from 67 to 143 pieces/kg, while the abundance in water ranged from 24.34 to 59 pieces/m3. The average concentrations of MPs in sediment and water were 110.90 ± 20.62 pieces/kg and 38.77 ± 10.09 pieces/m3, respectively. Most identified MPs from sediment samples were transparent (51%), while about 54.1% of the identified MPs from water samples were colored. The fragment was the most common form of MP in both compartments, with a value of 64.6% in sediment samples and 60.6% in water samples. In sediment and water samples, almost 74% and 80% of MP were <0.5 mm, respectively. Polypropylene (PP) was the most abundant polymer type, accounting for 51% of all identified polymers. The contamination factor, pollution load index, polymer risk score, and pollution risk score values indicated that the study area was moderately polluted with MPs. The

spatial distribution patterns and hotspots of MPs echoed profound human pathways. Based on the results, sustainable management strategies and intervention measures were proposed to reduce the pollution level in the ecologically diverse area. This study provides important insights into evaluating estuary ecosystem susceptibility and mitigation policies against persistent MP issues.

Plastic pollution in the aquatic ecosystem: An emerging threat and its mechanisms

Author: Mir Mohammad Ali
Year:2024
Abstract:

The smaller fragments of plastics including microplastics and nanoplastics are of particular concern since their existence throughout the food web is more persistent than larger particles. Microplastics enter in the food chain and its very bottom, when aquatic organisms eat or ingest contaminated food materials, and keep being transferred in the next food web predator, including humans. These are detected in Asia, Europe and North America and the studies show that aquatic organisms frequently ingest microplastics across a variety of feeding guilds. Marine organisms may cause shock, inner or outer injuries, ulcerating sores, blocking digestive tracts, fake feelings, degraded feeding capabilities, fatigue, weakness, limited predator prevention, or death in the ingestion of large plastic material and/or particles. However, effects of ingestion of microplastic particles on marine organisms and the toxicity mechanisms are largely unknown. There is much more limited evidence of the impacts of microplastic intake on freshwater species, both in the limited number of studies performed and the number of species examined. However, the few recent studies of freshwater suggest that physical effects are analogous to those carried out in the sea. Therefore, we reviewed the state of the science for briefly identifying knowledge gaps and investigating research needs. To date, a small number of studies have been conducted to investigate biological effects of plastics on aquatic species, and the significant transport pathways of plastics from freshwater ecosystems to marine ecosystems and vice-versa have received little attention. So potential sources and the fate of the environment continue to be investigated. Likewise, there is limited research to explain how plastics and its fragments could transfer from the freshwater to terrestrial and to marine ecosystems, and to know if they can affect human health.

Assessment of As, Cr, Cd, and Pb in urban surface water from a subtropical river: contamination, sources, and human health risk

Author: Mir Mohammad Ali, Delower Hossain, Ranjan Roy
Year:2024
Abstract:

Safe levels of heavy metals in the surface water and sediment of the Kirtankhola River watershed have not been universally established. Current study characterized heavy metals such as arsenic (As), chromium (Cr), cadmium (Cd) and lead (Pb) in surface water and sediments of the most important fishing resource at the coastal area of Bangladesh. Considering both of the season, the mean concentration of Cr, As, Cd and Pb in water sample was 33.25, 8.14, 0.48 and 21.14 µg/L, respectively and in sediment was 30.47, 4.48, 0.20 and 19.98 mg/kg, respectively. Heavy metals concentration in water samples surpassed the acceptable limits of drinking water quality, indicating that water from this river is not safe for drinking and cooking. Enrichment factors also directed minor enrichment of heavy metals in sediments of the watershed. Other indexes for ecological risk assessment such as pollution load index (PLI), contamination factor (CF), geoaccumulation index (I geo), modified contamination degree (mCd) and potential ecological risk index (PERI) also indicated that the sediment of the study river was low contamination. Taking into account,

water and sediment of the study river, in-depth inventorying of heavy metals and holistic ecological risk assessments are required to determine river health.

Status and health risk assessment of heavy metals in vegetables grown in industrial areas of Bangladesh

Author: Md. Muradul Islam, Md. Wadud Ahmed
Mominul Haque Rabin, Md. Abdur Razzaque
Mahbuba Sidddika, Sheikh Shawkat Zamil
Year:2024
Abstract:
The presence of toxic heavy metals in vegetables is a matter of concern worldwide as they impose significant public health hazards. This study quantified heavy metals such as lead (Pb), cadmium (Cd), chromium (Cr), copper (Cu), and zinc (Zn) in widely consumed vegetables such as red amaranth (Amaranthus cruentus), radish leaf (Raphanus sativus), brinjal (Solanum melongena), spinach (Spinacia oleracea), bottle gourd (Lagenaria siceraria), carrot (Daucus carota), and fenugreek (Trigonella foenum-graecum) grown in Savar industrial areas of Bangladesh to assess human health risks. Atomic absorption spectroscopy (AAS) was used to determine heavy metals in vegetables (n = 96). Studied heavy metals were detected in most vegetable samples, whereas 59.38% and 40.62% of samples contained carcinogenic Pb and Cd higher than the Food and Agriculture Organization (FAO) maximum allowable concentration (MAC). Principle component analysis (PCA) revealed that wastewater irrigation due to anthropogenic activities is the main source of heavy metal contamination in vegetables of the study area. Human health risks were assessed in terms of estimated daily intake (EDI), incremental lifetime cancer risks (ILCR), target hazard quotient (THQ), and hazard index (HI). EDI values of all heavy metals were lower than the corresponding maximum tolerable daily intake (MTDI) values. The ILCR values of Pb in most samples (except fenugreek) for children were found above the threshold value (ILCR> 10−4), indicating carcinogenic health effects from lifetime consumption of these vegetables. The THQs of Pb in sample red amaranth and carrot were greater than 1.0, indicating potential non-carcinogenic risks of consuming contaminated vegetables. The HI values of all heavy metals in red amaranth and carrot >1.0 for adults and children, suggesting health hazards from these samples. This study might help policymakers and concerned authorities to implement a strategic plan for safe vegetable production and minimise the health risks of consuming heavy metal contaminated vegetables.

Assessing risk to human health for potentially toxic elements in farmed and wild giant tiger prawn (Paeneas monodon) in the coastal area of Bangladesh

Author: Mir Mohammad Ali
Year:2024
Abstract:
Giant tiger prawn (Penaeus monodon) is an important marine crustacean widely reared for food all over the world but poses a health risk if it is contaminated by toxic elements. Potentially toxic elements (PTEs), i.e. copper (Cu), chromium (Cr), nickel (Ni), arsenic (As), cadmium (Cd), lead (Pb), manganese (Mn) and zinc (Zn) in wild- and farm-cultured prawns were measured for the first time to assess the levels of PTEs, their sources and health risks. Average concentrations (mg/kg) of Cr, Ni, Cu, As, Cd, Pb, Mn and Zn in farm prawn were 3.13, 3.06, 14.21, 1.28, 0.50, 1.32, 5.89 and 7.68, respectively, and in wild prawn, they were 0.98, 2.43, 8.48, 0.45, 0.19, 0.46, 2.77 and 3.88, respectively. Except Ni and Zn, the concentrations of PTEs in prawn samples were higher than the maximum allowable concentration (MAC), indicating their

contamination by PTEs which might pose risks to human health. Multivariate principal component analysis (PCA) revealed that anthropogenic activities including industrial wastes and agricultural chemicals are substantial sources of PTEs in the samples. Estimated daily intake (EDI), target hazard quotient (THQ) and target carcinogenic risk (CR) assessed for potential human health risk implications suggest that the values were slightly higher than the acceptable threshold for both adults and children.

Environmental pollution, ecological and human health risk assessment of heavy metals in rice farming system near the Buriganga River in Dhaka, Bangladesh
Author: Abdul Kaium, Md. Tazul Islam Chowdhury
Mohammed Ariful Islam, Simana Akter Bhuiya
Md. Wadud Ahmed
Year:2024
Abstract:
The current study focused on quantifying hazardous heavy metals (As, Cd, Cr, Pb, Ni, and Zn) in soil-rice systems near the Buriganga River in Bangladesh to assess their impact on human health and the environment. The mean concentrations of As, Cd, Cr, Ni, and Zn in soil exceeded FAO/WHO acceptable limits, and the metal pollution index (MPI) indicated that all soil samples collected from the rice fields were severely polluted (MPI>30) than water and rice grain samples. According to the sum of pollution index (SPI) by studied metals, rice grains collected from Kamrangirchor (29.36), Dhakauddan (28.75), and Bosila (18.08) were severely polluted. Mean Bio-concentration factors (BCFs) and Transfer factors (TFgrain/soil) in rice grains were in the following order: Cd (6.034) > Zn (1.752) > Pb (0.697) > Ni (0.666) > Cr (0.135) > As (0.037), and Cd (1.150) > Zn (0.421) > Ni (0.112) > Pb (0.072) > Cr (0.015) > As (0.034) respectively indicating higher accumulation of Cd in rice grain than others toxic heavy metal. The potential ecological risk index (RI) showed that except for water in Kamrangirchar and Keraniganj rice fields, all other rice fields soil and water samples did not pose severe ecological pollution (RI<110) by different toxic heavy metals. Health risk assessment showed that rice grains are unsafe for human consumption as the carcinogenic health risk (CHR>10-3) and non-carcinogenic health risk (HI >1) quotients seem more than the safe level in all samples collected from rice fields surrounding the Buriganga River. Findings show that heavy metal concentrations are high in rice fields near the Buriganga River, endangering the environment and consumer health.

Determination and probabilistic health risk assessment of heavy metals in widely consumed market basket fruits from Dhaka city Bangladesh

Author: Sadia Afrin, Md. Wadud Ahmed, Aney Parven
Islam Md Meftaul, Md. Sirajul Islam Khan
Year:2024
Abstract:
Heavy metals contamination of fruits and vegetables is a growing concern to the public and policymakers in developing countries. This study investigated the extent of heavy metal contamination in widely consumed grape, apple, orange, banana, and pomegranate from supermarkets in Dhaka, Bangladesh, using atomic absorption spectroscopy (AAS) to assess the health risks to humans. Of the total 80% of banana and 60% of pomegranate samples, the mean lead (Pb) concentrations were 0.608 and 0.164, respectively, exceeding the maximum allowable concentration (MAC = 0.1) set by FAO/WHO and EU regulations, while the remaining fruit samples were below the limit. The Single-factor pollution index (PI) of Pb in bananas (6.08) and pomegranate (1.64) was higher than the reference value (PI>1), indicating the lower quality of fruits due to the higher amount of lead contents. The calculated incremental lifetime cancer risks (ILCRs)

of cadmium (Cd) and Pb in banana, apple, grape, orange, and pomegranate for both children and i adults were exceeded the threshold limit (ILCR>10−6), which suggests that the consumption of heavy metal contaminated fruits poses potential cancer risks to the human health. In contrast, target hazard quotients (THQs) and chronic hazard index (HIs) values of all heavy metals were in the range of (THQ: 2.4 × 10−6–0.76; 6.5 × 10−7–0.20) and (HI:0.03–0.49; 0.01–0.13), respectively, for children and adults, which were below the acceptable limit (THQ<1), indicating no potential non-cancer risk for both consumer groups. These findings might help the policymakers and regulatory bodies concerned to apply control measures through monitoring the quality of locally grown or imported fruits available in supermarkets for human consumption.

Inquisition of the Phytochemistry, Antioxidants, and Hemolytic and Antimicrobial Potential of Polar Extracts of Moringa oleifera Leaves Indigenously Grown in Pakistan

Author: Md. Belal Hossain
Year:2024
Abstract:
Phytochemicals and metabolites make Moringa oleifera (MO) a very nutritious vegetable tree with therapeutic properties. MO leaves contain phytochemicals that have anticarcinogenic, antidiabetic, antioxidant, and antibacterial abilities. This study investigates the antibacterial, antioxidant, total phenolic, total flavonoid , and hemolytic and antimicrobial activities of MO leaf (MoLe) extracts grown indigenously in Pakistan. Phytochemical study utilizing qualitative chemical tests revealed the presence of key phytochemical components such as alkaloids, saponins, flavonoids, tannins, coumarins, quinones, and terpenoids in organic solvents. Antioxidant (SOD, POD, and CAT) activities in the MoLe aqueous extract vary dose-dependently. Acetic acid extract endured the highest total phenolic content (TPC) and total flavonoid content (TFC), followed by n-hexane, chloroform, and butanol solvents. The current investigation suggests that all extracts have the ability, to varying extents, to function as radical scavengers because of the presence of polyphenolics. 2,2-Diphenyl-1-picrylhydrazyl (DPPH) activity was observed to be significantly varied in all solvents, with the highest activity observed in acetic acid, methanol, and n-butanol. Maximum ZOI (mm) in Streptococcus pneumoniae (13 ± 1.24) and Staphylococcus aureus (17 ± 1.26) was marked by an aqueous solvent; likewise, Escherichia coli (13 ± 1.24) and Pseudomonas aeruginosa (15 ± 1.69) showed maximum ZOI by acetic acid and methanol, respectively. Additionally, the acetic acid extract showed significant inhibitory activity (ZOI, mm) against fungal pathogens Aspergillus fumigatus (22 ± 1.24), A. flavus (24 ± 1.24). Maximum hemolytic was documented by aqueous (0.51 ± 0.001) followed by acetic acid (0.38 + 0.003), whereas minimum one was exhibited by n-hexane (0.3 ± 0.002). Overall, the results indicated that MoLe is an excellent selection for elevated antioxidants, DPPH activity, and biological control of bacterial and fungal pathogens.