Sher-e-Bangla Agricultural University

SDG Activity Report
on

SDG 02:
Zero Hunger

Contents

Faculty Research and Publications

Optimizing growth, yield, and nutritional quality of Chinese cabbage through vermicompost and reduced fertilizer application in organic farming systems

Author: Jasim Uddain.

Year: 2024

Abstract: Chinese cabbage, though less prominent in Bangladesh, has shown potential for successful cultivation in the region. This study aimed to assess various cultivars' efficacy on Chinese cabbage growth, yield, and quality within an organic farming system. A field experiment was conducted for two consecutive years, investigating the combined impact of cultivar and vermicompost with reduced fertilizer levels on yield. Three cultivars, viz., BARI Chinakopi 1, Blues, and Retasi, were tested along with four fertilizer levels: recommended NPK (control); 80% NPK + vermicompost 6 t/ha; 70% NPK + vermicompost 8 t/ha; and 50% NPK + vermicompost 10 t/ha. Results demonstrated that cv. Blues, treated with 50% NPK + 10 t/ha of vermicompost, exhibited significant enhancements in various parameters compared to the control group. Notably, the treated variety Blues showcased increased plant height (43%), head diameter (46.3%), dry matter (71.2%), and gross yield (72.2%) at harvest. Moreover, var. Blues treated with vermicompost at 10 t/ha displayed elevated levels of vitamin C (28%), β-carotene (96.3%), Ca (7.1%), Mg (18.4%), P (5%), K (10.5%), Fe (13.1%), and Zn (21%) compared to control. These findings suggest that utilizing 50% NPK + vermicompost at 10 t/ha significantly enhances Chinese cabbage growth and quality, particularly in cv. Blues. Incorporating this treatment method could effectively elevate both production yield and crop quality, providing valuable insights for organic farming practices.

Thermochemical and physical characterization of agricultural biomass for sustainable energy in Bangladesh

Author: Debu Kumar Bhattacharjya

Year: 2024

Abstract: The United Nations Sustainable Development Goals (SDGs) prioritize affordable, clean energy solutions to tackle global issues like poverty, climate change, and environmental degradation. In Bangladesh, agricultural biomass residues present a renewable and underutilized alternative to fossil fuels. This study systematically characterizes the thermochemical and physical properties of key agricultural residues-rice husk, rice straw, wheat straw, sugarcane bagasse, jute stick, dhaincha, and water hyacinth-to assess their potential for sustainable energy production. Key analyses include higher heating value (HHV), proximate composition (volatile matter, fixed carbon, ash), and elemental makeup. Volatile matter content ranged from 71.52 % in rice husk to 90.83 % in sugarcane bagasse, while fixed carbon varied between 7.00 % in sugarcane bagasse and 16.45 % in dhaincha. Ash content was highest in rice straw (15.05 %) and lowest in sugarcane bagasse (2.17 %). The HHV ranged from 19.65 MJ/kg for dahincha to 11.95 MJ/kg for water hyacinth, highlighting dahincha's high energy potential. However, elevated potassium in rice straw (1.62 %) and water hyacinth (2.84 %) suggests risks of slagging in thermal conversion systems. These findings underscore the value of region-specific biomass data in informing energy policy and advancing renewable energy initiatives. By identifying high-potential feedstocks and conversion needs, this study supports targeted biomass applications, contributing to cleaner energy solutions and reduced dependency on fossil fuels. Advanced conversion technologies and ash management strategies are recommended to optimize the energy efficiency of these residues, particularly in regions with abundant agricultural waste. The insights provided serve as a foundation for sustainable biomass utilization in Bangladesh, with potential replicability in other agrarian countries facing similar energy and environmental challenges.

The effect of plant extracts and cultural practices on Cucumber Mosaic Virus Disease, and growth and yield attributes of Capsicum

Author: Ismam Aurin & Fatema Begum

Year: 2024

Abstract: Cucumber mosaic virus (CMV) is non-persistently transmitted by aphids, rendering chemical insecticides ineffective. The effects of various plant extracts (neem leaf extract, garlic bulb extract, mahogany bark extract) and cultural practices (aluminium foil as reflective mulch, coriander as intercrop, marigold as border crop) on CMV incidence and severity were evaluated in capsicum at Sher-e-Bangla Agricultural University, Bangladesh. Mosaic, shoestring, vein banding and stunted growth were observed visually in the field and DAS-ELISA confirmed CMV infection in capsicum. Neem leaf extract resulted in the lowest CMV incidence (8.33%) and severity (21.67%), number of symptomatic leaves and the smallest percentage of leaf area reduction (%LAR) whereas the highest CMV incidence and severity, number of symptomatic leaves, and %LAR were observed in the untreated plots. However, the highest growth and yield parameters were recorded using aluminium foil as reflective mulch. Maximum plant height and the highest number of asymptomatic leaves were observed in aluminium foil as reflective mulch-treated plants. The highest fruit number per plant (13.33), heaviest fruits (62.10 g), highest fruit yield per plant (725.74 g), highest plot yield (2.78 kg), highest total yield (5.56 ton/ha) and lowest yield loss (17.68%) were observed in aluminium foil as reflective mulch. Neem leaf extract effectively decreased the number of aphids per leaf. Total yield negatively correlated to CMV incidence and severity with 74.2% and 95.7% yield reduction respectively, indicating that effective management of CMV will lead to higher yield.

Do climate-smart agricultural practices impact the livelihoods of vulnerable farmers in the Southern part of Bangladesh?

Author: Mohummed Shofi Ullah Mazumder

Year: 2024

Abstract: Efforts to reduce food insecurity must include building resilience in rural farmers to shocks. One way to achieve this is through climate-smart agriculture (CSA). This paper analyzes the impact of CSA on farmers' livelihoods. Data were collected in two phases in 2010 and 2018 from a study (CSA practitioners) and control group (CSA non-practitioners) of climate-affected farmers (240 farmers in each group) using a quasi-experimental survey design considering all possible biases. Descriptive statistics, variance inflation factor analysis, multiple regression, path analysis, FE-IV, and propensity score matching models were applied. Practicing CSA technologies improved food security and the incomes of the farmers through increased agricultural productivity. The impact of CSA technologies differed based on farmers' understanding of technologies, the time and amount of financial support, availability of extension staff, the provision of technical and other logistical support, and CSA practitioners' experience, such as knowing how to enhance plant resilience. Specific policy interventions, including financing of CSA, would benefit rural farmers. CSA provides a path towards sustainable livelihood development and food security. These findings will be useful for policymakers, planners, administrators, and development workers.

Biochar Outperforms Biochar-Compost Mix in Stimulating Ecophysiological Responses and Enhancing Soil Fertility under Drought Conditions

Author: Mirza Hasanuzzaman

Year: 2024

Abstract: Purpose: Biochar (BC) can directly enhance soil fertility, thereby improving land productivity and crop health and restoring degraded lands. This study aims to investigate the potential of BC, alone or combined with compost (Co), to improve soil properties and plant drought tolerance, promoting sustainable agriculture amidst climatic and anthropogenic challenges. Methods: Phragmites karka was cultivated in a controlled greenhouse with treatments: (i) 0% BC [control, well-watered, 65% water holding capacity (WHC)], (ii) 0% BC (drought), (iii) 1.5% BC (drought), and (iv) 1.5% BC + 1.5% Co (drought). Plant growth, water relations, mineral content, carbon and nitrogen content, proline, soluble sugars, gas exchange, chlorophyll, fluorescence, and soil respiration were measured using standard protocols and advanced instruments. Results: Applications of BC or BC + Co improved soil fertility, plant dry biomass, number of tillers, leaf development, and root-to-shoot ratio. Biochar-treated plants showed better leaf water and osmotic potential, essential for turgidity and growth. Biochar also increased leaf proline, soluble sugars, and Ca2+, Mg2+, and K+/Na+ ratios, enhancing osmotic adjustment and nutrient acquisition of plants. Net photosynthesis, carbon metabolism, photochemical efficiency, and electron transport rate were higher with BC under drought, outperforming the BC-Co mix. Both treatments significantly boosted soil respiration, enhancing soil fertility and drought resilience more effectively than unamended soils. Conclusion: Our results show that amending soil with 1.5% BC was more effective in improving plant drought tolerance than a mixture of BC and compost for maximum water management, allowing P. karka to grow under water-limited environments.

Livestock farming and women empowerment in rural Bangladesh: a mixed method approach

Author: Md. Sadique Rahman

Year: 2024

Abstract: Background In Bangladesh, livestock farming is not only a major source of animal protein, but it also provides opportunities for women to contribute to household income. Therefore, this study was undertaken to identify the empowerment status of women livestock farmers, factors influencing women's participation in livestock farming and its impact on women's empowerment. Methods The study was conducted in the Mymensingh district (administrative unit) of Bangladesh, due to the active participation of women in livestock farming activities. A total of 200 women were surveyed between May to November 2018. Additionally, prior to the final survey, 02 Focus Group Discussions (FGDs) were performed to gain insight into the context of the study areas. Furthermore, a total of 12 semi-structured in-depth interviews were performed with 12 experienced women livestock farmers to collect data regarding the challenges they encounter in livestock farming. Women empowerment was measured using four domains: decision-making process, ownership of assets, social and political awareness, and freedom of mobility. Descriptive statistics, and Heckman's endogenous treatment effect model were applied to analyze the data. Results The results revealed that majority (75%) of women who are involved in livestock farming had a medium level of empowerment. Women's decision to participate in livestock farming was positively influenced by farm size, knowledge, extension contact, and training. According to the average treatment effect on the treated (ATT) value, the empowerment status of women is 16 points higher among participants in livestock farming

compared to non-participants. Furthermore, women in rural areas face several obstacles such as economic issues and inadequate marketing facilities, which may prevent them from engaging in livestock farming. Conclusions Educating women through raising awareness and providing training is warranted because there is a notable disparity in the empowerment status of women who are and are not involved in livestock farming. This will help women improve their social awareness, decision-making capacity, and mobility. Livestock initiatives that encourage women's involvement could be generated by various rural-focused organizations.

Selenium and its nanoparticles modulate the metabolism of reactive oxygen species and morpho-physiology of wheat (Triticum aestivum L.) to combat oxidative stress under water deficit conditions

Author: Mirza Hasanuzzaman & Md. Sarwar Hosen

Year: 2024

Abstract: Background Wheat (Triticum aestivum L.) is one of the most important cereal crop species worldwide, but its growth and development are adversely influenced by drought stress. However, the application of trace elements is known to improve plant physiology under water-limited conditions. In this study, the effects of drought stress on wheat plants were investigated, with a focus on potential mitigation by foliar application of selenium nanoparticles (Se(np)) and sodium selenate (Na2SeO4). The experiment was conducted in a net house using a completely randomized design with four replications. The treatments involved three levels of drought stress (mild, moderate, and severe) started at 30 days after sowing (DAS), with foliar sprays of Se(np) and Se (both 25 µM) initiated at 27 DAS and repeated 4 times at 7-day intervals until 55 DAS. Results Drought stress significantly reduced plant growth, whereas Se(np) and Se sprays enhanced it. Drought stress induced chlorophyll degradation, increased malondialdehyde and hydrogen peroxide levels, impaired membrane stability, and caused electrolyte leakage. Severe drought stress reduced the levels of antioxidants (e.g., proline, ascorbate, and glutathione by 4.18-fold, 80%, and 45%) and the activities of antioxidant enzymes (ascorbate peroxidase, dehydroascorbate reductase, and others). Conversely, treatment with Se(np) and Se restored these parameters, for example, 1.23-fold higher total chlorophyll content with Se(np) treatment, 26% higher APX activity with Se treatment, 15% lower electrolyte leakage with Se treatment in wheat plants under severe drought stress. This Se-associated enhancement facilitated rapid scavenging of reactive oxygen species and reduced methylglyoxal toxicity, thereby diminishing oxidative stress and positively affecting the morphophysiological and biochemical responses of the plants under drought. Conclusions Drought-stressed wheat plants exhibited reductions in physiological processes, including water uptake and photosynthetic activity. However, Se(np) and Se applied at 25 µM mitigated the detrimental effects of drought. The application of Se(np) was notably more effective than the application of Se in mitigating drought stress, indicating the potential of the application of Se(np) as a sustainable agricultural practice under water-limited conditions.

Climate-smart agriculture and food security in climate-vulnerable coastal areas of Bangladesh

Author: Monoj Kumar Majumder ,MdSadique Rahman, Ripon Kumar Mondal &MstShopna Akter

Year: 2024

Abstract: The issue of global climate change is increasingly worrisome, particularly for countries heavily reliant on agriculture. To reduce the negative impact of climate change on agriculture, farmers of Bangladesh started adopting different climate smart agriculture (CSA) practices. The CSA sustainably increases productivity, resilience, and food security, which can contribute to the achievement of a number of sustainable development goals (SDGs). However, the adoption of CSA is low especially in the climate-vulnerable coastal areas of Bangladesh. Therefore, this study was conducted to identify the factors affecting the adoption of CSA and its influence on coastal household's food security. A total of 327 sample farmers from three coastal districts of Bangladesh were interviewed. The collected data were then analyzed by using the binary probit and ordered probit model. The findings indicated that highest 65 % of farmers adopted early planting of rice as one of CSA practices. The adoption of CSA practices positively affected by the household annual income, extension services and awareness regarding CSA practices. Moreover, the adopters of CSA were more food secure than non-adopters. For instance, adoption of one additional CSA practice leads to an increase in the likelihood of being food secure by 4.3 %. In terms of policy perspective, the adoption of CSA in the coastal areas can be increased through creation of employment opportunities, increasing access to extension services, and broadcasting of CSA-related programs on mass media.

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.

Impact of contemporary management practices in pond fish farming on the socio-economic condition of fish farmers in north-central Bangladesh

Author: Koushik Chakroborty & Jahid Hasan

Year: 2024

Abstract: Aquaculture in Bangladesh has greatly improved diet structure, ensured food safety, and facilitated the transformation of fisheries growth mode. The study aimed to investigate the existing management techniques of fish farming in ponds and assess its impact on the socioeconomic status of fish farmers in the Trishal upazila (sub-district), Mymensingh, a region in north-central Bangladesh, from

January to June 2023. Data were collected using a well-structured questionnaire. The majority of farmers (62.50%) had ponds that were 0.5-1.0 ha in size. Over half of the farmers (52.50%) practiced monoculture, with catfish comprising 37.13%. The average stocking density was 50,000-65,000 fry ha-1 With conventional post-stocking management, the majority of farmers (90%) utilized probiotics, and 87.50% used vitamins and minerals. Around 90% had formal education, and most individuals resided in standard housing. All participants had access to electricity and potable water, 96% had adequate sanitary facilities, and 95% of the farmers had proper healthcare facilities. Half of the farmers (50%) were involved in fish farming as their primary occupation. Most farmers (75%) earned an annual income ranging from 700 to 1,300 USD, and a significant 90% invested their own funds into fish farming. More than half of the farmers (55%) received technical assistance from their neighbors. Fish farming in the region has intensified, and the existing management practices have led to enhanced production, thus benefiting the livelihoods of the fish farmers. However, achieving long-term sustainability necessitates a supply of high-quality fry, cost-effective and high-quality feed, comprehensive training, and effective marketing strategies.

Breaking Barriers: Strategies for Overcoming Constraints Faced by Women-led Small-scale Dairy Farm Entrepreneurs in Rural Bangladesh

Author: Nushrat Jahan, Md Mahbubul Alam, Md Sekender Ali, Mohammed Shofi Ullah Mazumder, Md Mizanur Rahman Sarker & Sharjana Akter Shaba

Year: 2024

Abstract: Rural household-based dairy farming is a crucial component of meeting the national demand for nutrition. Despite the significant contributions women have made to agriculture, particularly in dairy farming, gender discrimination persists in access to resources and services, making it challenging to operate dairy farming effectively. An exploratory qualitative research project was conducted in four different areas of Panchgarh district in Bangladesh to identify the constraints rural women face in dairy farming and gather their suggestions for overcoming them. Data was collected through Focus Group Discussions and analyzed using NVivo v.14, revealing six recurring constraints: high input prices, financial challenges, inadequate marketing facilities, limited training opportunities, inadequate livestock health services, and lack of social support. To address these constraints, women in dairy farming expressed a desire for effective support in financial, marketing facilities, training, livestock health treatment, and community support, which may motivate them to continue farming and even strengthen their entrepreneurship. For this, policymakers must prioritize finding ways to provide work-life balance for rural dairy women to sustain dairy entrepreneurship among them. Both government organizations and non-governmental organizations must also ensure comprehensive financial, institutional, and social support systems. Developing an action plan to address these suggestions and implementing appropriate actions is nothing but a demand of time.

Partitioning water footprints of rice for assessing their implications in the face of climate change in Bangladesh

Author: Mostafijur Rahman

Year: 2024

Abstract: To improve rice yields while conserving water and minimizing environmental impact, a lysimeter experiment was conducted at Bangladesh Agricultural University's field irrigation laboratory in

Mymensingh. This study, spanning 2018–2020, aimed to measure the water footprint (WF) of the Aman-Boro-Aman rotation, considering green water footprint (GWF; rainwater) and blue water footprint (BWF; irrigation water), with a focus on climate change implications. Various irrigation methods, including rainfed and several interval-based irrigations (I9D–irrigation applied after nine days of ponded water disappearance, I6D, I3D, I3D + NP–I3D with no percolation allowed, and I1D), were evaluated. Results showed rainfed treatments had higher GWF (1155–1575 L/kg) due to reliance on inconsistent rainfall, while irrigated ones had lower GWF (375–1084 L/kg) but increased BWF, notably I1D with the highest BWF (2675 L/kg). This contrast highlights significant water usage differences among irrigation methods. The total water footprint (TWF) varied, with rainfed methods showing 1460–1960 L/kg and I1D the highest at 3603 L/kg. The consumptive water footprint ranged from 734 L/kg (I3D + NP) to 1097 L/kg (rainfed), indicating the efficiency of no-percolation strategies in water conservation. This also led to improved nutrient availability, resulting in higher plant height and rice yield. Seasonal variations in TWF were also observed, with the Aman season showing greater variability than the Boro season due to differences in rainfall and irrigation practices. The study underscores the importance of managing irrigation frequency, timing, and percolation for optimizing rice water footprints under changing climatic conditions.

Drought Stress Tolerance in Rice: Physiological and Biochemical Insights

Author: Sujat Ahmed & Pallab Ghosh

Year: 2024

Abstract: Rice (*Oryza sativa* L.), an important food crop, necessitates more water to complete its life cycle than other crops. Therefore, there is a serious risk to rice output due to water-related stress. Drought stress results in morphological changes, including the inhibition of seed germination, reduced seeding growth, leaf area index, flag leaf area, increased leaf rolling, as well as the decrement of yield traits, such as plant height, plant biomass, number of tillers, and 1000-grain yield. Stress also causes the formation of reactive oxygen species (ROS) such as O_2^-, H_2O_2, and OH^-, which promote oxidative stress in plants and cause oxidative damage. The process of oxidative degradation owing to water stress produces cell damage and a reduction in nutrient intake, photosynthetic rate, leaf area, RWC, WUE, and stomatal closure, which may be responsible for the decrement of the transpiration rate and plant dry matter under decreasing soil moisture. Plants have the ability to produce antioxidant species that can either be enzymatic (SOD, POD, CAT, GPX, APX) or non-enzymatic (AsA, GSH) in nature to overcome oxidative stress. During drought, several biochemical osmoprotectants, like proline, polyamines, and sugars, can be accumulated, which can enhance drought tolerance in rice. To meet the demands of an ever-growing population with diminishing water resources, it is necessary to have crop varieties that are highly adapted to dry environments, and it may also involve adopting some mitigation strategies. This study aims to assess the varying morphological, physiological, and biochemical responses of the rice plant to drought, and the various methods for alleviating drought stress.

Application of a count regression model to identify the risk factors of under-five child morbidity in Bangladesh

Author: Iqramul Haq

Year: 2024

Abstract: Bangladesh has seen a significant decline in child mortality in recent decades, but morbidity among children <5 y of age remains high. The aim of this analysis was to examine trends and identify risk factors related to child morbidity in Bangladesh. Methods This analysis is based on data from four successive cross-sectional Bangladesh Demographic and Health Surveys for the years 2007, 2011, 2014 and 2017–18. Several count regression models were fitted and the best model was used to identify risk factors associated with morbidity in children <5 y of age. Results According to the results of the trend analysis, the prevalence of non-symptomatic children increased and the prevalence of fever, diarrhoea and acute respiratory infections (ARIs) decreased over the years. The Vuong's non-nested test indicated that Poisson regression could be used as the best model. From the results of the Poisson regression model, child age, sex, underweight, wasted, stunting, maternal education, wealth status, religion and region were the important determinants associated with the risk of child morbidity. The risk was considerably higher among women with a primary education compared with women with a secondary or greater education in Bangladesh. Conclusions This analysis concluded that child morbidity is still a major public health problem for Bangladesh. Thus it is important to take the necessary measures to reduce child morbidity (particularly fever, diarrhoea and ARI) by improving significant influencing factors.

Does the adoption of homestead gardening increase dietary diversity in climate-vulnerable coastal areas? Evidence from Bangladesh

Author: Md. Sadique Rahman & Mofasser Rahman

Year: 2024

Abstract: Coastal areas are not conducive to cultivating a variety of crops due to the occurrence of natural disasters. Therefore, homestead gardening has the potential to increase food production and consumption in coastal households, thereby enhancing climate resilience. Adopting homestead gardening as an adaptation measure for climate change can improve food security in climate-vulnerable areas. This study identified factors associated with the adoption of homestead gardening and their impacts on dietary diversity in coastal areas of Bangladesh. A total of 750 coastal households were surveyed. To analyze the data, descriptive statistics, household dietary diversity score, endogenous switching regression model, and propensity score matching method were applied. According to the results, only 14.26% of coastal households adopted homestead gardening. The likelihood of adoption was increased by factors, such as age, spousal education, own cultivable land size, salinity perception, and mobile phone ownership. Results of the endogenous switching regression model indicated that the adopters of homestead gardens had a 13-point greater mean probability of a higher household dietary diversity score than the non-adopters. Results of the propensity score matching also showed a nearly identical finding. A strong extension service that uses modern information technology is required to disseminate homestead gardening technology in coastal areas. Climate change awareness initiatives are recommended to raise households cognizance on the negative effects of climate change, which in turn helps increase the adoption of homestead gardening as an adaptation measure.

Salinity negatively correlates with the production and immunity of chicken: A molecular insight for food security and safety issues

Author: Subrato Biswas, Md Abdul Masum, Sujan Kumar Sarkar, Basant Saud, Rupa Akter, K.B.M. Saiful Islam, Shah Jungy Ibna Karim, Maksuda Begum

Year: 2024

Abstract: Salinity intrusion into the freshwater system due to climate change and anthropogenic activities is a growing global concern, which has made humans and domesticated animals more susceptible to diseases, resulting in less productivity. However, the effects of salinity on domesticated and wild birds, especially in terms of production and immunity, have not been fully elucidated yet. Therefore, this study was designed to examine the effects of salinity on the production and immunity of birds and the mechanisms by which immunity is compromised. Broiler chicks were subjected to different concentrations of salty water (control = normal water, treatment = 5 g/L, treatment = 10 g/L, and treatment = 15 g/L). The collected blood and organs from different groups of broilers were biochemically and histopathologically examined. Birds in salt-treated groups consumed significantly less feed than the control group, while the feed conversion ratio (FCR) was significantly higher. Body weight gain was significantly lower in salt-treated groups compared to control. Serum analysis revealed a lower systemic antibody titer in the salt-treated groups compared to the control. Primary lymphoid organs (thymus and bursa of Fabricius) were reduced in size in the salt-treated group due to cellular migration and depletion from these organs. Importantly, most of the parenchyma of lymphoid organs was replaced with fibrotic tissue. Gut microbes, Escherichia coli (E. coli) and Salmonella spp., from salt-treated groups, showed less viability but developed antibiotic resistance. Levels of salinity were significantly and negatively correlated with feed intake, body weight gain, antibody titer, lymphoid organ size, and viable count of gut microbes, while FCR, fibrosis of lymphoid organs, and antibiotic resistance were significant positively correlated. In conclusion, increased salinity is a possible threat to food security and safety as it decreases body weight gain, reduces immunity, and influences the development of multi-drug resistance in gut microbes.

Farmers’ Satisfaction with Agricultural Extension: A Service Quality-based Assessment

Author: Md. Mahbubul Alam

Year: 2024

Abstract: The study assessed agricultural extension service through farmers satisfaction. Hierarchical regression analysis was used to predict SERVQUAL model's contribution. The study compared SERVQUAL dimensions with traditional socioeconomic attributes in measuring satisfaction ABSTRACT With an aim to contribute to the methodology in Agricultural Extension research and draw extension professionals' attention to evaluating farmers' satisfaction with extension service delivery, this research presents a comparative evaluation of the traditional research approach, which treats farmers' selected socioeconomic characteristics as the predictor variables against SERVQUAL five-dimensions (i.e., tangibility, reliability, assurance, responsiveness, and empathy). The study was carried out from 2022-2023 and data used in this research were collected from August 01 to August 15, 2022. Stratified random sampling was used to select 120 farmers from two unions of the Savarupazila (i.e., sub-district) of Dhaka district, Bangladesh, and analyzed using hierarchical regression analysis. Results revealed that without using SERVQUAL dimensions, farmers' socioeconomic characteristics explained 30.9 per cent of the variance of their satisfaction when SERVQUAL dimensions were not used. However, this percentage increased to 61.8 per cent upon adding SERVQUAL dimensions to the model. Therefore, the findings provide a novel dimension for further research on farmers' satisfaction with agricultural extension and evaluate similar agriculture-based rural development programs.

Improvement in yield attributes and fatty acids composition in the derivative hybrids compared to their respective parents in Indian mustard (Brassica juncea L.)

Author: Niloy Gain, Fatema Tuj Johora, Jamilur Rahman

Year: 2024

Abstract: Erucic acid, more than 2 %, in mustard seed oil is considered unhealthy as edible oil, and also anti-nutritional for human consumption. The existing mustard varieties of Bangladesh contain 40–48 % erucic acid, which is a big concern for the country's nutritional, and food security and safety. Hence, to improve the seed oil quality of the existing variety, six popular cultivars of Brassica juncea mustard were crossed with a canola-grade line in 7 × 7 half diallel fashion, and the developed 21 F1 hybrids were assessed for yield contributing traits, and fatty acids composition. Variables with significant variations were found, while days to siliquae maturity, plant height, days to first flowering, and seeds per siliquae have moderate narrow sense heritability. The estimated gene action indicated that dominant or over-dominant gene action was more prominent in governing the traits. The parents, P1, P3, and P4 were discovered the best general combiners for early maturity and short phenology, whereas P2 and P7 were found to be the best general combiners for yield-attributing traits. Moreover, the hybrids P1 × P4, P1 × P6, P2 × P7, P4 × P6 and P3 × P5 were chosen as the promising hybrids due to their best specific combining ability, and desired heterotic effects on yield contributing traits. In addition, a significant decrease, on average 30–40 %, in erucic acid, but an approximately 20–25 % increase of oleic acid was found among the hybrids, in which the hybrids P1 × P6–S1, P5 × P6–S2 and P5 × P6–S4 demonstrated a better stability index. Overall, the obtained findings suggested that the hybrids, viz. P1 × P5, P1 × P6, P2 × P3, P2 × P7, P4 × P6, P5 × P6, and P6 × P7 were promising based on their early maturity, high-yielding, reduced erucic acid, and high oleic acid contents.

Designing and development of agricultural rovers for vegetable harvesting and soil analysis

Author: AFM Jamal Uddin

Year: 2024

Abstract: To address the growing demand for sustainable agriculture practices, new technologies to boost crop productivity and soil health must be developed. In this research, we propose designing and building an agricultural rover capable of autonomous vegetable harvesting and soil analysis utilizing cutting-edge deep learning algorithms (YOLOv5). The precision and recall score of the model was 0.8518% and 0.7624% respectively. The rover uses robotics, computer vision, and soil sensing technology to perform accurate and efficient agricultural tasks. We go over the rover’s hardware and software, as well as the soil analysis system and the tomato ripeness detection system using deep learning models. Field experiments indicate that this agricultural rover is effective and promising for improving crop management and soil monitoring in modern agriculture, hence achieving the UN’s SDG 2 Zero Hunger goals.

Synergistic effects of biochar and potassium co-application on growth, physiological attributes, and antioxidant defense mechanisms of wheat under water deficit conditions

Author: Md. Shah Newaz Chowdhury

Year: 2024

Abstract: Global wheat production faces a severe threat from drought stress, necessitating innovative strategies for enhanced crop resilience. This study examined the synergistic impact of biochar and potassium co-application on the growth, physiological attributes, and antioxidant defense system of wheat under water deficit conditions at crown root initiation (CRI), anthesis, and grain development stage. Drought-induced reactive oxygen species (ROS) accumulation, particularly pronounced at the CRI stage, adversely affected all growth stages. At CRI, co-application of biochar and foliar potassium delivered significant improvements in growth parameters, including increased plant height (15.4%), spike length (50%), grain yield (43.0%), photosynthetic performance (chlorophyll content 125.8%), and relative water content (11.2%), compared to untreated drought-exposed counterparts. The combined application of biochar and potassium effectively reduced hydrogen peroxide production, electrolyte leakage, proline accumulation, and malondialdehyde generation, while increasing relative water content and glutathione levels under both well-irrigated and drought stress conditions. Furthermore, the combined biochar and potassium treatment was effective in mitigating oxidative stress and enhancing physiological resilience in wheat, particularly during the anthesis stage of drought stress. Specifically, the combined treatment ameliorated the effects of drought by reducing ROS levels through enhanced antioxidant enzyme activities and elevating osmoprotectants levels. The synergistic modulation of tissue osmotic balance and relative water content holds promise for mitigating drought-induced stress, offering an innovative and practical strategy for resilient wheat production in water-limited environments.

Economic viability of releasing Bt cotton in Bangladesh: An early insight

Author: Md. Hayder Khan Sujan, Mohammad Mizanul Haque Kazal & Md. Sadique Rahman

Year: 2024

Abstract: Insect resistant genetically modified Bt cotton (containing a gene of Bacillus thuringiensis) has substantial potentiality of mounting cotton productivity. This study unveils an early insight on the economic viability of Bt cotton in Bangladesh. A total of 248 traditional cotton farmers and 8 Bt cotton experimental fields were surveyed in April 2022 for achieving the objectives. The data were analysed using descriptive statistics. Findings showed that the cost of Bt cotton production was slightly higher than that of conventional cotton. However, Bt cotton yielded a productivity increase of 0.81 t/ha. The cultivation of Bt cotton resulted in a higher net return (USD 2436/ha) compared to conventional cotton (USD 1624/ha). The results further indicated that the use of insecticides and pesticides in Bt cotton was significantly lower compared to traditional cotton, thereby contributing to the preservation of the natural environment. Overall, cultivation of Bt cotton is economically viable and may generate environmental benefits. Steps are warranted to disseminate and expand its cultivation.

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

Author: 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.

Influence of Effective Irrigation Water Usage on Carrot Root Productivity and Quality Properties in Soilless Culture

Author: Md. Dulal Sarkar & Sarmin Akter

Year: 2024

Abstract: The availability of irrigation water is becoming an increasingly significant concern for crop production in urban areas of Southeast Asia, particularly in Bangladesh. To ensure optimal plant growth and development, it is essential to establish precise irrigation scheduling. Therefore, this study examines the effects of limited irrigation usage on the root quality, production, and morphophysiological features of carrots grown under soilless conditions. Irrigation treatments were in intervals of 200 mL 3-day, 250 mL 2-day, 300 mL 3-day, and 350 mL 4-day. Plants were grown on biodegradable substrates, including cocopeat, sawdust, rice husk, and a mixture of all three with 10% wood ash and 40% cow dung following a randomized complete block design (RCBD). Significant differences in root yield and quality of carrots were observed by irrigation water levels and media types. The yield and quality attributes decreased most when they were subjected to reduced watering, accompanied by a decline in morphological traits (plant height, leaf number, root mass, root length, and diameter) and physiological aspects (relative water content, membrane stability index, and chlorophyll content of leaves). Root quality metrics, i.e., brix, vitamin C, sugar content, beta-carotene, and phenolic content, were also influenced by the frequency of irrigation water used. Root yield and irrigation water usage efficiency were highest with the 2-day interval of 250 mL treatment. The growing media, cocopeat, was found to have acceptable levels of water-holding capacity (87.73%), porosity (69.80%), bulk density (0.10 g cm−3), pH (6.73), and EC (0.14 dSm−1), allowing for optimal carrot growth and development. Watering the plants with 250 mL every 2 days was the best irrigation schedule for growing carrots under a cocopeat-based growth medium, ensuring effective carrot root production considering quality and water use efficiency.

Salt stress tolerance in rice (Oryza sativa L.): A proteomic overview of recent advances and future prospects

Author: Mohammad Shah Jahan

Year: 2024

Abstract: Salt stress is one of the major impairments to agricultural soil that significantly reduces growth and productivity in rice (Oryza sativa L.) and other crop plants. The proteomic mechanisms underlying salt stress tolerance in rice have not been well established. Therefore, a comprehensive understanding of

molecular mechanisms associated with salt signaling, salt-toxicity detoxification, and other metabolic mechanisms is essential for elucidating salt tolerance mechanisms in rice as well as ensuring global food security. Recent proteome studies have provided a global proteomic signature of rice cultivars. Integrative studies of proteomic, physiological, and molecular responses under salt stress have provided detailed mechanisms associated with salt stress tolerance in rice. This review explores the proteomic mechanisms with finely-tuned salt-responsive networks in this cereal. Several proteomic processes, including salt sensing and signaling, scavenging of reactive oxygen species (ROS) and stress defense, salt compartmentalization and homeostasis, alterations of cell wall components, modulation of the cytoskeleton, regulation of salt-responsive genes, transcription factors, and protein synthesis, protein folding and processing, protein degradation, and strategies of carbohydrate and energy metabolism for organ development, elucidate extensive molecular mechanisms linked to salt stress responses and tolerance in rice. Further, it is updated the prospects of salt stress tolerance in rice using multi-omics and CRISPR/Cas approaches. These finely-tuned molecular insights will be beneficial to rice breeders and farmers for developing high-yielding, salt-tolerant rice cultivars to achieve global food security.

Decreased Photosynthetic Efficiency in Nicotiana tabacum L. under Transient Heat Stress

Author: Mirza Hasanuzzaman

Year: 2024

Abstract: Heat stress is an abiotic factor that affects the photosynthetic parameters of plants. In this study, we examined the photosynthetic mechanisms underlying the rapid response of tobacco plants to heat stress in a controlled environment. To evaluate transient heat stress conditions, changes in photochemical, carboxylative, and fluorescence efficiencies were measured using an infrared gas analyser (IRGA Licor 6800) coupled with chlorophyll a fluorescence measurements. Our findings indicated that significant disruptions in the photosynthetic machinery occurred at 45 °C for 6 h following transient heat treatment, as explained by 76.2% in the principal component analysis. The photosynthetic mechanism analysis revealed that the dark respiration rate (Rd and Rd*CO2) increased, indicating a reduced potential for carbon fixation during plant growth and development. When the light compensation point (LCP) increased as the light saturation point (LSP) decreased, this indicated potential damage to the photosystem membrane of the thylakoids. Other photosynthetic parameters, such as AMAX, VCMAX, JMAX, and ΦCO2, also decreased, compromising both photochemical and carboxylative efficiencies in the Calvin–Benson cycle. The energy dissipation mechanism, as indicated by the NPQ, qN, and thermal values, suggested that a photoprotective strategy may have been employed. However, the observed transitory damage was a result of disruption of the electron transport rate (ETR) between the PSII and PSI photosystems, which was initially caused by high temperatures. Our study highlights the impact of rapid temperature changes on plant physiology and the potential acclimatisation mechanisms under rapid heat stress. Future research should focus on exploring the adaptive mechanisms involved in distinguishing mutants to improve crop resilience against environmental stressors.

Mechanistic Basis of Silicon Mediated Cold Stress Tolerance in Alfalfa (Medicago sativa L.)

Author: Mohammad Shah Jahan

Year: 2024

Abstract: Cold stress (CS) impact on crops is one of the critical constraints for sustainable and smart agricultural production. CS adversely affects plants leading to growth retardation, necrosis, chlorosis, and significant yield loss. The objective of this study was to explore the mechanistic basis of silicon (Si) in enhancing CS tolerance in alfalfa plants. The fluorescence staining indicated that Si-reduced the intensity of CS-induced superoxide radical (O2•–) and hydrogen peroxide (H2O2) generation in plants that improved plant photosynthesis, cellular integrity, and alfalfa biomass production under CS. The exogenous supplementation of Si significantly restored the endogenous Si status accompanied by the upregulation of NIP (nodulin 26-like intrinsic protein) genes NIP2, NIP5;1, and NIP6;1 in alfalfa. The elemental concentration analysis revealed that exogenous silicon (E-Si) triggers the increase of calcium (Ca), magnesium (Mg), and sulfur (S) in plants subjected to Si-supplementation compared to the plants cultivated without Si under CS. The application of Si significantly increased the activity of antioxidant enzymes including superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX), and glutathione reductase (GR). Furthermore, Si significantly enhanced the expression of CS-responsive candidate genes including ICE1, CBF1/DREB1C, CBF2/DREB1B, CBF3/DREB1A, COR15A, COR47, and KIN1 in alfalfa. These findings together provide mechanistic insights into Si-involving CS tolerance in alfalfa. This eco-friendly SC management strategy using Si treatment can be useful to plant breeders and farmers for developing CS-resilient smart alfalfa production through breeding program.

Influences of Feed Additives for Sustainable Aquaculture Production in Asia: A Review

Author: JAHID HASAN

Year: 2024

Abstract: Aquaculture is considered as the primary source to increase fish supply in order to ensure food security and effectively address the nutritional needs of the growing population specially in Asian countries. The utilization of antibiotics in aquafeeds has been extensively employed in aquaculture of Asian region in order to prevent disease and promote growth. But due to various unfavorable consequences and growing acceptance of the benefits of restricted use of antibiotic administration in aquaculture, the necessity to consider alternate options is urgent. In light of this, the development of eco-friendly feed additives, particularly immunostimulants, for disease control and improved health of aquatic animals is gaining popularity in Asia. The utilisation of natural feed additives has the potential to enhance the efficiency of aquaculture production, reduce the need for medicated treatments, minimize waste discharges, and promote sustainability and long-term profitability. Various high-quality feeds, customized for specific needs, are now supplemented with essential feed additives in the Asian aquaculture industry. The recent focus on functional feed additives has led to the incorporation of probiotics, prebiotics, mycotoxin binders, organic acids, phytogenic compounds, and other medicinal herbs. These feed additives not only boost and support the general health of aquatic animals but also increase consumer confidence in farmed fish. The main objective of the present review is to emphasize the significance of functional feed additives in Asian aquaculture, as they play a vital role in regulating growth, optimizing feed utilization, and enhancing the overall health status of aquatic animals.

Climate-smart practice: level of effectiveness and determinants of Sorjan farming adoption in coastal Bangladesh

Author: Md. Hayder Khan Sujan, Monira Sultana

Year: 2024

Abstract: Climate-smart agriculture stands as a promising solution to elevate cropping intensity and enhance food security in climate-vulnerable communities. Despite the evident potential, there is an existing gap in understanding the effects of climate change adaptation measures, with limited research explicitly focusing on adopting sorjan cultivation. This study seeks to address this gap by delving into the effectiveness and determinants of sorjan farming in the coastal regions of Bangladesh. Data was collected in three south-central districts, namely Patuakhali, Jhalakathi, and Pirojpur in 2022. A total of 222 farmers participated in the study, with 120 practicing plain land cultivation, while the remaining 102 were engaged in sorjan farming. Results show that the cropping intensity of farm households increased from 100–200% to 300–500% in sorjan farming. Farmers earned the highest net return by following the crop combinations of 'Bottle gourd-Potato-Sweet gourd-Indian spinach', 'Banana-Okra-Snake gourd-Bottle gourd', and 'Jujube-Stem amaranth-Indian spinach' under the sorjan method in Patuakhali, Jhalakathi, and Pirojpur districts, respectively. On average, farmers realized an additional net benefit of Tk. 55 for every Tk. 100 invested upon transitioning from plain land farming (benefit cost ratio, BCR = 1.25) to sorjan cultivation (BCR = 1.80). The results of the logit model found that household size, farming experience, and extension contact positively influenced the adoption of the sorjan method, while farmers' age and farm size had a negative influence. Further analysis of challenges in both types of farming revealed the advantages of sorjan over plain land cultivation, categorizing them into four distinct areas: environmental, management, input-related, and market issues. Government policies should prioritize holistic support systems and foster collaborative knowledge-sharing among stakeholders to enhance the adoption and diffusion of sorjan farming in coastal communities. Graphical abstract.

Evaluation of growth and nutritional profile of microgreens of different crops under various LEDs light spectrums

Author: Swarna Mahajan, Minhazul Kashem Chowdhury, Sohel Rana Mazumder, Abul Hasnat M. Solaiman, Zerin Tasnim, S.M. Anamul Arefin and Jasim Uddain

Year: 2024

Abstract: Carefully selecting the appropriate lighting is vital for indoor farming systems to ensure sustainable agriculture and the production of microgreens rich in health-beneficial phytochemicals. This study aimed to investigate the impact of various light spectrums on the growth and nutritional composition of microgreens. The experiment focused on a single factor: five different concentrations of LED lights, specifically White light (L1) at 100%, Red light (L2) at 100%, Blue light (L3) at 100%, Red and Blue light (L4) at a 70:30 ratio, and Red, Green, and Blue light (L5) at a 70:10:20 ratio. Four microgreen crops were used: Mustard (C1), Lettuce (C2), Radish (C3), and Broccoli (C4). The results showed that the hypocotyl lengths of C1, C2, C3, and C4 were higher under the L4 light treatment (70:30 Red and Blue), measuring 10.53 cm, 8.47 cm, 15.23 cm, and 11.43 cm, respectively. The shorter hypocotyl lengths of 7.67, 5.53, 11.2 and 7.73 cm were observed under the L1 (White light) condition. The greater fresh weights for C1, C2, C3, and C4 (0.1 kg each) and yields (0.115 kg, 0.110 kg, 0.135 kg, and 0.125 kg, respectively) were also obtained under the L4 light condition. The higher SPAD values for C1 (38.2 nm), C2 (16.9 nm), C3 (55.3 nm), and C4 (49.9 nm) were recorded with the L4 light treatment. Additional findings included potassium

content for C1 (0.19%), C2 (0.19%), C3 (0.22%), and C4 (0.16%), and antioxidant capacity for C1 (0.22%), C2 (0.23%), C3 (0.19%), and C4 (0.18%). The higher gross income was achieved with the L4C1, L4C2, L4C3, and L4C4 treatments, while the lower was with the L1C1, L1C2, L1C3, and L1C4 treatments. The benefit-cost ratios were higher (4.1, 3.9, 4.9, and 4.5) for the L4C1, L4C2, L4C3, and L4C4 treatments, respectively. Therefore, a 70:30 Red and Blue light combination (L4) can be used profitably in indoor farming to maximize growth, yield, and nutritional content of microgreens.

Increasing Boro rice productivity through credit: Evidence from Bangladesh

Author: Shah Johir Rayhan & Md. Sadique Rahman

Year: 2024

Abstract: Rice productivity needs to be increased to feed Bangladesh's growing population. Productivity can be increased by adopting improved varieties and management practices, which require additional capital inputs. In this article, we aim to estimate the effect of formal and semiformal credit on rice productivity in Bangladesh. We surveyed 500 rice farmers to achieve these objectives. We used descriptive statistics, propensity score matching and Heckman's endogenous treatment effect model to analyse the data. The findings indicate that literacy, television ownership and training positively influenced access to formal credit. In general, credit recipients achieved higher productivity than did non-recipients. In the situation of credit source-specific effect, we found mixed results. Given the estimated difference of 438 kg/ha to 495 kg/ha, the results indicated that formal credit recipients had significantly higher productivity than did formal credit non-recipients. In contrast, endogenous treatment effect model results suggested that both formal and semiformal sources of credit had a significant effect on rice productivity. Increased agricultural loan disbursement through formal and semiformal credit institutions is strongly advocated. Farmers' decision-making abilities regarding the most effective source of credit can be improved through training in financial literacy. The central bank of Bangladesh, along with the credit regulatory authorities of non-governmental organizations, can implement appropriate agricultural credit programmers' for farmers.

Catastrophic risk perceptions and attitudes in aquaculture: Evidence from flood prone areas of Bangladesh

Author: Airin Rahman

Year: 2024

Abstract: Aquaculture is still an emerging industry that is highly dependent on the environment and more unstable than other conventional agricultural operations. Diverse environmental and production hazards must be managed by aquaculture farmers for sustainability. Farmers' decisions on farm operations and risk management are significantly influenced by their risk attitudes and perceptions of risk. However, few empirical studies on risk management have been done, but literature on aquaculture is scarce. In light of this knowledge vacuum, the current study investigated how farmers perceive catastrophic risk and their attitudes toward various sources. The information was gathered using a stratified random sample method, with 300 aquaculture farmers interviewed from two major flood-prone regions in Bangladesh. A cubic utility function and the Equally Likely Certainty Equivalent (ELCE) approach were used to quantify farmers' risk aversion. The risk matrix technique was used to assess farmers' perceptions of risk. The effects of socioeconomic factors on farmers' risk attitudes were examined using a Logit model. Floods, strong rains, and pest and diseases all posed potential productivity hazards and most farmers were risk averse in

nature. Age, educational position, income, and land proprietorship were the most important predictors of risk attitude, while social and agricultural characteristics had little influence on farmers' risk perceptions. The study's findings will eventually allow policymakers to forecast the suitable risk management measures for the aquaculture farmers in Bangladesh.

Farmers perspectives on options for and barriers to implementing climate resilient agriculture and implications for climate adaptation policy

Author: Shilpi Kundu

Year: 2024

Abstract: The impacts of climate change in low lying coastal areas, such as Bangladesh, are adversely affecting food and livelihood security, requiring adaptation to build resilience. However, effective implementation is limited by a lack of local-level knowledge regarding the barriers that prevent adoption and up-scaling of climate resilient agriculture (CRA). Case studies in coastal Bangladesh provide novel insights regarding barriers to planned and autonomous adaptation from the perspective of farmers facing multiple climate change impacts across seven key dimensions of CRA (agrometeorology services, water management practices, nutrient management activities, technologies and knowledge management activities, infrastructure development, socio-economic resilience, and institutions and good governance). Farmers generally perceive that adaptation actions increase resilience in crop production systems and their surrounding social systems, but also identify the important barriers that inhibit or constrain planned and autonomous adaptation opportunities. Planned adaptation actions are perceived to be limited by institutional arrangements and lack of implementation capacity. Autonomous adaptation was found to be dependent on income level, farm-holding size, access to input resources and services and peer/social influences. Planned and autonomous adaptation actions were both affected by specific social and geographic contexts and cultural factors. Recommendations are suggested to address key constraints and thereby promote CRA in coastal agricultural landscapes in Bangladesh and in other developing countries confronting similar challenges.

Optimizing growth, yield, and nutritional quality of Chinese cabbage through vermicompost and reduced fertilizer application in organic farming systems

Author: Nishat Islam, Minhazul Kashem Chowdhury, Soumitro Biswas & Jasim Uddain

Year: 2024

Abstract: Chinese cabbage, though less prominent in Bangladesh, has shown potential for successful cultivation in the region. This study aimed to assess various cultivars' efficacy on Chinese cabbage growth, yield, and quality within an organic farming system. A field experiment employed a for two consecutive years, investigating the combined impact of cultivar and vermicompost with reduced fertilizer levels on yield. Three cultivars viz., BARIChinakopi 1, Blues, and Retasi, were tested along with four fertilizer levels namely, recommended NPK (control);80% NPK + vermicompost 6 t/ha; 70% NPK + vermicompost 8 t/ha; and 50% NPK + vermicompost 10 t/ha.Results demonstrated that cv. Blues, treated with 50% NPK + 10 t/ha of vermicompost, exhibited significant enhancements in various parameters compared to the control group. Notably, the treated var. Blues showcased increased plant height (43%), head diameter (46.3%), dry matter (71.2%), and gross yield (72.2%) at harvest. Moreover, var. Blues treated with vermicompost at 10 t/ha displayed elevated levels of vitamin C (28%),β-carotene (96.3%), Ca (7.1%), Mg (18.4%), P (5%), K

(10.5%), Fe (13.1%), and Zn (21%) compared to control. These findings suggest that utilizing 50% NPK + vermicompost at 10 t/ha significantly enhances Chinese cabbage growth and quality, particularly in cv. Blues. Incorporating this treatment method could effectively elevate both production yield and crop quality, providing valuable insights for organic farming practices.

Sustainable management of Spodoptera litura (Fab.) in tropical Sugar Beet

Author: Muhammad Abu Talha, M. M. Rahman, Ruhul Amin, Md. Emam Hossain & Md. Shahidul Islam Khan

Year: 2024

Abstract: Control of Spodoptera litura in the tropical sugar beet is a critical issue for sustainable agriculture. The purpose of this field experiment was to assess the efficacy of botanical and non-chemical techniques against S. litura to identify ecologically viable management alternatives. Spodoptera litura responded best to a neem oil solution at a concentration of 3.0 mL/L. In terms of insect infestation, the plot treated with neem oil outperformed the untreated control plot. The infection rates for plants, leaves, and beets were 5.66/plot, 5.33/plant, and 11.00/plot, respectively. In terms of larvae decrease over control, the plot treated with neem oil had the greatest effectiveness (84.33%), followed by pheromones, which had an efficiency of 80%. Plants treated with neem oil showed the highest Brix and Pol values (17.61% and 12.62%, respectively). Weight per beet was lowest in the control plot (690.33 g), and highest in the best treatment (791.33 g). It clearly shows that when insect infestation grows, beet yield falls. The control plot was unable to effectively resist S. litura, resulting in unhealthy sugar beet output. In contrast, eco-friendly techniques such as NPV spraying, Bio Neem Plus®, Tracer 45SC (spinosad), hand picking, light trap, and polythene mulching trap outperformed the control plot.

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.

Waste-derived nanobiochar: A new avenue towards sustainable agriculture, environment, and circular bioeconomy

Author: Mehedi Amin

Year: 2024

Abstract: The greatest challenge for the agriculture sector in the twenty-first century is to increase agricultural production to feed the burgeoning global population while maintaining soil health and the integrity of the agroecosystem. Currently, the application of biochar is widely implemented as an effective means for boosting sustainable agriculture while having a negligible influence on ecosystems and the environment. In comparison to traditional biochar, nano-biochar (nano-BC) boasts enhanced specific surface area, adsorption capacity, and mobility properties within soil, allowing it to promote soil properties, crop growth, and environmental remediation. Additionally, carbon sequestration and reduction of methane and nitrous oxide emissions from agriculture can be achieved with nano-BC applications, contributing to climate change mitigation. Nonetheless, due to cost-effectiveness, sustainability, and environmental friendliness, waste-derived nano-BC may emerge as the most viable alternative to conventional waste management strategies, contributing to the circular bioeconomy and the broader goal of achieving the Sustainable Development Goals (SDGs). However, it's important to note that research on nano-BC is still in its nascent stages. Potential risks, including toxicity in aquatic and terrestrial environments, necessitate extensive field investigations. This review delineates the potential of waste-derived nano-BC for sustainable agriculture and environmental applications, outlining current advancements, challenges, and possibilities in the realms from a sustainability and circular bioeconomy standpoint.