Message from the Chief Guest

I am delighted to learn that the Bangladesh Society of Plant Science and Technology (BSPST) is hosting its Third International Conference on February 23-24, 2024, at the Bangladesh Rice Research Institute (BRRI) in Gazipur.

Since its inception in 2020, BSPST has made remarkable strides by organizing two international seminars and demonstrating its commitment to advancing the field. Disciplines like plant physiology, ecology, morphology, taxonomy, and biodiversity form the cornerstone of plant production, protection, and improvement. By delving into these areas, we gain invaluable insights into stress management, breeding resilient crops, achieving climate-smart agriculture, and conserving irreplaceable plant genetic resources.

The conference's theme, "Plants for food security under changing climate" couldn't be more timely and more relevant. By sharing, discussing, and formulating recommendations, the conference will play a crucial role in boosting crop production and adoptingmeasures to mitigate the problemsof our changing climate, particularly in the unique context of Bangladesh. With over 70 abstracts submitted, I anticipate engaging presentations, insightful discussions, and valuable recommendations will ultimately benefit our farmers.

Professional societies like BSPST play a vital role in shaping the future of agriculture. From influencing course curricula and problem-solving strategies to training farmers and agro-entrepreneurs, your efforts in collaborative research will hold immense significance. It is evident that BSPST is actively pursuing this mission, and I commend your dedication.

I wish the “Third International Conference of the BSPST” a grand success with a great impact on agriculture.

Professor Emeritus Dr. A. K. Azad Chowdhury
President, The Bangladesh Academy of Sciences
Former Chairman (State Minister), The University Grants Commission of Bangladesh
Former Vice Chancellor, The University of Dhaka

Message from Special guest

I feel honoured to have the scope of participation in this crucial conference on " Plants for Food Security under Changing Climate".The theme resonates deeply with our mission to equip future generations with the knowledge and tools to ensure sustainable food production amidst an evolving climate.

The challenges before us are undeniable. Climate change casts a long shadow over our fields, threatening the very foundation of food security. Rising temperatures, erratic rainfall patterns, and extreme weather events disrupt traditional practices and jeopardize the livelihoods of millions. But within these challenges lies an opportunity for growth, for innovation, and collaboration.

This conference serves as a beacon of hope, bringing together the brightest minds in plant science, technology, and policy. Through focused research on climate-resilient crops, efficient water management systems, and advanced breeding techniques, we can cultivate solutions that nourish communities and safeguard our environment.

Equally critical is empowering the next generation of agricultural leaders. We are committed to equipping our students with the latest knowledge and skills, fostering a spirit of innovation and entrepreneurial thinking. Through collaborations like this conference, we can ensure that young minds are actively engaged in finding solutions to real-world challenges.

However, technology and education alone are not enough. We must build bridges between research and practice, translating scientific advancements into tangible benefits for farmers on the ground. We must work hand-in-hand with policymakers, creating an enabling environment that incentivizes sustainable practices and promotes equitable access to resources.

Abiotic and biotic elements interact with the plants which createsfavourable or unfavourable conditions. A sustainable balanced physiological adaptation is needed through genetic support and adjustment.So, advanced research in these contexts are utmost necessary.

I believe that this conference holds the potential to be a turning point. By fostering open dialogue, collaborative research, and knowledge sharing, we can sow the seeds of a more secure and sustainable future. Let us remember, that the plants we nurture today will nourish the generations of tomorrow.

I extend my heartfelt congratulations to the organizers and participants of this important conference. May your collaborative efforts blossom into solutions that ensure food security not just only for Bangladesh, but for the world also.

Prof. Dr. Kamal Uddin Ahamed
Former Vice-Chancellor
Sher-e-Bangla Agricultural University, Dhaka

Message from the Special Guest

It's a distinct honor and privilege to address you at the Third International Conference of the Bangladesh Society of Plant Science and Technology (BSPST), themed "Plants for food security under changing climate." My profound thank goes to BSPST for organizing such timely critical discussion.

This conference showcases the exceptional research of distinguished plant scientists from Bangladesh and beyond. I applaud BSPST for its dedication to nurturing young talent, as their fresh perspectives are vital for addressing our shared challenges.

"Plants for food security under changing climate" resonates deeply, particularly for Bangladesh. As climate change disrupts agriculture, ensuring food security and a healthy population demands innovative solutions. This conference provides a unique platform to brainstorm and collaborate on developing climate-resilient crops, promoting sustainable practices, and safeguarding biodiversity.
The government recognizes the transformative power of science and technology for sustainable development. Our commitment extends beyond funding research. We encourage active collaboration between researchers, policymakers, farmers, and private entities. Such partnerships are crucial for translating research findings into practical solutions that reach our farmers and communities.

While Bangladesh boasts high-quality research, we must strive for greater impact. Research excellence, measured by publications alone, isn't the sole goal. We need to bridge the gap between research and practice, ensuring our innovations address the real needs of farmers and contribute to a Sonar Bangla, as envisioned by the Father of the Nation.

Partnerships are the cornerstone of progress. By joining forces, we can harness the power of science and technology to build a food-secure, healthy, and resilient Bangladesh. I urge all participants to engage in active dialogue, share knowledge, and forge collaborations that translate into tangible benefits for our nation.

I have immense faith in the collective wisdom and dedication of this gathering. May this conference be a springboard for innovative solutions that ensure a brighter future for all.

Dr. Debasish Sarker
Director General
Bangladesh Agricultural Research Institute
Gazipur

Message from Special guest

Across Bangladesh, fertile soil and resilient farmers face a growing peril, a changing climate threatening food security. This conference, organized by the Bangladesh Society of Plant Science and Technology, seeks not just only to acknowledge this threat, but also to sow the seeds of solutions.

Here, minds dedicated to plant science and technology gather, united by a common goal, ensuring food on every table, in the face of rising sea levels, erratic rainfall, and extreme weather events. We envision climate-resilient crops thriving in unpredictable environments, advanced breeding techniques yielding high-yielding, nutrient-rich varieties, and efficient water management systems conquering drought and flood.

Yet, technology alone cannot nourish a nation. Collaboration is key. We envision researchers, policymakers, farmers, and communities joining hand in hand, sharing knowledge and expertise. We envision education empowering the next generation, equipping them to tackle future challenges. We envision sustainable practices safeguarding our resources, and fostering harmony with nature.

This conference is a testament to the unwavering spirit of Bangladesh. It is a platform for showcasing innovative research, sparking fruitful partnerships, and generating actionable solutions. By harnessing the power of plants, we can transform landscapes, empower communities, and build a more secure and sustainable food system.

The challenges are formidable, but the will to overcome them is stronger. Let this conference be the catalyst for change, nurturing a future where food security blooms, even under a changing sky.

I wish success of this important conference.

(Dr. Md. Shahjahan Kabir)
Director General (Grade-1)
Bangladesh Rice Research Institute

Message from Special guest

Message from President

It is with great pleasure that I welcome participants and guests to the Third International Conference of the Bangladesh Society of Plant Science and Technology (BSPST), held on February 23-24, 2024. The chosen theme, **"Plants for Food Security under Changing Climate"** couldn't be more timely and important. It reflects a critical challenge demanding the combined efforts of researchers to share findings and advance solutions for ensuring food and nutrition security in the face of a changing climate.

I commend the BSPST, established in 2020, for consistently organizing conferences, demonstrating its commitment to fostering collaboration and knowledge dissemination within the field. This year, I'm pleased to hear the impressive response with 79 abstracts submitted covering diverse areas like plant physiology, ecology, taxonomy, morphology, and other crucial aspects of crop botany/agricultural botany.

Crop production faces multifaceted challenges due to abiotic stresses like drought, salinity, and waterlogging. Addressing these pressures through innovative techniques developed by plant physiologists is crucial for achieving sustainable yields. Additionally, understanding the evolving environmental landscape caused by climate change is essential for formulating resilient crops better suited to future conditions. Identifying stress-tolerant morphological and anatomical structures, leveraging biotechnological tools, and exploring other innovative approaches are urgently needed to secure food and nutrition security for Bangladesh.

I encourage all participants to engage in active dialogue, share research findings, and recommend specific approaches and techniques that can boost crop yields while identifying critical research areas demanding immediate attention.

I firmly believe that this Third International Conference will be a resounding success and pave the way for impactful solutions in ensuring food security for generations to come.

Dr. Md. Solaiman Ali Fakir
President, BSPST
&
Professor, Department of Crop Botany
Bangladesh Agricultural University, Mymensingh

Message from the General Secretary

With immense pride and excitement, I welcome you all to the Third International Conference of the Bangladesh Society of Plant Science and Technology (BSPST) on February 23-24, 2024!

Established in 2020, BSPST has grown rapidly, fostering a vibrant community of plant scientists across research, extension, and academia. From crop botany and ecology to physiology and biotechnology, our members are united by a shared passion: understanding and improving the fundamental processes of plants to enhance food security and agricultural sustainability.

The theme of the conference, "Plants for Food Security under Changing Climate", could be more relevant for this moment. With over 130 scientists and academicians participating from diverse backgrounds, viz. universities, research institutes, extension services, and NGOs, we have a unique opportunity to share research outcomes, exchange valuable insights, and collaborate on solutions.

I firmly believe that this conference will be a catalyst for stimulating research, fostering collaboration, and driving positive change in the field of plant science in Bangladesh. Through active engagement, knowledge sharing, and open discussions, we can pave the way for a more food-secure and climate-resilient future.

Let this conference be a celebration of plant science, a platform for innovation, and a springboard for a brighter future for agriculture in Bangladesh and beyond.

Prof. Md. Abdul Baset Mia, Ph. D
General Secretary, BSPST &
Department of Crop Botany
Bangabandhu Sheikh Mujibur Rahman Agricultural University
Gazipur 1706

Distinguish Alumni

Reputed Alumni

Prof. Dr. A K M Zakir Hossain
Vice-Chancellor
Kurigram Agricultural University
Kurigram

Dr. Md. Ismail Hossain
Director General
Bangladesh Tea Research Institute

Retired Alumni (Till 31 January 2024)

Prof. Dr. M A Halim Khan
Department of Crop Botany
Bangladesh Agricultural University
Mymensingh

Prof. Dr. Md. Abdul Karim
Department of Crop Botany
Bangladesh Agricultural University
Mymensingh

Prof. Md. Mustafizur Rahman
Department of Crop Botany
Bangladesh Agricultural University
Mymensingh

Dr. Subodh Candra Sarker
Department of Crop Botany
Bangladesh Agricultural University
Mymensingh

Dr. Afsana Islam
Department of Crop Botany
Bangladesh Agricultural University
Mymensingh

Prof. Dr. Tofazzal Hossain
Department of Crop Botany
Bangabandhu Sheikh Mujibur Rahman
Agricultural University

Prof. Dr. Kamal Uddin Ahamed
Department of Agricultural Botany
Sher-e-Bangla Agricultural University

Prof. Dr. Jalal Uddin Ahmed
Department of Crop Botany
Bangabandhu Sheikh Mujibur Rahman
Agricultural University

Distinguish Alumni

Dr. Jiban Krishna Biswas
Former Director General
Bangladesh Rice Research Institute

Dr. Amzad Hossain
Former Director General
Bangladesh Sugarcrop Research Institute

Dr. Tariqul Islam
Crop Physiology Division
Bangladesh Institute of
Nuclear Agriculture

Md. Saiful Islam Chowdhury
Crop Physiology Division
Bangladesh Institute of
Nuclear Agriculture

Dr. Abdur Razzaque
Former Director General
Bangladesh Institute of
Nuclear Agriculture

Dr. Serajul Islam
Former CSO and Head
Plant Physiology Division
Bangladesh Rice Research Institute

Dr. Rumena Yasmeen
Former CSO (CC) & Head
Plant Physiology Division
Bangladesh Rice Research Institute

Dr. Md. Zahurul Haque
Former Director General
Bangladesh Rice Research Institute

People we have lost (Till 31 January 2024)

Prof. Dr. Ashraful Haque
Department of Crop Botany
Bangladesh Agricultural University
Mymensingh

Prof. Dr. S H Chowdhury
Department of Crop Botany
Bangladesh Agricultural
University, Mymensingh

Distinguish Alumni

Prof. Dr. A AA Muhsi
Department of Crop Botany
Bangladesh Agricultural University
Mymensingh

Prof Dr. M Abdul Haque
Department of Crop Botany
Bangladesh Agricultural University
Mymensingh

Prof. M Arshad Ali
Department of Crop Botany
Bangladesh Agricultural University
Mymensingh

Lutfor Rahman
CSO
Plant Physiology Division
Bangladesh Institute of
Nuclear Agriculture

Prof. Rafiqul Islam
Department of Agricultural Botany
Sher-e-Bangla Agricultural University
Dhaka

Prof. A K M Shamsuddin
Department of Agricultural Botany
Sher-e-Bangla Agricultural University
Dhaka

Dr. Abdur Rashid Gomosta
Former Director (Research)
Bangladesh Rice Research Institute

Program layout

Day 1: 23 February 2024		
9.0 am – 10.0 am	:	Registration
10.0 am – 12.30 pm	:	Inauguration Ceremony
12.30 pm – 3.00 pm	:	Prayer and Lunch Break
3.00 pm – 4.40 pm	:	Oral Session I & II
4.40 pm – 5.00 pm	:	Tea Break
5.00 pm – 6.00 pm	:	Poster Session
7.00 pm	:	Dinner
Day 2: 24 February 2024		
9.30 am – 11.10 am	:	Oral Session III & IV
11.10 am – 11.30 am	:	Tea Break
11.30 am – 1.00 pm	:	Award giving, Business Session and Closing Ceremony
1.00 pm – 2.00 pm	:	Lunch Break
2.00 pm – 5.00 pm	:	Visit to Rice Museum and Other Laboratories of BRRI

Inauguration Ceremony: 23 February 2024
Venue: BRRI Auditorium

9.00 am	:	Registration
10.00 am	:	Recitation from the Holy Books
10.10 am	:	Welcome Address by **Prof. Dr. Md. Abdul Baset Mia,** Secretary, BSPST & Dean, Faculty of Agriculture, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur
10.20 am	:	Keynote Speech by **Dr. Jiban Krishna Biswas,** Former Executive Director, Krishi Gobeshona Foundation (KGF), BARC Campus, Dhaka
10.50 am	:	Address by the Special Guest **Dr. Nur Ahamed Khondaker,** Assistant Representative (Program), Food and Agriculture Organization of the United Nations, Dhaka, Bangladesh
11.00 am	:	**Dr. Md. Shahjahan Kabir,** Director General, Bangladesh Rice Research Institute, Gazipur
11.10 am	:	**Dr. Debasish Sarker,** Director General, Bangladesh Agricultural Research Institute, Gazipur
11.20 am	:	**Prof. Dr. Kamal Uddin Ahamad,** Former Vice-Chancellor, Sher-e-Bangla Agricultural University, Dhaka
11.30 am	:	Address by the Chief Guest **Prof. Dr. A K Azad Chowdhury, President, Bangladesh Academy of Sciences** and Emeritus Professor & former Vice-Chancellor, University of Dhaka, Former Chairman (State Minister), University Grants Commission of Bangladesh
11.50 am	:	Address by the Chair **Dr. Md. Solaiman Ali Fakir,** President, BSPST & Professor, Department of Crop Botany, Bangladesh Agricultural University, Mymensingh.

Technical session I: Plant Abiotic Stress Tolerance
23 February 2024, Time: 3.00-4.40 pm
Venue: BRRI Auditorium
Chair: Prof. Dr. Jalal Uddin Ahmed, Department of Crop Botany, BSMRAU
Co-Chair: Dr. Md. Alamgir Hossain-1, Department of Crop Botany, BAU
Session organizer: Dr. Mr. Hirendra Nath Barman, SSO, Plant Physiology division, BRRI
Rapporteurs:
1. Md. Mehedi Hasan, Department of Crop Botany and Tea Production Technology, SAU, Sylhet.
2. Raiyan Meem Saiem, Scientific Officer, Bangladesh Sugarcrop Research Institute.

Sl. No.	Title	Presenting author	Institute
1.	A 7×7 diallel cross in barley for developing high yielding and saline tolerant barley (*Hordeum vulgare* L.)-*Lead paper*	Md. Motiar Rohman	BARI
2.	Alleviation of high temperature induced injuries of wheat through exogenous application of nutrients and phytohormones at seedling stage	Md. Mehedi Hasan	SAU, Sylhet
3.	Application of melatonin and biochar for sustainable improvement of drought tolerance in rapeseed and mustard genotypes	Md. Rabiul Islam	HSTU
4.	Salt tolerance in aromatic rice: a physiological and biochemical appraisal	Mohammad Israr	BSMRAU
5.	Assessment of exotic melon (*Cucumis melo* L.) genotypes for salt tolerance using morpho-physical and biochemical attributes at the seedling stage	Mehede Hassan Rubel	NSTU
6.	Influence of salicylic acid and calcium on growth and yield of tomato at different transplanting times	Nigar Afsana	KAU
7.	Exploring the physiological basis of drought tolerance in Soybean [*Glycine max* (L.) Merr.] genotypes using proximal sensing	Mahmudul Hasan Tahery	BSMRAU
8.	Agro-morphological characterization and genetic diversity assessment of tea (*Camellia sinensis* (L.) O. Kuntze) genotypes for waterlogging tolerance	Md. Riyadh Arefin	BAU
9.	Morpho-physiological & biochemical responses of Chickpea to drought stress at different growth stages	Bakara Moazzama	BAU
10.	Enhancement of drought tolerance in wheat by foliar application of abscisic acid and glycine betaine at reproductive stage	Shitosri Mondal	BAU
11.	Alleviation of salt stress in bell pepper through integrated application of seaweed extract and arbuscular mycorrhizal fungi	Debesh Das	KU
12.	Morpho-molecular characterization of rice landraces growing in saline prone areas	Md Babul Akter	BINA

Technical session II: Plant Physiology and Ecology
23 February 2024, Time: 3.00-4.40 pm
Venue: Training Complex, BRRI
Chair: Prof. Dr. Md. Solaiman Ali Fakir, Department of Crop Botany, BAU
Co-Chair: Prof. Dr. Sripati Sikder, Department of Crop Physiology and Ecology, HSTU
Session organizer: Dr. Salma Akter, SSO, Plant Physiology division, BRRI
Rapporteurs:
1. Dr. Md. Elias Hossain, Department of Agricultural Botany, SAU, Dhaka
2. Sadia Afrin Shupta, Plant Physiology Division, BRRI.

Sl. No.	Title	Presenting author	Institute
1.	Revealing chemical ecology and omics strategies to safeguard plant health and ensure food security-*Lead paper*	Tofazzal Islam	BSMRAU
2.	Sustainable production of sweet pepper (*Capsicum annuum* L.) using polyhouse for low temperature management	AKM Muktadirul Bari Chowdhury	HSTU
3.	Leaf and calyx yield and quality as affected by NPK fertilization in *Hibiscus sabdariffa* var. *sabdariffa*	Raha TT	BAU
4.	Arbuscular Mycorrhizal Fungi bio-fertilization improved plant growth, N uptake, and straw N use efficiency of maize in microcosm ecosystem: A 15N labeled study	Md Elias Hossain	CAAS, China
5.	Enhancement of drought tolerance in french bean using plant growth promoting rhizobacteria	Anika Anzuma	BSMRAU
6.	Selection of high yielding and quality linseed genotypes through eco- physiological study	Sripati Sikder	HSTU
7.	Morpho-physiological and biochemical characterizations in response to single and combined salt and heat stresses at vegetative to reproductive stages	Lutfun Nahar	SAU, Dhaka
8.	Contribution of culm water soluble carbohydrates to grain filling in grain and fodder type oats (*Avena sativa* L.)	Md. Alamgir Hossain	BAU
9.	Optimizing cherry tomato production: impact of fertilizer doses and mulching on fruit yield and lycopene content	Afsana Ahamed Eva	BAU
10.	Phytochemical screening of medicinal Zingiberales in Bangladesh: antioxidants and their free radicals scavenging potential	Md. Nesar Uddin	BAU
11.	Polyhouse cover in raising quality boro-rice seedling averting winter cold injury for boro-rice production	Md Habibur Rahman Pramanik	BAU
12.	Influence of mulching on growth and yield of strawberry genotypes	Afroza Akter	SAU, Sylhet
13.	Qualitative and quantitative characterization of twenty one F5 genotypes of AUS Rice	Md. Kamrul Islam	BJRI

Technical Session-III: Plant Physiology and Ecology
24 February 2024, Time: 9.30-11.10 am
Venue: BRRI Auditorium
Chair: Prof. Dr. Kamal Uddin Ahamed, Department of Agricultural Botany, SAU, Dhaka
Co-Chair: Prof. Dr. Md. Abdul Kayum, Department Agricultural Botany, PSTU
Session organizer: Tuhin Halder, SSO, Plant Physiology Division, BRRI
Rapporteurs:
1. Prof. Dr. Md. Rabiul Islam, Department of Crop Physiology and Ecology, HSTU
2. Dr. Mehede Hassan Rubel, Department of Agriculture, NSTU.

Sl. No.	Title	Presenting author	Institute
1.	Climate-smart C_4 rice development: challenges and opportunities-*Lead paper*	Md. Alamgir Hossain	BAU
2.	Chlorophyll fluorescence kinetics for detection of submergence stress of rice	Md. Sazzadur Rahaman	BRRI
3.	Exogenous application of mepiquat chloride and abscisic acid on aromatic rice cv. Kataribhog for increasing lodging resistance and grain yield	Sarker B. C	HSTU
4.	Effect of plant age on nutritional composition of jute leaf as a vegetable	Md. Zablul Tareq	BJRI
5.	Effect of GA3 on morpho-physiological characteristics, flowering biology, fruit setting and yield attributes of brinjal (*Solanum melongena* L)	Md. Abdul Kayum	PSTU
6.	Physiological characteristics of BAU Chia-1 (*Salvia hispani* ca L.) and their Relation with growth parameters	Shagata Islam Shorna	BAU
7.	Stability assessment of different sugarcane clones under flood stress condition	Tasnima Husna	BSRI
8.	Effect of light-emitting diodes (LEDs) spectrums on potato (*Solanum tuberosum* L.) tuberization in plant-factory growing (aeroponic) culture system	Md. Jahirul Islam	BARC
9.	Effect of organic and inorganic fertilizers on growth, yield and antioxidant contents of lettuce grown in a rooftop garden	Monika Kundu	SAU, Dhaka
10.	Close link between green leaf volatiles and jasmonic acid: progress in herbivore-plant interaction	S.M. Ahsan	ANU, Korea
11.	Performance of different mustard cultivars under different planting techniques	Azizur Rahman	SAU, Dhaka
12.	Morphological features and yield response of mungbean under waterlogging stress	Awfiqua Nusrat	SAU, Dhaka

Technical Session-IV: Climate Smart Agriculture, Economic Botany and Others
24 February 2024, Time: 9.30-11.10 am
Venue: Training complex, BRRI
Chair: Prof. Dr. Habibur Rahman Pramanik, Department of Crop Botany, BAU
Co-Chair: Prof. Dr. Mohammad Mahbub Islam, Department of Agricultural Botany, SAU, Dhaka
Session organizer: Tuhin Halder, SSO, Plant Physiology Division, BRRI
Rapporteurs:
1. Dr. Md. Abubakar Siddik, Department of Crop Botany, Habiganj Agricultural University
2. SM Zubair Al Meraj, Department of Crop Botany, BSMRAU.

Sl. No.	Title	Presenting author	Institute
1.	Cassava tuber as a potential supplement to potato, wheat and rice in tropical and subtropical regions-*Lead paper*	MSA Fakir	BAU
2.	Estimating potential yield and change in water budget for wheat and maize across Huang-Huai-Hai Plain in the future	Sana Zeeshan Shirazi	CAAS, China
3.	Genetic control of NPF2.12-NIA1 signaling cascade improve nitrogen utilization in cereals	Md. Nurealam Siddiqui	BSMRAU
4.	Rooftop garden: crop production and environment conservation with changing climate in the Dhaka city	Mohammad Mahbub Islam	SAU, Dhaka
5.	Rainwater harvesting as a due climate-smart practice: Problems and prospects in Bangladesh agriculture	Md. Abdul Awal	BAU
6.	Effect of different agronomic practices on the chemical composition and antioxidant activity of black pepper (*Piper nigrum* L.) grown in Sylhet	Abdulla Al Baki Rafat	SAU, Sylhet
7.	Medicinal weeds of Bangladesh: an investigation into pigments, antioxidants and free radical scavenging potential	Mousumi Jahan Sumi	KAU
8.	Quantification of total phenolics, flavonoids, antioxidant activity, pigments, and mineral composition in three Dillenia species: a comprehensive analysis	Arup Karmokar	BAU
9.	Exploring the aquatic crops of Bangladesh: status and prospects of water chestnut	M A Baset Mia	BSMRAU
10.	Fertilizer management and irrigation improve yield contributing characteristics of aged black pepper plant	Md. Moudud Ahmod	SAU, Sylhet
11.	Exploring the therapeutic treasures: medicinal plants flourishing over the embankment of Brahmaputra river, a semi-natural habitat, at the BAU campus	Rounak Jahan Raka	BAU
12.	Bacterial diversity in the rhizosphere of black pepper plants grown in Sylhet	Tasfia Tahzin	SAU, Sylhet
13.	Gibberellin-producing bacteria isolated from coastal soil enhance seed germination of mallow and broccoli plants under saline conditions	Md. Injamum-Ul-Hoque	KNU, Korea

Poster session
23 February 2024, Time: 5.00 pm -6.00 pm
Venue: Training Complex, BRRI
Chair: Prof. Dr. AFM Saiful Islam, Department of Crop Botany and Tea Production Technology, SAU, Sylhet
Co-Chair: Dr. Mst. Salma Parvin, CSO, Plant Physiology Division, BRRI
Session organizer: Tuhin Halder, SSO, Plant Physiology Division, BRRI
Rapporteurs:
1. Prof. Dr. Debesh Das, Agrotechnology Discipline, KU
2. Anika Nazran, Department of Crop Botany, BSMRAU.

Sl. No.	Title	Presenting author	Institute
1.	Characterization for lodging tolerance of BRRI developed varieties & advanced breeding lines in Boro season	Sadia Afrin Shupta	BRRI
2.	Shading effect on growth, yield and chlorophyll pigment of some soybean (*Glycine max* L.) varieties	Biplob Deb	SAU, Sylhet
3.	Strategies for improving salt stress tolerance in tomato plants through using abscisic acid (ABA) and gibberellic acid (GA3)	Md. Saidur Rahman	SAU, Dhaka
4.	Physiological attributes, antioxidant defense system and growth performance of lettuce (*Lactuca sativa* L.) as affected by salinity	Mst. Iya Mou Mitu	SAU, Dhaka
5.	Calcium-induced reduction of lead toxicity in Amaranthus tricolor	Most. Farzana Aktar	SAU, Dhaka
6.	Investigating the role of 6-Benzyladenine and Melatonin in improving waterlogging tolerance of eggplant	S. M. Zubair Al-Meraj	BSMRAU
7.	Assessing the salt tolerance of aromatic rice genotypes	Shyma Parvin	BSMRAU
8.	Physiological and biochemical responses of waterlogging tolerance in sesame at vegetative stage	A F M Shamim Ahsan	BARI
9.	Characterization of rice germplasm for salinity tolerance at reproductive stage under different saline conditions.	Salma Akter	BRRI
10.	Kitchen waste application in the form of Biochar and ComBio improves the root morphology of red amaranth	Md. Moudud Ahmod	SAU, Sylhet
11.	Effective performance of biochar for phytotoxic glyphosate residues in soils	Abu Sayem Jiku	BJRI
12.	Life cycle of *Epuraea* sp. (Order: Coleoptera; Family: Nitidulidae): A newly emerging pest bottle gourd in Sylhet region	Khadiza Sultana Snigda	SAU, Sylhet
13.	Insect community analysis of cruciferous vegetables in north-eastern part of Bangladesh	Md. Omor Faruk	SAU, Sylhet
14.	The role of Silicon supplementation on reducing major rice insect's pests in Bangladesh	Md. Abdul Kader Duel	SAU, Sylhet

Sl. No.	Title	Presenting author	Institute
15.	The new list of coconut insect pest in Bangladesh: Farmers' perspective	Ashraful Hasan Moyem	SAU, Sylhet
16.	Mitigation of Cadmium toxicity in water spinach using salicylic acid modulating morphology and antioxidative defense system	Artho Baroi	BAU
17.	Gas exchange parameters and yields of some cruciferous vegetables under different types of poly-mulching	Abdullah Omar Asif	BAU
18.	Genetic variability and character association of quantitative characters in boro rice (*Oryza sativa* L.)	Tanjina Islam	BRRI
19.	Ornamental Pothos – A Taxonomic Dilemma	Amena Akter	BAU
20.	Evaluation and characterization of eighteen F5 lines of AUS rice for yield traits	Abu Sayem Jiku	BJRI
21.	Medicinal potentiality of Fenugreek plant	Maisha Rahman	BAU
22.	Bangladesh's diabetic population's need for stevia to promote sustainability, future food security, and health	Md. Shariful Islam	BSRI
23.	BAU Chia cultivation stands out in Bangladesh	Bushra Anika Akhter	BAU
24.	Morpho-physiological and phytochemical investigation of *Piper chaba* hunter	Sumaya Akter Ruponti	BSMRAU
25.	Rooftop garden to enrich research, study and biodiversity at Habiganj Agricultural University	Md. Abubakar Siddik	HAU
26.	Carbon footprint, energy budgeting and economic analysis of tobacco production in Bangladesh	RM Saiem	BAU
27.	Organic liquid fertilizer from kitchen waste can promote food waste recycling and sustainable agriculture	Jakia Hossain Moon	NSTU
28.	Optimization doses of urea super granule boost the efficiency of N and improve the growth, yield and quality of the potato	Abu Sayem Jiku	BJRI
29.	Production and selection of somaclones for drought and salinity tolerant cultivar	Mst. Kohinoor Begum	BSRI

Organizing Committee

Sl. No.	Name	Designation
1.	Prof. Dr. Md. Solaiman Ali Fakir, Department of Crop Botany, BAU, Mymensingh	Convener
2.	Prof. Dr. A. F. M. Saiful Islam, Department of Crop Botany & Tea Production Technology, SAU, Sylhet	Member
3.	Dr. Md. Amzad Hossain, Ex Director General, BSRI, Ishurdi, Pabna	Member
4.	Prof. Dr. Sripati Sikder, Department of Crop Physiology & Ecology, HSTU, Dinajpur	Member
5.	Prof. Dr. Md. Masudur Rahman, Department of Crop Botany & Tea Production Technology, SAU, Sylhet	Member
6.	Mr. Haider Iqbal Khan, Department of Crop Botany, BSMRAU, BSMRAU, Gazipur	Member
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Cassava tuber as a potential supplement to potato, wheat and rice in tropical and subtropical regions

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Abstract

Cassava (*Manihot esculenta* Crantz.) tuber (root) is rich in starch and is used as a staple food for about 800 m people in Africa, the Caribbean and some Asian countries. On being peeled, cassava tuber is consumed after boiling, just like a sweet potato; can be cooked as a substitute for potato tuber; flour extracted from tuber can be utilized to prepare products fortifying with wheat flour *viz*., cassava-chapati-roti, pie, bread, cake, biscuits, 'chanachur' industries, and these cassava-products may be used as snacks and meal alternative to rice. In the backdrop of decreasing cultivable lands and increasing population in many subtropical and tropical areas, cassava can be cultivated in the 'non-rice' lands like fallow lands, homesteads, roadsides, and other high fallow lands. Cassava is a C_3 plant but photosynthesizes like C_4, and is tolerant to high temperatures and drought. Hence, cassava can be grown under the changed climate scenario successfully. Moreover, cassava produces fairly good yields in soils where other crops almost fail. The average yield of cassava, paddy and wheat are 40 (*c.* 35-40% DM), 8 (2-cropped, 85-88% DM) and 3.5 (85-88% DM) t ha^{-1}, respectively. Further, cassava is a high starch/flour yielder; produces 3-20 kg of fresh roots $plant^{-1}$, and increased starch/flour yield compared to wheat and rice. On a per hectare basis, Cassava produces 10 t flour compared to 5 t rice grain and 3.5 t wheat flour. The price is cheaper in cassava (tk 40-50 kg^{-1} flour) than in wheat (tk 55-60 kg^{-1} flour) and rice (tk 45- 65 kg^{-1} grain). The gross income appeared much higher in cassava (tk 400,000/ from 10 t flour @ tk 40/kg) than in rice (tk 300,000/ from 5 t rice grain @ tk 60/kg) and wheat (tk 2,10,000/ from 3.5t @ tk 60/kg flour). The profit is, therefore, expected to be much higher in cassava than in rice and wheat. Cassava flour, therefore, can be mixed in varied proportions with wheat flour to prepare different cassava products. It is suggested that cultivating cassava in unconventional lands, especially in poor soils, would be a potential concept to substantially supplement potato tuber, wheat flour and even rice by utilizing cassava-based products.

Keywords: Root crop, *Manihot esculenta*, food & nutrition security, alternative foods

Climate-smart C_4 rice development: challenges and opportunities

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Abstract

To feed the ever increasing population in the globe, 70% more food needs to be produced by 2050 in a sustainable manner. Achieving food and nutritional security, rising costs of energy, changes in diet preferences, economic development, and climate risks are major global challenges faced by producers, scientists, policy makers, and governments. Keeping all in mind, the introduction of 'C_4' traits into C_3 rice is predicted to increase photosynthetic efficiency, improve nitrogen use efficiency, double water use efficiency and rice yield increased by 50% (https://c4rice.com). Biochemically, photorespiration (oxygenase activity of RUBISCO, starter enzyme of Calvin cycle) is the fundamental reason for being less efficient in C_3 rice than in C_4 plants. Therefore, supercharged C_4 rice development is a dream and photorespiratory carbon loss at high temperatures or high intensity sunlight or both is the major obstacle to materializing this issue. Undoubtedly, it is a challenging task but is not impossible to perform since the C_4 rice program (IRRI) was awarded by Bill & Melinda Gates foundation in 2008. Actually, C_4 plants have a biochemical 'CO_2 pump' for avoiding photorespiration in hot and dry climates. Finally, fundamental aspects of the photosynthetic machinery, underlying physiological, biochemical and molecular mechanisms of its regulation and highlighted recent scientific achievements on climate smart C_4 rice development will be reviewed and discussed critically.

Keywords: Yield improvement, photosynthesis, resource use efficiency, C absorption

Revealing chemical ecology and omics strategies to safeguard plant health and ensure food security

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Abstract

Healthy plants are crucial for sustaining life on Earth and supporting global agriculture and food security. However, challenges such as climate change, chemical reliance, and environmental degradation threaten plant health, crop productivity and overall global food security. Our approach employs chemical ecology, genomics, transcriptomics, genome editing, and nanotechnology to enhance crop nutrition and protection. Wheat blast is a potentially catastrophic plant disease that poses a threat to global food and nutritional security. Facing the first wheat blast epidemic in Bangladesh in 2016, we utilized field pathogenomics and international collaboration, swiftly determining pathogen identity. Using genome-specific primers and CRISPR-Cas12a, we developed a rapid, sensitive method for wheat blast detection. Novel technologies, including a daylight-driven nanocatalyst and a *Bacillus* bacteria-based formulation, effectively control wheat blast in the field. Cloning the major blast resistance gene *Rmg8* enabled us to control the pandemic lineage by introgressing it into commercial wheat varieties. Transcriptomics analysis of blast-infected wheat leaves identified S-genes, paving the way for CRISPR-Cas editing for durable blast-resistant wheat. We actively engage in developing blast-resistant wheat varieties through genome editing, integrating resistance genes, and mutation breeding. Additionally, we discovered bioactive secondary metabolites from marine and terrestrial organisms that effectively suppress oomycete and fungal phytopathogens. These natural products offer sustainable alternatives to synthetic pesticides. Plant-associated probiotic bacteria, unlocked through genomics, serve as bioregulators to enhance rice and strawberry yield and quality. Implementing these advanced technologies on a large scale could reduce synthetic agrochemical reliance by up to 50%, improving farm productivity and profitability. This lecture outlines our interdisciplinary research, open science practices, and international collaboration addressing plant health and food security issues in Bangladesh and beyond.

Keywords: Sustainable plant protection, precision agriculture, food security, open science & collaboration

A 7×7 diallel cross in barley for developing high yielding and saline tolerant barley (*Hordeum vulgare* L.)

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Abstract

The experiments were conducted with F_1s produced from a 7×7 half diallel cross along with their parents [INBYT/18-E-19 (P_1), INBON/18-L-53 (P_2), INBYT/18-E-9 (P_3), INBYT/18-E-6 (P_4), BARI barley-9 (P_5), INBYT/18-E-25 (P_6) and BARI barley-7 (P_7)] to develop high yielding and saline tolerant barley lines. An investigation was done on the general and specific combining abilities (GCA and SCA) of parents and offspring, respectively, as well as genetic action and heterosis of eight quantitative variables. The results of genetic analysis and combining ability analysis revealed the existence of great genetic variability among their parents and among the hybrids. Additive and non-additive genetic effects were involved in the control of the traits evaluated. Preponderance of the dominant genes, involved in the expression of tiller number per plant, panicle length, number of grains per plant and grain yield per plant, on the other hand, the characters of days to 50% flowering, days to maturity, plant height (PH), and 1000-grain weight were governed by additive gene action. The parents P_5 and P_6 have the genetic potential to develop an early and short stature hybrid whereas the parents P_2 and P_4 hold the potential to develop short stature and high yielding hybrid. Based on the results of the mean performance, SCA value and heterobeltiosis the crosses $P_2\times P_3$, $P_2\times P_7$, $P_3\times P_4$, $P_4\times P_5$, $P_5\times P_6$ and $P_6\times P_7$ were selected as promising hybrids because of earliness, short stature and high yield potency, and recommended for obtaining high yielding segregants. On the other hand, the F_1s were screened saline media in half strength Hoagland solution (first 10 days in 100 mM NaCl and then 150 mM until maturity) to select saline tolerant hybrids. Based on healthy seed setting, K^+/Na^+, root volume, generation of reactive oxygen species ($O_2^{\bullet-}$ and H_2O_2) and enzymes like superoxide dismutase (SOD), catalase (CAT), peroxidase (POD), ascorbate peroxidase (APX) and glutathione reductase (GR), five crosses ($P_1\times P_2$, $P_2\times P_3$, $P_3\times P_5$, $P_4\times P_6$ and $P_4\times P_7$) were identified as saline tolerant for further segregation.

Keywords: Barley, combining ability, genetic action, oxidative stress, salinity, varietal improvement

Alleviation of high temperature induced injuries of wheat through exogenous application of nutrients and phytohormones at seedling stage

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Abstract

Heat stress is a major environmental factor that affects the growth and development of wheat at every growth stage. Exogenous application of various nutrients and phytohormones could be effective in mitigating the negative impacts of heat stress in wheat especially at the seedling stage. Accordingly, $CaCl_2$ (10 mM), $MnCl_2$ (10 mM), Methyl Jasmonate (MeJA) (20 µM), Salicylic Acid (SA) (2 mM), and Melatonin (MT) (100 µM) were exogenously applied to 10 days aged wheat seedling before the onset of heat stress (38 °C)) for 48 hours. Our results revealed that heat stress significantly cut down the seedling length and biomass, chlorophyll fluorescence attributes and pigment contents while the elevated temperature increased root shoot ratio, the quantum yield of non-regulated energy loss in PSII (Φ_{NO}) and excess excitation energy (EXC). The upgrading role of nutrients and hormone molecules, irrespective of wheat genotypes, was prominent as they enhanced biomass accumulation, leaf relative water content, cell membrane stability, the efficiency of the water-splitting complex on the donor side of PSII (F_v/F_0), the effective quantum yield of PSII photochemistry (Φ_{PSII}), electron transport rate (ETR), photochemical quenching (q_p) as well as non-photochemical quenching (NPQ), coefficient of photochemical fluorescence quenching (qL), chlorophylls and carotenoids content. The pheatmap shows that all mitigation agents were effective in minimizing the negative impacts of elevated temperature but the role of melatonin have appeared to be consistent with the control condition. The outcomes of our study will further assist in investigating the effect of protective molecules in minimizing the devastating impacts of terminal heat stress in wheat, a global concern to sustain wheat productivity.

Keywords: Thermotolerance, photosystem II, melatonin, $CaCl_2$, photochemical quenching, wheat

Application of melatonin and biochar for sustainable improvement of drought tolerance in rapeseed and mustard genotypes

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Abstract

Brassica oilseeds (rapeseed and mustard) are the major source of vegetable oil. Many investigations have stated that melatonin and biochar can improve the drought tolerance of crop plants. But their specific role in plant drought tolerance especially, in rapeseed and mustard genotypes is poorly understood in Bangladesh. Therefore, the present investigation was conducted to evaluate the enhancing role of melatonin and biochar for assessing the drought tolerance of rapeseed and mustard genotypes through photosynthetic pigments, physiochemical and yield traits. The experiment was conducted at the research field and laboratory of the Department of Crop Physiology and Ecology of Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh from November 2022 to March 2023. The experiment was carried out in a two factors split plot design with three replications. Factor A consisted of five growing conditions such as i) Well water (T1, Control, Provide two irrigations), ii) Rainfed (T2, No irrigation will be applied), iii) Rainfed + Melatonin @ 100 µM (T3), iv) Rainfed + Biochar @ 1 kg DM m^{-2} (T4) and v) Rainfed + Melatonin @ 100 µM + Biochar @ 1 kg DM m^{-2} (T5); whereas factor B comprised of three mustard genotypes viz. i) BARI Sarisha-16 from Brassica juncea group (Mustard), ii) BARI Sarisha-17 from *Brassica campestris* group (Rapeseed) and iii) BARI Sarisha-18 from Brassica napus group (Rapeseed). From the results, it was observed that the drought stress plot (T2) showed lower performance concerning yield and yield contributing traits, various water relations and physiological attributes compared to well water (T1, control) condition. When the drought stressed plots treated with exogenous melatonin (T3) and biochar (T4) alone, gave somewhat better outputs compared to drought (T2) environments. Overall, yield and yield contributing parameters such as plant height (cm), leaf area $plant^{-1}$, siliqua $plant^{-1}$, seed $siliqua^{-1}$, siliqua length (cm), test weight, yield $plant^{-1}$, and yield $plot^{-1}$ were greater in T5 treatments. Soil moisture content, relative leaf water content and canopy temperature depression, photosynthetic pigments were enhanced due to the combine application of melatonin and biochar (T5) under drought conditions but proline content was reduced as compared to drought (T2), melatonin (T3) and biochar (T4) treatments alone. Overall, it was concluded that the combine application of melatonin and biochar (T5) on rapeseed and mustard genotypes plays a vital role in ameliorating the drought stress condition.

Keywords: Biochar, *Brassica*, drought, melatonin, mustard, photosynthetic pigments, proline, relative leaf water content

Salt tolerance in aromatic rice: A physiological and biochemical appraisal

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Abstract

Cultivating high-value crops, specifically aromatic fine rice, is seen as an alternative strategy for value addition, and a sustainable environmentally friendly crop production system in Bangladesh. The aromatic rice is generally low-yielding and prone to abiotic stress, especially the salinity, which hinders yield and quality drastically. Rice has been classified as a cereal that is sensitive to salt, particularly while it is young, and at the mature stage, salinity limits the efficiency of production. An experiment was conducted to observe the physiological attributes of aromatic rice under salt stress. The experiment was conducted under pot-culture conditions, and the design was a factorial complete randomized block design with four replications. Two advanced lines viz. PK31 and PK37 were developed by crossing between Kalojira (a local aromatic rice variety) and Pokkali (a salt tolerance rice variety). Commercial salt NaCl was applied after 30 days of seedling growth, where 30-day-old seedlings were transplanted. The genotypes were evaluated biochemically, physiologically and morphologically during the tillering and panicle initiation stages, respectively. The results indicated that at the tillering stage, the genotype PK31 was more sensitive to salinity. Of the genotypes, PK 37 was shown to be more resistant to salt stress than PK 31. The physiological parameters like chlorophyll, proline, and melondialdehyde contents showed higher values in genotype PK37 compared to PK31. Increasing salinity had a detrimental influence on plant height, percent effective tiller, stem elongation ratio, shoot weight, root weight, shoot-root ratio, grain weight, total dry matter, and harvest index. Furthermore, increased crop sterility was a direct consequence of rising salt levels. This study contributes to understanding the physiological features of salinity resistance in crop varieties and highlights the performance of the selected varieties under salt stress.

Keywords: Aromatic rice, physiology, biochemical attributes, salt tolerance

Assessment of exotic melon (*Cucumis melo* L.) genotypes for salt tolerance using morpho-physical and biochemical attributes at the seedling stage

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Abstract

Salt stress is caused by an excess of salt in the soil, which disrupts the growth and development of crops leadings to crop mortality. The study was conducted using sixteen different melon genotypes to find salt (150 mM NaCl) tolerant melon genotypes at the seedling stage following a completely randomized (CRD) design. During the experiment, 150 mM NaCl was applied, and the data was analyzed using a modified standard evaluation score (SES) of visual salt injury, Analysis of Variance (ANOVA), genotypic correlation, Principal Component Analysis (PCA), and heatmap-based hierarchical cluster analysis. Imposition of salt stress, the studied genotypes showed significant changes in different morpho-physical and biochemical traits. Shoot length (SL), Shoot dry weight (SDW), Leaf area (LA), Root dry weight (RDW), and shoot fresh weight (SFW) were the most significant morphological traits ($p<0.01$), whereas significant changes were exhibited in all biochemical traits (Chlorophyll, H2O2, MDA) except in proline and antioxidant. Most of the studied genotypes showed superior performance compared to the control melon genotype (V1). Among the sixteen genotypes, the following thirteen genotypes (V1, V2, V3, V4, V5, V6, V7, V9, V10, V11, V13, V14, and V16) were tolerant to salt stress, whereas the remaining genotypes showed salt susceptible. The results of SES observed that the genotypes (V2, V5, V6, V11, and V16) were found extremely tolerant (SES value 1) to salt stress. The findings of the study revealed that the majority of the qualitative and quantitative traits had significant genetic variation. Finally, the genotypes (V2, V5, V6, V9, V10, V11, and V16) can be considered salt tolerant genotypes and these could be used in future melon breeding programs.

Keywords: Melon, salt stress, morpho-physical and biochemical traits, stress tolerance index, seedling stage

Influence of salicylic acid and calcium on growth and yield of tomato at different transplanting times

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Abstract

The morpho-physiology and yield of different crops are influenced by various factors including the date of planting. The period November-March is congenial for growing tomatoes in Bangladesh. But sometimes it is difficult to transplant seedlings of tomato in proper time due to unpredictable weather factors in a specific area. However, to our knowledge no study has been conducted to find the effects of exogenous application of salicylic acid (SA) and calcium (Ca^{2+}) on the growth and yield of tomato, variety BARI tomato-15 at different transplanting times. The experiment was conducted on the farm of Sher-e-Bangla Agricultural University, Dhaka, from November 2013 to April 2014 using RCBD design with three replications. In this experiment, the treatments consisted of factor (A) three different times of transplanting: T1 = First transplanting time (10 December 2013), T2 = Second transplanting time (20 December 2013), T3 = Third transplanting time (30 December 2013); and factor (B) six different combinations of SA and Ca^{2+} *viz.* A0 = 0 mM of SA and 0 mM Ca^{2+}, A1= 0.25 mM SA and 0 mM Ca^{2+}, A2 = 0 mM SA and 5 mM Ca^{2+}, A3 = 0.25 mM SA and 5 mM Ca^{2+}, A4 = 0 mM of SA and 10 mM Ca^{2+} and A5 = 0.25 mM SA and 10 mM Ca^{2+}. The total treatment combinations were 18 (3x6). The first transplanting time (T1) significantly increased growth characters: plant height, number of leaves plant^{-1}, number of branches plant-1; yield contributing characters: number of flower clusters plant^{-1}, number of flowers plant-1, number of fruits plant-1, fruit length, fruit diameter and yield (t ha^{-1}) and compared to third or late transplanting time (T3). The interaction between the time of transplanting and sole or together application of SA and Ca^{2+} significantly improved all the growth and yield contributing characters and yield of tomato. The highest yield (86.62 t ha^{-1}) of tomato obtained with the first transplanting time along with 0.25 mM SA and 5 mM Ca^{2+} (T1A3) treatment combination, whereas the lowest yield (36.59 t ha^{-1}) was recorded from T3A0, third transplanting time with 0 mM SA and 0 mM Ca^{2+} treatment combination. Therefore, the present experimental results suggest that the use of both SA and Ca^{2+} increases the growth and yield of tomatoes at each transplanting time

Keywords: Tomato, different transplanting times, salicylic acid, calcium, growth and yield

Exploring the physiological basis of drought tolerance in Soybean [*Glycine max* (L.) Merr.] genotypes using proximal sensing

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Abstract

In climate change, drought stress is an exigent issue in soybean cultivation affecting its productivity on a global scale. This study has investigated the physiological basis of drought tolerance using proximal sensing techniques. We incorporated a combination of vegetation indices obtained from multispectral imaging collected by DJI Inspire 2 UAV-equipped with a MicaSense Altum sensor, morphological and physio-biochemical data to explore and evaluate how six different genotypes (BD 2330, BU Soybean 1, BU Soybean 2, BU Soybean 3, BU Soybean 4, and G00056) of soybean responded to water deficient and irrigated conditions. Irrigation was withdrawn 30 days after sowing and data were collected from the field in 3-4 different developmental stages. These genotypes were assessed concerning various physiological parameters, including leaf relative water content (LRWC), cell membrane stability (CMS), leaf chlorophyll and carotenoid contents, metabolites concentration (proline, soluble sugar), and chlorophyll-a fluorescence quotients. The spectral indices evaluated, encompassed simple ratio (SR), normalized difference vegetation index (NDVI), green normalized difference vegetation index (gNDVI), plant nitrogen spectral index (PNSI), optimized soil-adjusted vegetation index (OSAVI), photochemical reflectance index (PRI), transformed chlorophyll absorption ratio index (TCARI), structure-insensitive pigment Index (SIPI), normalized difference red edge index (NDRE) etc. Among the genotypes, BU Soybean 2 exhibited notably superior results compared to others across spectral indices, physiological, and yield parameters. The spectral indices also corroborated its exceptional performance with physiological and yield parameters. These findings highlight the promising potential of BU soybean 2 to be exploited in agricultural development and breeding programs. Additionally, the significant correlation between the physiological and yield parameters with the spectral indices underpins the potential utility of proximal sensing as an efficient and reliable tool for screening and identifying drought-tolerant soybean cultivars.

Keywords: Vegetation indices, screening, photosystem II activity, oil crops

Agro-Morphological characterization and genetic diversity assessment of tea (*Camellia sinensis* (L.) O. Kuntze) genotypes for waterlogging tolerance

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Abstract

Tea is one of the most important non-alcoholic beverages worldwide and Bangladesh's tea industry is one of the major sources of income for the national exchequer contributing 1% to the national GDP. Seepage water from nearby hills or tillahs currently causes waterlogging situations on about 8–10% of each tea estate's acreage. The cultivation of waterlogging tolerant varieties is one of the best options to expand tea-growing areas in waterlogged soils. In search of waterlogging tolerant tea germplasms, a total of two hundred genetic potential germplasms were collected from waterlogged areas of different tea estates which were characterized based on sixteen (selection) criteria (descriptors) viz. plant types (PT), leaf color (LC), growth form (GF), 8 weeks green leaf yield (GY1), dormancy period (DR), plucking interval (PI), spreading of bush frame (SBF), density of plucking points (PP), number of flower (NF), number of pubescence (NP), recovery after pruning (RP), length of bud (LB), scoring for fermentation (SF), quality scoring of CTC (QSB), quality scoring of white tea (QSW) and survivability percentage (SP). Cluster heatmap and other relevant analyses were done to measure the hierarchical clustering based on average linkage. The grouping of genotypes and traits was explained by a two-way (row and column) hierarchical clustering heatmap where the 200 genotypes and 16 measured traits were grouped into six (row) and three (column) clusters, respectively. The maximum number of closely related genotypes (57) were observed in Cluster-4 followed by Cluster-5 (53) and Cluster-6 (43). Cluster-1, Cluster-2, and Cluster-3 are composed of 7, 24, and 16 genotypes, respectively. In contrast, the measured traits were grouped into three-column clusters where, Cluster-1, Cluster-2, and Cluster-3 comprised 2, 3, and 11 traits, respectively. The highly related traits such as GY1 and PP were assembled in Cluster-1 while, the traits SF, NP, and QSB were placed in Cluster-2. All the remaining characters such as PT, PI, DR, QSW, RP, SBF, LC, GF, NF, LB, and SP, were closely associated and assembled in Cluster-3. The results of this study show that there is enough genetic variation both within and across genotypes, suggesting that further genetic advancement may be possible. The diverse genetic makeup might contribute valuable data for future waterlogging-tolerant tea breeding initiatives.

Keywords: Morphological descriptors, heatmap, cluster analysis, waterlogging, tea

Morpho-physiological & biochemical responses of Chickpea to drought stress at different growth stages

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Abstract

Drought is one of the major abiotic stresses in agriculture worldwide. It is the most familiar abiotic stress limiting chickpea production. Finding suitable chickpea varieties with drought tolerance potential is an absolute necessity. As part of this quest, a pot experiment comprising five chickpea varieties (Binasola-3, Binasola-5, Binasola-7, Hyprosola and BARI Chola-10) and four treatments was carried out in a complete block design with three replications, at the Botanical Garden, Bangladesh Agricultural University, Mymensingh, during November 2021 to March 2022. Treatments included T_0=control (no drought), T_1=drought stress imposed during the vegetative phase, T_2=drought stress imposed during reproductive phase and T_3=drought stress imposed during both vegetative and reproductive phase. Morphological, physiological, biochemical and yield contributing traits were compared under varying water treatments. Drought stress and varietal interaction were significant in all measured traits, indicating that different varieties responded distinctively to drought stress. According to the findings, shoot length, total dry weight, RWC, SPAD, Fv/Fm, total chlorophyll, total carotenoid, total number of pods, seed yield, 100 seed weight decreased during drought stress, while root length, R/S ratio, proline content, TAC got increased under drought stress conditions. The results showed that the varieties in question were more sensitive when subjected to drought stress, imposed at both the vegetative and reproductive phases. Stress tolerance index (STI) indicated that Hyprosola exhibited the highest seed yield (47.17) and higher values for the studied traits among all the varieties and Binasola-5 performed better in terms of morphological and biochemical attributes. Taken together, it may be inferred that Hyprosola and Binasola-5 manifested enhanced drought tolerance and these findings might be explored further in future research works.

Keywords: Drought stress, stress tolerance indices, Morpho-physiological attributes, Biochemical responses

Enhancement of drought tolerance in wheat by foliar application of abscisic acid and glycine betaine at reproductive stage

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Abstract

Global climate models predict frequent and severe droughts in the future resulting in limited crop production affecting growth and yield. The extent of drought tolerance in two wheat cultivars (WMRI-1 and BARI GOM-33) was investigated by foliar application of abscisic acid (ABA) and glycine betaine (GB) at the anthesis and grain filling stages. A pot experiment maintaining a completely randomized design with four replications was conducted in the field laboratory of the Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, Bangladesh. A total of four treatments were followed such as i) Control (20-22% moisture content) ii) Drought (8-10% moisture content) iii) Drought + ABA iv) Drought + GB. The plants at the reproductive stage were sprayed with ABA (20 µM) and GB (50 mM) under drought conditions. Drought stress significantly declined chlorophyll content and photosynthetic rate in comparison to control. However, the foliar application of ABA and GB under drought considerably increased the rate of photosynthesis and pigment contents in the flag leaves compared to the plants grown under individual drought conditions. A considerable increase in lipid peroxidation and H_2O_2 contents in flag leaves was recorded in all drought conditions, while these values were reduced in ABA and GB treatments. ABA and GB application significantly enhanced the activities of antioxidative enzymes (catalase and peroxidase) and total antioxidant capacity exhibiting a reduction in oxidative damage and increased grain yield. Heatmap using stress tolerance index (STI) values showed that Drought+ABA and Drought+GB secured higher STI scores suggesting a greater degree of drought tolerance in both cultivars. In conclusion, foliar application of ABA and GB enhanced drought tolerance in wheat cultivars by altering physiology and antioxidative defense suggesting a declined state of oxidative damage with increased yield.

Keywords: Phytohormone, Osmolyte, drought tolerance, photosynthesis, oxidative damage, antioxidants

Alleviation of salt stress in bell pepper through integrated application of seaweed extract and arbuscular mycorrhizal fungi

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Abstract

Climate change induced soil salinity is the most catastrophic abiotic stress that aggravates its detrimental effects on the productivity of horticultural crops especially bell pepper which might be alleviated through judicious application of seaweed extract (SWE) and arbuscular mycorrhizal fungi (AMF). Therefore, the present study was focused on the interactive effects of SWE and AMF to improve growth, physiological responses and yield performance of bell pepper grown under salt stress. The factorial pot experiment consisted of three factors namely SWE dose (non-treated control, 2.5 gL^{-1}, 5.0 gL^{-1} and 7.5 g L^{-1} designated as SWE0, SWE2.5, SWE5.0 and SWE7.5, respectively); water salinity levels (control- 0.54, 4, 8 and 12 dS m^{-1}) and two levels of AMF inoculation (with AMF [+AMF] and without AMF [–AMF]). A factorial experiment was laid out where treatment combinations were assigned a completely randomized design (CRD) with three replications. SWE treated plants upgraded leaf relative water content, leaf greenness and membrane stability index 16 %, 19 % and 13 %, respectively with lower electrolyte leakage (15 %) at 12 dS m^{-1} water salinity compared to non-treated plants. In addition, higher proline content (79 %) was observed at SWE5.0 in AMF inoculated plants over control (non-inoculated plants. Marketable fruit yields were higher (31 %) with the combined application of SWE and AMF at extreme salt stress conditions (12 dS m^{-1}). Apart from that, SWE7.5 treated plants exhibited more accumulation of potassium (26%) and phosphorous (32%) while less accumulation of sodium (16%) was displayed at higher salinity levels (12 dS m^{-1}) compared to control plants. Moreover, SWE and AMF treated plants showed better postharvest quality (pH, Brix) performance during storage conditionss compared with the control. Finally, it might be inferred that integrated application of SWE and AMF had boosted morpho-physiological traits, yield and ion homeostasis to ameliorate the baleful effects of salt stress on bell peppers.

Keywords: Salt stress, Seaweed extract, AMF, Electrolyte leakage, Proline content and Fruit yield

Morpho-molecular characterization of rice landraces growing in saline prone areas

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Abstract

Salinity is a complex issue that causes yield reduction in the coastal region for rice production. For being a staple food, rice production is considered the key factor for food security in Bangladesh but there are a few salt tolerant rice varieties cultivated for about 10 lac ha saline prone areas. Thus, it is important to study the genetic diversity studies of rice varieties have a vital role in the efficient use of genetic resources for rice breeding to ensure yield stability in the future. The experiment was conducted at the BINA sub-station, Satkhira throughout the Kharif-II season in 2022 to find out the suitable rice cultivar for saline tolerance as well as for higher grain yield production. A total of 99 rice cultivars were used in this study including Bangladeshi landrace (114) and High Yielding Variety (HYV) (5) were assessed to find the morphological superiority for salinity tolerance. The experiment was laid out in alpha lattice design with 2 replications. Unit plot size was 2m × 1m. Fertilizer application, salinity measurement and intercultural operations were done as recommended. The fresh leaves of rice seedlings were collected at about 3-4 leaf stage for DNA extraction and phenotypic data were collected from five randomly selected plants from each plot. The collected data were analyzed using the statistical computer package program R. Experimental results showed that all the studied traits are significantly difference and widely distributed in different parameters among the rice landraces. Considering the data on the PCA biplot, it is revealed that positive and negative correlation within the traits was found. Based on the morphological observation, all the tested cultivars are classified into three distinct major groups. The varieties that have similar genetic relations with local cultivars may be descendants from the crosses of those varieties or varieties having a close genetic similarity to them. Molecular markers analysis is in progress. All the studied landraces showed different degrees of saline tolerance which may serve as an important genetic resource for future rice improvement for saline prone areas.

Keywords: Ionic toxicity, ionic homeostasis, abiotic stress, salt tolerant cultivars, cereal crops

Sustainable production of sweet pepper (*Capsicum annuum* L.) using polyhouse for low temperature management

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Abstract

A field research was conducted from November 2022 to May 2023 to manage low temperature effect for sustainable production of sweet pepper (*Capsicum annuum* L.) using polyhouse. Two growing conditions (Polyhouse and open field) and four genotypes were evaluated based on their morpho-physiological, biochemical characteristics and yield attributes at the research field and laboratory of the Department of Crop Physiology and Ecology, HSTU, Dinajpur. The experiment was laid out in a Split Plot Design with three replications. The main plot treatment comprised of two growing conditions mentioned above and the subplot treatment included four varieties of sweet pepper such as green, orange, red and yellow varieties. Polyhouse conditions play a significant role in the regulation of temperature and relative humidity (%) which ultimately control the production of sweet pepper. Different growth parameters, physiological, biochemical and yield attributes such as plant height, leaf number, SPAD value, vitamin C, total carotenoid, fruit length, fruit diameter, single fruit weight, no. of fruit per plant, fruit yield per plant, fruit yield per plot and fruit yield (tha^{-1}) were measured during the experiment period. The result revealed that the poly house condition always showed better performance in the production of sweet pepper than that of open field condition. All the varieties performed equally in terms of fruit yield. The red variety contained the maximum vitamin C (74.1 mg/100ml) but the yellow variety contained the highest total carotenoid (30.48 µ/g). Polyhouse growing conditions significantly influenced the yield and yield traits. Red variety with polyhouse field condition produced the highest yield (12.33 tha^{-1}) but the best market quality of fruit (fruit length 105.95 mm and diameter 100.53 mm) was produced by green variety in polyhouse field condition which was statistically similar to red variety. Therefore, polyhouse field conditions could be used for sweet pepper production at the farmer's level as a low-cost sustainable technique.

Keywords: Sweet pepper, poly house, temperature management

Leaf and calyx yield and quality as affected by NPK fertilization in *Hibiscus sabdariffa* var. *sabdariffa*

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Abstract

'Chukur' or Roselle (*Hibiscus Sabdariffa* var. *Sabdariffa*) possess culinary, beverages and health benefits. In Bangladesh, published information on canopy trait, leaf biomass yield, and calyx yield & quality as affected NPK fertilizer is unavailable. Hence, the current research was conducted to investigate the important morphological characters, leaf and calyx yields, and quality of calyx as affected by NPK fertilization under field conditions. A field experiment with eight treatments (2 genotypes × 4 NPK doses) was conducted in RCBD design with 3 replications in 2022-223. The two Roselle genotypes were Red and Green morphotypes. The four fertilizer doses were 0, 50, 100 & 150% of the recommended dose of fertilizer (RDF). The recommended doses of NPK were urea @ 400kg/ha, both TSP and MOP @ 200kg/ha of NPK. Plant height, stem diameter, branches number; leaf, calyx and biomass yield per plant and hectare were recorded at 60, 120 and 220 days after seed sowing. Calyx was stored in 3 storage temperatures (0, 4 & 25^{0}C) for 6 months and was analyzed for anthocyanin and color contents. Calcium pectate and total organic acid were also determined in calyx stored at 0^{0}C. The result revealed that 100% RDF of NPK fertilizer produced the best canopy traits, leaf, calyx and total biomass yields, especially at final harvest, 220 DAS (both fresh and dry yield plant^{-1}, hectare^{-1}). It may be concluded that 100% NPK fertilizer significantly improved leaf, calyx and total biomass yields, and genetic differences existed between the Red and Green morphotypes with increased total anthocyanin and total organic acids contents of calyx noted in the Red compared to green Morphotypes.

Keywords: Sorrel, Fertilization, pectin, biomass, calyx yield

Arbuscular mycorrhizal fungi bio-fertilization improved plant growth, N uptake, and straw N use efficiency of maize in microcosm ecosystem: A ^{15}N labeled study

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Abstract

The extent of AMF effects on straw N recovery and N use efficiency in dryland soils is unclear. Therefore, this study was undertaken to understand the effects of AMF on N uptake, straw N recovery, and NUE under maize-growing under no-tillage (NT) and conventional-tillage (CT) dryland soils. Four rhizosphere treatments were established in two-chambered microcosm units where AMF was either permitted or excluded from straw mineralization for 50 days. The rhizosphere treatments were (1) NT+AMF, no-tillage soil with AMF-permitted to straw mineralization; (2) NT-AMF, no-tillage soil with AMF-excluded from straw mineralization; (3) CT+AMF, conventional tillage soil with AMF-permitted to straw mineralization; and (4) CT–AMF, conventional tillage soil with AMF-excluded from straw mineralization. Results found that NT+AMF and CT+AMF treatments improved the plant biomass accumulation, root length, root surface area, and root volume. The N accumulation in the plant was increased up to 116% (42.21 mg) under NT+AMF treatment. The NT+AMF and CT+AMF treatments substantially improved ($p < 0.01$) the 15N abundances (%TN) in shoot biomass, root biomass, and soil. The straw 15N use efficiency of maize from NT+AMF and CT+AMF treatments was 7.9% and 4.4% which were significantly higher than NT–AMF and CT–AMF treatments, respectively. Compared to other treatments, the 15N recovery in plant-soil components was 9.4% (0.18 mg), which was 78.6 to 229.1% greater than other treatments. We suggest AMF application can improve plant growth, N uptake, and straw NUE; however, the best results could be observed in no-tillage dryland soil, possibly for inherent soil properties.

Keywords: Arbuscular mycorrhizal fungi, maize growth, straw mineralization, N use efficiency, microcosm study

Enhancement of drought tolerance in French bean using plant growth promoting rhizobacteria

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Abstract

Drought is one of the major abiotic stresses that significantly affect the productivity of French beans worldwide. Plant growth promoting rhizobacteria (PGPR) have been proved as the suitable mitigators for the consequences of drought stress. The present effort was made to explore the implications of PGPR in French beans while acclimating to drought stress. Among the three bacterial strains [Bacillus subtilis (PPB2), Stenotrophomonas maltophilia (PPB3), and Bacillus amyloliquefaciens (PPB6)], PPB6 was selected as the best candidate for better growth performances in French bean. Therefore, the French bean plants were supposed to the non-stressed control, drought and drought with PPB6 to see the impacts of this bacterium during acclimation to drought stress. Plants provided with drought and PPB6 showed better performances in shoot length, root, shoot and pod weight, number of flowers and pods than plants with drought stress only, indicating the phenotypic adaptation of French beans by PPB6 under drought stress. PPB6 increased relative water content, photosynthetic pigments, SPAD value, chlorophyll fluorescence and reduced electrolyte leakage under drought stress than drought-imposed plants only indicating the amelioration of physiological properties by PPB6 under drought stress. In contrast, PPB6 significantly reduced proline, total phenolics and flavonoid contents under drought stress than only drought-imposed plants. Along with that, the significant reduction of enzymatic antioxidant activity such as ascorbate peroxidase, glutathione S-transferase and peroxidase by PPB6 under drought stress suggests the lowering of drought-induced oxidative damage by this bacterium that is consistent to have reduced electrolyte leakage in plants treated with drought and PPB6. Although non-stress control plants showed the best performances in the induction of morpho-physiological parameters and reduction of antioxidative properties, the better permeances in this regard by the plants treated with drought and PPB6 than drought-stressed only suggest that PPB6 can reduce the drought impacts and could partially complement the features of non-stressed control plants. Taken together, our results suggest that the PPB6 as the potential mitigator for the negative consequences of drought stress in French beans.

Keywords: Drought, French bean, stress and antioxidant

Selection of high yielding and quality linseed genotypes through eco-physiological study

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Abstract

To screen out high yielding linseed genotypes based on morpho-physiology and yield an experiment was conducted at the research field and laboratory of the Crop Physiology and Ecology Department, HSTU, Dinajpur from October 2022 to April 2023. The experiment was laid out in a Randomized Completely Block Design with three replications. Data were collected on different morpho-physiological traits, yield components, yield and oil content of 20 linseed genotypes. Among the 20 linseed genotype LIN W 17, GP 10696, KUSTIA 2, LIN F 2017 and BD 10705 performed better for morphological traits; LIN W 17, KUSTIA 2, BD 10705, WB and BD 10710 are found as better regarding physiological traits, whereas LIN W 17, WB, GP 10696, LIN F 2017 and NEELA were found as comparatively high yielder than other genotypes. The maximum seed yield (1.96 t ha^{-1}) was recorded in KUSTIA 1, while the minimum seed yield (0.53 t ha^{-1}) was recorded in LIN W 17. The order of seed yield performance of linseed genotype was KUSTIA 1 > KUSTIA 2> WB > BD 10703 > GOPALGANJ > CHAPAI > LIN 1903 > LIN C 2017 > BD 10705 > BD 10710 > LIN 503 > BD 7141 > LIN 1507/2 > BD 10709 > LIN F 2017 > GP 10696 > LIN 703 > NEELA > LIN 1403 > LIN W 17. The maximum oil content of the seed (45.43%) was recorded in WB and the minimum oil content (43.85) was found in BD 10710. The order of linseed genotypes based on total oil content was WB > LIN 1507/2 > KUSTIA 2 > LIN 503 > KUSTIA 1 > BD 7141 > BD 10709 > GP 10696 > LIN 1903 > GOPALGANJ > LIN W 17 > CHAPAI > LIN F 2017 > BD10703 > BD 10710 > LIN 703 > NEELA > LIN1403 > LIN C 2017 > BD 10705.

Keywords: Linseed genotypes, morpho-physiological traits, yield, oil content

Morpho-physiological and biochemical characterizations in response to single and combined salt and heat stress at vegetables to reproductive stages

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Abstract

An excessive ecological factor that is harmful can hamper the productivity of crops. With the abiotic stress salinity, heat waves, and/or warm spells have been increasing due to global warming. Therefore, we took an endeavor, to investigate the growth and morpho-physiological responses of rice plants under salt stress (SS) with short episodes of high temperature (HT), and a combination of SS + HT, at the vegetative to reproductive stage. Morpho-physiological traits were significantly reduced under SS and SS+HT compared to control. The net photosynthetic rate, pigments synthesis, and Relative water content (%) were constrained significantly in the studied rice genotypes when subjected to single SS and SS+HT stress throughout the vegetative to the reproductive stage but water use efficiency (WUE) increased than the other stress scenarios. Generally speaking, ROS scavenging antioxidant enzyme content was significantly higher in studied rice genotypes under single SS, HT, and SS+HT stress compared to other stressors. The YNU-SLs were more affected by prolonged salt stress experienced from the vegetative to the reproductive stage than the 'Yukinkomai' and 'YNU31-2-4' genotypes due to a significant decrease of morpho-physiological, photosynthetic rates and pigments except only in the heat treatments. The 'YNU31-2-4' genotypes showed more tolerances under salt stress up to the reproductive stage than 'Yukinkomai' and YNU-SLs. Under SS+HT stresses, all genotypes were more affected than experiencing the single SS or SS→HT stress during the vegetative to the reproductive stage but the 'YNU31-2-4' genotype showed comparatively more tolerances than others.

Keywords: Salt and heat stresses, stress tolerance; yield traits

Contribution of culm water soluble carbohydrates to grain filling in grain and fodder type oats (*Avena sativa* L.)

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Abstract

Oats (*Avena sativa* L.) are commonly farmed as a grain and/or fodder crop worldwide but are considered a non-traditional crop in Bangladesh. This crop's importance is rising globally due to its higher health benefits and ease of growing. The grain filling process, which affects grain weight, is one of the key elements in cereal grain yield. Culm reserves and current assimilation have an impact on oat grain filling. To investigate the grain filling pattern and contribution of culm water-soluble carbohydrates to grain in oats, a field experiment was carried out, and chemical analysis was done at the field and plant physiology laboratory of the Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, from November 2021 to April 2022. Two oat genotypes were used in the experiment such as i) BARI Oat-1 as grain type, and ii) a genotype collected from the Central Cattle Breeding and Dairy Farm (CCBDF) in Savar as fodder type. The experiment was laid out in a Randomized Complete Block Design with three replications. Five tillers were sampled once a week during the grain filling period to determine the changes in dry weights of different parts, viz., leaves, culm with sheath, panicles, and grains, and to examine the grain filling pattern in the two genotypes. Data on phenological traits, grain yield, and its attributes were recorded. The bulk of the traits under investigation revealed substantial differences between the two genotypes-grain and fodder types. In the trial, grain type genotype (BARI Oat-1) produced a higher grain yield (0.939 tha^{-1}) compared to the fodder type genotype (0.8713 t ha^{-1}). The grain from the grain type genotype weighted 93.90 g m^{-2} compared to 87.13 g m^{-2} for the fodder type genotype. The grain-filling duration was the same for both genotypes. The grain type genotype exhibited a higher weight of 1000 grain than fodder type genotype, and the 1000 grain weight of the two genotypes was 31.13 g and 28.83 g, respectively. Grain type oat cultivar, BARI Oat-1 contained higher water-soluble carbohydrates in culm and contributed more to grain in oats than the fodder type genotype studied.

Keywords: Culm reserves, grain filling, yield, oats, crop quality

Optimizing cherry tomato production: Impact of fertilizer doses and mulching on fruit yield and lycopene content

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Abstract

Cherry tomato (*Solanum lycopersicum* var. *cerasiforme*), one of the important botanical varieties of the cultivated tomato is a member of the family Solanaceae, containing higher nutritious values and lycopene. A three-factorial randomized complete block design was used to perform this experiment in the field laboratory of the Department of Crop Botany. Three cherry tomato genotypes (Binatomato-10, Exotic cherry tomato line-1 and Golden Purna) were cultivated in the field providing two mulching types (mulch paper vs. no mulch) and three schemes of fertilizers viz. i) recommended doses of fertilizers (RDF) (ii) RDF + Tricho-compost, and iii) RDF + vermicompost. Thus, in total $3 \times 2 \times 3 = 18$ treatment combinations were used in quadruplicates to find the fruit yield and lycopene contents in tested genotypes. We found that the fruit yields of three tested cherry tomato genotypes did not vary significantly due to the genotypes*mulching*fertilizer interaction term. However, the genotypes*mulching interaction and the single effect of each of the genotypes, mulching and fertilizers were found to influence the yields significantly. In mulched condition Exotic cherry tomato line-1 had the highest yield and yield augmentation was 46.32% under mulching compared to the non-mulched ones. The same interaction patterns were found in the other two genotypes. The yield of Binatomato-10 and Golden Purna was increased by 21.02% and 13.17%, respectively when mulch was provided. Also, different fertilizer schemes significantly influenced yields across three genotypes. All three genotypes gave the highest yield under RDF with the Tricho-compost application the lowest was confirmed from the RDF application. Single effect of genotypes revealed that the highest fruit yield in Exotic cherry tomato line-1 (1610.42 g/plant) differed significantly from the lowest fruit yield that came from Golden Purna (744.42 g/plant). The single effect of mulching reveals that the mulched plants had significantly higher fruit yields (1449.3 g/plant) than the non-mulched plants (1121.6 g/plant). Also, a single effect of fertilizer shows that each Tricho-compost or vermicompost along with RDF gave significantly higher fruit yields compared to RDF alone. Fruit size was significantly higher in Exotic cherry tomato line-1 (11.35 g/fruit) than in Binatomato-10 (4.95 g/plant) and Golden Purna (5.12 g/plant). Lycopene contents in the freshly ripped tomatoes and during a 12d storing at room temperatures were assessed. In general, lycopene status in the Exotic cherry tomato line-1 was almost two-fold to that of Binatomato-10, and the lycopene in Golden Purna was almost nil. After 4 days of harvest lycopene concentrations increased by around 10% in each of Exotic cherry tomato line-1 and Binatomato-10. However, the concentrations of lycopene then gradually declined at 8 and 12 days of post-harvest period @ of around 10% and 37%, respectively, in both genotypes.

Keywords: Cherry tomato, fertilizer, mulch, lycopene, nutrient

Phytochemical screening of medicinal Zingiberales in Bangladesh: antioxidants and their free radicals scavenging potential

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Abstract

The present study aimed to evaluate the dry matter, phytochemical constituents, and radical scavenging potentials of leaves and rhizomes of twenty important Zingiberales medicinal plants. The dry matter content in the leaves ranged from 5.32% to 24.81%, while in rhizomes, it varied from 5.11% to 20.1%. Total phenolics content in leaves ranged from 76.14 to 1395.37 mg GAE/100g FW, and in rhizomes, it ranged from 48.73 to 359.91 mg GAE/100g FW. Flavonoid content in leaves varied from 204.29 to 3894.81 mg CE/100g FW, and in rhizomes, it ranged from 157.87 to 768.9 mg CE/100g FW. The IC50 value to scavenge DPPH in the leaves ranged from 1.57 to 104.30 mg mL^{-1}, and in rhizomes, it varied from 4.01 to 152.94 mg mL^{-1}. Regardless of the plant parts analyzed, the dry matter content ranged between 7.29 to 21.2%, phenolics content between 62.43 to 841.27 mg GAE/100g FW, flavonoids content between 229.89 to 2069.05 mg CE/100g FW, and IC50 values to scavenge DPPH between 4.16 to 128.62 mg mL^{-1} among the 20 species studied. Leaves exhibited approximately 2.03, 3.3, and 2.83 times higher dry matter, phenolics, and flavonoid content compared to rhizomes, respectively. However, rhizomes showed approximately 1.79 times lower IC50 values for scavenging DPPH compared to leaves among the 20 species. Based on hierarchical cluster analysis, the 20 genotypes were grouped into four clusters for leaves, where Clusters 1, 2, 3, and 4 contained 1, 9, 8, and 2 genotypes, respectively. Cluster 1 demonstrated the highest antioxidant capacity, while Cluster 2 exhibited the highest dry matter values. For rhizomes, they were also separated into four clusters, with Cluster 1, 2, 3, and 4 comprising 4, 8, 6, and 2 species, respectively. Cluster 4 showed the highest antioxidant capacity, and Cluster 3 exhibited the highest dry matter values. In conclusion, the leaves of Zingiberales plants are a significant source of dry matter and antioxidants, surpassing rhizomes in health-beneficial biochemical constituents. The hierarchical cluster analysis helped identify clusters with superior antioxidant capacity and dry matter content in both leaves and rhizomes among the species studied.

Keywords: Zingiberales, antioxidants, phytochemicals, free radical scavenging

Polyhouse cover in raising quality boro-rice seedlings averting winter cold injury for boro-rice production

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Abstract

Low temperature injury on Boro-rice seedlings is a common occurrence in the winter of Bangladesh. Experiments were conducted in Boro-season using portable polyhouse covers to avert winter low temperature injury on Boro-rice seedlings. Seeds of HYV rice varieties collected from BRRI, Gazipur and BINA, Mymensingh were sprouted and uniformly sown in well puddle seedbeds each of 1 m^2 size followed by immediate covering with portable polyhouses each of 1.1x1.1m size for 30 or 40 days (30d or 40d) keeping open beds aside as a control. RCBD design with three replications was followed for each experiment. Temperature and seedling growth within and outside the polyhouse covers were recorded. Initial low soil/air temperatures in the morning inside or outside the polyhouses increased with advancement of the day till 2:00 PM followed by a decline but air temperature inside the polyhouses increased by 5-7°C over control at noon time. Seedlings under polyhouse covers were 35-80% taller than those in control beds depending on the varieties. Irrespective of varieties leaf chlorosis was almost nil in seedlings continuously covered with polyhouse but was severely noticed in control seedlings even in seedlings exposed for a short time (10 days) in open air. Seedlings under polyhouse cover accumulated 40- to 80-fold high soluble sugar contents compared to those grown in the open fields. Seedlings under polyhouse cover accumulated about 2 times more dry matter than that in the open fields. Warm conditions (5-7°C) inside polyhouse cover would enhance the biological activities of those in control and thereby producing healthy and quality seedlings. Light intensity curtailed by 40% for polyhouse cover has no significant negative impact on rice seedling growth. Seedlings grown in the open field and those under polyhouse cover for different durations (30d and 40d) were transplanted in rice field to know their carryover effects of polyhouse on the growth and yield of Boro-rice. Irrespective of variety flowering and maturity time was enhanced by 5-10 days and grain yield increased by about 10% from the seedlings grown under polyhouse covers compared to those from open fields. The experiment with different colored polythene covers revealed that white/yellow polythene cover had shown superiority to green/blue polythene cover.

Keywords: Polyhouse, seedling growth, boro rice, chilling injury

Influence of mulching on growth and yield of strawberry genotypes

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Abstract

Strawberry is mainly a temperate fruit crop but growing in tropical and sub-tropical regions due to the development of day-neutral varieties. The morpho-physiological response of those varieties differs based on their coping ability with the environment. Intercultural operations like mulching play an important role in coping ability, performance, and yield. However, there has been no report describing the performance of strawberry genotypes with mulching practices in Bangladesh. Therefore, this research aimed to determine the impact of mulching on morpho-physiology, yield, and yield attributes of various strawberry genotypes centering on their coping ability with the environment. The study was carried out with two factorial RCBD with three replications from November 2022 to March 2023 in the field laboratory of the Department of Crop Botany and Tea Production Technology, Sylhet Agricultural University, Sylhet. After the collection of different genotypes, six were used for the study. Environmental data were collected with a digital data logger. Various morph-physiological, biochemical and yield attributing data from plants and fruits were recorded. Under the rising temperature and lower relative humidity of March, G2 and G5 were found to be very sensitive to heat while G1 and G6 endured the environmental conditions for their growth. Mass distribution and pigment content of the leaves of G5 and G2 were negatively impacted while G4 and G6 performed comparatively better respectively. Genotype G1 blooms flower earlier and provides fruit for a longer period followed by G2 and G6 under mulch conditions while G3 does the opposite. However, sugar content (Brix) was maximum in G1 (9.9%) and G6 (10%) but has a relatively low level of antioxidant activity (62.98% & 61.61%) with low levels of vitamin B and C. The G2 has a relatively high level of Vitamin B and C with lower levels of sugar content (7%) and antioxidant activity (64.74%). In this case, the G5 had moderate levels of sugar content (8.1%) with moderate levels of vitamin B and C but a higher level of antioxidant activity (76.25%). Although the G2 with mulches provided better yield despite heat sensitivity G6 with mulches showed the best performance in terms of its response in growth and yield compared to the rest of the genotypes.

Keywords: Strawberry genotypes, mulching, growth, vitamin content, antioxidant activity

Qualitative and quantitative characterization of twenty one F_5 genotypes of AUS Rice

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Abstract

The investigation was carried out under field conditions to characterize qualitative and quantitative traits of twenty-one (21) advanced Aus rice lines (F_5). The experiment was conducted in a randomized complete block design (RCBD). The field was divided into three blocks; each block was subdivided into 21 plots (lines) where genotypes were randomly assigned. The experiment was conducted during the period of the Transplanting Aus season (April 2015 to August 2015) at the genetics and plant breeding experimental field of Sher-e-Bangla Agricultural University, Bangladesh. All the genotypes were characterized and categorized as per the descriptors developed by Biodiversity International, IRRI and WARDA-2007 for DUS test of inbred rice. All the genotypes were grouped and classified as well as described based on morphological characters as per descriptors so that all the observed genotypes containing described characters can be easily evaluated and identified at a glance for further studies.

Keywords: Characterization, DUS test, Genotypes, AUS Rice.

Chlorophyll fluorescence kinetics for detection of submergence stress of rice

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Abstract

Chlorophyll fluorescence imaging is a useful technique for evaluating plant health and stress responses, such as submergence stress in rice. When rice plants are submerged in water for an extended period, they suffer from reduced oxygen availability and other physiological challenges. Chlorophyll fluorescence imaging is a non-invasive and quick method of monitoring plant photosynthetic efficiency under stress conditions. Photosystem II (PSII) is extremely sensitive to both abiotic and biotic stresses. To detect damage to photosynthetic apparatus, a variety of chlorophyll fluorescence kinetics are used. The maximum quantum yield of PSII, on the other hand, is represented by the dark-adapted state of the Fv/Fm ratio (variable fluorescence over maximum fluorescence). A decrease in dark adapted Fv/Fm indicates photosynthesis system damage. To date, dark adapted Fv/Fm has been found to have less sensitive kinetics in C3 species compared to C4 species for the majority of abiotic and biotic stress conditions. The current study sought to elucidate the kinetics of chlorophyll fluorescence in rice under a variety of submergence stresses. Ten-day-old seedlings were inundated in 100 cm of turbid floodwater for 1, 2, 3, 4, and 5 days. After each of the five days of submergence treatments, as well as the recovery following the receding of the floodwaters, a dark-adapted image of chlorophyll fluorescence was captured. The maximum quantum yield of PSII (Fv/Fm) under dark adaptation decreased as the duration of the flooding increased in both tolerant and sensitive cultivars. However, significant differences were only observed when the leaves were nearly dead. This demonstrated that dark-adapted Fv/Fm is insufficiently sensitive to detect damage at an early stage of stress. As a result, a variety of quenching protocols were tested to identify the best kinetics for detecting early stress damage. The dark-adapted sample was initially illuminated with a saturating pulse and subsequently with actinic light as part of the quenching protocol. Several saturating pulses were implemented in conjunction with actinic light exposures. This facilitates the PSII photochemistry to achieve steady-state operational efficiency. As evidenced by the fact that the first maximum fluorescence peak is less sensitive than the other three pulses, PSII operates precisely. In the majority of the studies that followed, reproducible kinetics for the early detection of submergence stress in rice were only identified between the second and fourth pulses. In conclusion, the PSII efficiency can precisely predict the onset of submergence stress damage under steady-state conditions when the quenching protocol is utilized.

Keywords: PSII efficiency, chlorophyll fluorescence, anoxia, waterlogging, abiotic stress

Exogenous application of mepiquat chloride and abscisic acid on aromatic rice cv. Kataribhog for increasing lodging resistance and grain yield

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Abstract

Aromatic rice is a cereal food crop of great importance which has economic potential in home and international markets but lower yield is a major constraint. A field experiment was carried out to explore the antioxidant enzyme activity, starch and chlorophyll content in flag leaf, dwarfing height and improving the yield of aromatic fine rice cv. Kataribhog under different levels of mepiquat chloride and abscisic acid. The PGRs treatment comprised five concentrations of mepiquat chloride (0 ppm, 100 ppm, 200 ppm, 300 ppm and 400 ppm) and four concentrations of abscisic acid (0 ppm, 50 ppm, 75 ppm, and 100 ppm) spraying quartet on early vegetative, vegetative, panicle initiation and heading stages. The antioxidant enzymes activities like superoxide dismutase (SOD), peroxidase (POD), catalase (CAT) and ascorbate peroxidase (APX), growth parameters like plant height, leaf blade length, internodal length and tiller number, physiological parameters like flag leaf starch and chlorophyll content, yield components like grain number panicle^{-1}, filled grain panicle^{-1}, unfilled grain panicle^{-1}, panicle length, spikelet number, 1000 grain weight, grain yield, straw yield, biological yield and harvest index were investigated. The independent effect of MC was significant in most of the studied parameters but there was a very negligible effect and/or not statistically significant effect of ABA treatment alone. It was found that spraying MC or ABA could positively increase SOD, POD, CAT and APX activities in aromatic rice flag leaves. There was a significant effect of different levels of MC for making dwarfing plants and shorter internodal length spraying with MC but ABA at all growth stages. As the concentration of MC increased, the plant height and internodal length shortened in the present study. It was also observed that the tillers number hill^{-1} was positively increased at different growth stages by different levels of MC on aromatic rice cv. Kataribhog. There were statistically significant variations among different levels of MC and ABA treatment in the synthesis of flag leaf starch and chlorophyll-a, and total carotenoid content. The study inferred that the application of 400 ppm mepiquat chloride had a better stimulation effect on antioxidant enzyme activities, increased tiller number, dwarfing the plant height, and increased yield, while 100 ppm abscisic acid had the best effects on growth as well as some yield contributing characters of aromatic rice cv. Kataribhog which might be recommended as an ecofriendly tool to the rice farming sector in Bangladesh.

Keywords: Aromatic rice, lodging, abscisic acid, grain yield

Effect of plant age on the nutritional composition of jute leaf as a vegetable

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Abstract

Jute is an important cash crop in Bangladesh, and its economic importance has been further enhanced by the nutritional value of its leaves, making them a popular vegetable. These leaves are an excellent source of vitamins, like vitamin A, C, and K, along with essential minerals such as iron, calcium, and magnesium. However, the influence of the plant's age on the vitamin and mineral content of jute leaves is not widely understood. The experiment was conducted at the Jute Agriculture Experimental Station in Jagir, Manikganj, using RCBD design to investigate the effects of plant age on the vitamin and mineral content of jute leaves. Fully developed leaves were randomly sampled from the apical stems of 15, 30, and 45 day old plants to ensure representative sampling across age groups. After estimating the vitamin & mineral contents of jute leaves, MSTAT-C software was used for statistical analysis of the experimental data. In terms of the relationship between mineral content & plant age, the maximum amount of Ca (4.62%), K (1.33%), N (5.39%), Fe (459 mg/kg) was obtained from 15 day aged plant leaves while Mg (1.21%) was found highest from 45 day aged plant leaves. On the contrary, the maximum amount of Vitamin A (203.09 µg/g), Total carbohydrate (7.05 g) and fat (0.8 g) was found from 30 day aged plant leaves while 15 days old leaves demonstrated the maximum amount of Vitamin C (54.66 mg/100g), and crude protein (33.69 g). It is worth mentioning that the highest ash content (4.56%) was derived from leaves of plants aged 45 days. As a result, it can be concluded that the maximum amount of vitamins and minerals can be obtained by eating jute leaves within 15 -30 days after germination.

Keywords: Food quality, vitamins, minerals, leafy vegetables, cash crop

Effect of GA3 on morpho-physiological characteristics, flowering biology, fruit setting and yield attributes of brinjal (*Solanum melongena* L.)

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Abstract

Brinjal plant (*Solanum melongena* L.) is a warm climate crop. The novelty of the present investigation consisted of the growth, flowering biology and yield of two varieties of brinjal (Islampuri and Rashmi) with different concentrations of GA3 [control (T0), 30ppmGA3 (T1), 50ppm GA3(T2), 70ppm GA3(T3), 90 ppm GA3(T4)] to find out the suitable variety, determine the crucial mechanisms behind the increased flowering and fruit set efficiency and optimum level of GA3 for increased brinjal production. The flower phenotype (long, medium or short styled), and fruit setting, were recorded during the reproductive periods. The experiment was laid out by randomized complete block design (RCBD). Data on morpho-physiological characteristics and yield contributing parameters were recorded at 45, 60, and 75 days after transplanting (DAT). Among all the treatments it was concluded that for morpho-physiological characteristics as well as yield attributes, the variety rashmi with GA3 @50 ppm treatment gave the highest plant height at 0.2 cm, 75.9 cm, and 85.4 cm at 45, 60 and 75 days respectively, SPAD value 67.3, 69.4 64.7 and fruit number 15, 15 & 24 at 45, 60 and 75 days respectively. Domination by long-styled flowers was observed, amounting to 41%, and 55% of all flowers of Islampuri and Rashmi respectively. On the other hand, long styled flowers were recorded, 26%, 32%, 39%, 33% and 28% of all flowers of T0, T1, T2, T3 and T4 treatment respectively. On the other hand, yield per plot 2.541 kg, 3.012 kg and 3.754 kg at 45, 60 and 75 days respectively was recorded from variety rashmi with the spraying of GA3 50ppm. So, considering the above observation, Rashmi and 50 ppm GA3 significantly affect the morpho-physiological, flowering biology and yield attributing characters which produce superior results compared to Islampuri and GA3 treatment. GA3 50 ppm is therefore suggested to apply on brinjal cultivation and Rashmi is recommended for Patuakhali region for better yield production.

Keywords: Brinjal plant, flowering biology, fruit set, yield

Physiological characteristics of BAU Chia-1 (*Salvia hispanica* L.) and their relation with growth parameters

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Abstract

BAU Chia-1 (Salvia hispanica L.) is an annual oilseed plant belonging to the Salvia category of the Lamiaceae family. It was introduced to Bangladesh in 2011. Considering its nutritional value, the European Union approved it as a novel food in 2009. Now BAU Chia-1 is becoming popular as a functional food crop in Bangladesh. Hence information on its photosynthesis and its relation with growth is scarce. This research is focused on the physiological characteristics (dry matter, photosynthetic rate, stomatal conductance, transpiration rate, leaf area, and SPAD value) and different growth parameters of BAU Chia-1 grown in Bangladesh. The experiment was conducted in the Field Laboratory, Department of Crop Botany at Bangladesh Agricultural University. We noticed that the dry matter of BAU Chia-1 continued to increase until harvesting. The maximum photosynthetic rate was 11.22 µmol m^{-2} s^{-1}, stomatal conductance was 0.667 mol m^{-2} s^{-1}, and transpiration rate was 4.16 mmol m^{-2} s^{-1}. Leaf area and SPAD value continue to increase up to 50 days, then gradually decrease till the time of harvesting. AT 50 DAS, the leaf area was 118.94 cm^2, and at harvesting the leaf area was 84.23 cm^2. However, the SPAD value was 32.867 at 50 DAS and 29.733 was at harvesting. The crop growth rate (6.46 g m^{-2} d^{-1}) gradually increases up to 51-60 DAS and then decreases. A similar trend was observed in the Net assimilation rate; gradually increased (9.87 g cm^{-2} d^{-1}) up to 51-60 DAS then declined. But the Relative growth rate gradually decreased and the highest RGR (0.24 g $g^{-1}d^{-1}$) was calculated at 31-40 DAS and decreased up to 0.04 g $g^{-1}d^{-1}$ at 61-70 DAS. The results revealed that physiological characteristics showed a strong relationship with the growth rate of BAU Chia-1 cultivating in Mymensigh.

Keywords: BAU Chia-1, photosynthesis, transpiration, stomatal conductance, SPAD value

Stability assessment of different sugarcane clones under flood stress condition

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Abstract

An experiment was carried out in flood-prone areas in farmers' fields at Chunarughat and Pakshy (Ishurdi) of Bangladesh during the cropping season 2017-2018. For this study, nine selected clones and one BSRI Released variety viz: I 103-11, I 7-11, I 111-11, I 230-11, I 36-12, I 143-12, I 146-12, GT-11, G -17 and Isd 39 (standard) were planted following RCBD design with three replications. The trial was conducted to screen flood stress tolerant clones. Significant differences were observed for all parameters of tested sugarcane in both locations. At the Chunarughat location, the highest cane yield (107.34 t ha^{-1}) was found in GT-11, which was followed by I 111-11 and GT-17. At Pakshy (Ishurdi) location, the highest cane yield (136.37 tha^{-1}) was found in GT-17, followed by I111-11. At Chunarughat location, the highest brix % (21.73) was found in I 111-11 that, followed by I 146-12 and GT-17. At Pakshy (Ishurdi) location, the highest brix % (21.03) was found from GT -17, followed by I 111-11, I 146-12 and GT-17. The clones I 111-11, GT-17 and GT-11 might be considered highly tolerant under flood stress conditions and showed highly tolerant reactions, having tolerance rating of 1 in both locations. This screening program will help the breeders for selecting suitable varieties for flood situations.

Keywords: Sugarcane, clone, yield, brix %, intolerant, tolerant

Effect of light-emitting diodes (LEDs) spectrums on potato (*Solanum tuberosum* L.) tuberization in plant-factory growing (aeroponic) culture system

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Abstract

A plant factory under artificial light conditions is an innovative and intelligent idea for growing plants, regardless of external environmental inconvenience. Growing potatoes (*Solanum tuberosum* L.) in (plant-factory) light-emitting diodes (LEDs) system is comparatively a renewed idea. The present experiment was conducted in a plant factory to investigate the effects of distinct spectrum compositions of LEDs on potato tuberization grown in an aeroponic culture system. Potato tuberization was tested under eight LED light combinations with 300 mol m-2 s-1 of irradiance, while natural light was used as the control treatment. According to the findings, the light spectrum L4 with red: blue: green (70+10+20) LED manifested higher tuber number, tuber size (>3g) and GA3 content along with better plant growth characteristics. Besides, photosynthetic pigments and photosynthetic activity were found better in L1 red: blue: green (70+25+5), L4, and L7 red: blue: far-red (70+15+15) treatments. Finally, with consideration of plant photo-morphological, physiological and tuberization performance the treatment L4 was found with best spectral composition compared to all treatments.

Keywords: Light spectrum, potato tuberization, tuber number, growth characteristics, photosynthetic activity

Effect of organic and inorganic fertilizers on growth, yield and antioxidant contents of lettuce grown in a rooftop garden

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Abstract

Urban agriculture is gaining attention as rooftop farming which provides a solution to food security and adaptation to climate change. There are various types of fruits and vegetables were grown in the roof garden including salad vegetable lettuce which contains vitamins, minerals etc. Suitable combinations of organic and inorganic fertilizer applications are the major concern for the development of sustainable rooftop farming. However, to our knowledge, no study has been conducted to evaluate the influence of inorganic and organic fertilizers in soil media on growth, fresh yield and antioxidant content of lettuce in rooftop garden conditions. This pot experiment was conducted in the rooftop garden of the Agricultural Botany Department of SAU, Dhaka to study the effects of organic and inorganic fertilizers on the yield and antioxidant properties of lettuce from November 2019 to May 2020. The twelve treatments are T0 = Soil 100%, T1= Soil 100% + Inorganic fertilizer, T2 = Soil 80% + Cowdung 20%, T3 = Soil 90% + Vermicompost 10% , T4 = Soil 95% + Biochar 5%, T5 = Soil 80% + Cowdung 20% + Inorganic fertilizer, T6 = Soil 90% + Vermicompost 10% + Inorganic fertilizer, T7= Soil 95% + Biochar 5% + Inorganic fertilizer, T8 = Soil 70% + Cowdung 20% + Vermicompost 10% + Inorganic fertilizer, T9 = Soil 75% +Cowdung 20% + Biochar 5% + Inorganic fertilizer, T10 = Soil 85%+ Vermicompost 10% + Biochar 5% + Inorganic fertilizer, T11 = Soil 65% + Cowdung 20% + Vermicompost 10% + Biochar 5% + Inorganic fertilizer were taken in this experiment with four replications. The growth parameter such as plant height, leaf number, shoot fresh and dry weight increased with sole or combined application of cowdung, vermicompost, biochar and inorganic fertilizers in soil than control (T0). Together application of organic and inorganic fertilizers significantly increases the fresh and dry weight of the shoot than the control (T0). The different antioxidant compounds of lettuce leaf such as vitamin C, phenolic and flavonoid content increased with the sole application of organic fertilizers and combined application of inorganic and organic fertilizers than control (T0). But inorganic fertilizers decrease antioxidant compounds such as vitamin C, phenolic and flavonoid content. Therefore, the results suggested that the sole application of organic fertilizers improves the yield and quality of lettuce than the sole application of inorganic fertilizers or combined application of both organic and inorganic fertilizers in soil media grown in rooftop garden conditions.

Keywords: Rooftop farming, organic and inorganic fertilizers, growth, yield, antioxidants

Close link between green leaf volatiles and jasmonic acid: Progress in herbivore-plant interaction

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Abstract

Plants emit a diverse array of phytogenic volatile organic compounds (VOCs). Although certain volatile chemicals are retained in plant tissues and released rapidly upon damaged, others are synthesized de novo in response to herbivore feeding and emitted not only from damaged tissue but also from nearby undamaged leaves. HIPVs can be used by predators and parasitoids to locate herbivores at different spatial scales. Olfaction is an essential sensory modality for insects and their olfactory environment is mostly made up of plant-emitted volatiles. Each insect species expresses a set of olfactory receptors that bind part of the volatile compounds present in its habitat. Plants biosynthesize a variety of bioactive lipid derivatives, such as green leaf volatiles (GLVs) and jasmonates (JAs). Plants emit green leaf volatiles (GLVs) in response to insects. GLVs consist of C6 and C9 aldehydes, alcohols, and their acetate esters, and play important roles in the plant defense response. The ability of exogenous GLV application to trigger an induced systemic resistance (ISR) phenotype against arthropod pests has been widely reported. The complexity of plant–insect chemical communication via VOCs is further enriched by the sophisticated molecular perception mechanisms of insects, which can respond to one or more VOCs and thereby influence insect behavior in a manner that has yet to be fully elucidated. Jasmonic acid (JA) pathways, thereby leading to gene expression, biosynthesis of secondary metabolites, plant defensive proteins and different enzymes and volatile compounds, that may induce defenses against leaf-chewing as well as phloem-feeding insects. By now, the biochemical pathway of JA-signalling has been well resolved, allowing the use of an interdisciplinary toolbox and spurring the mechanistic investigation ofplant–insect (herbivore) interactions. Moreover, the exogenous application of JA can be used to elicit plant defense responses similar to those induced by biting-chewing and piercing insects. Despite numerous gaps in the current understanding of VOC-mediated plant–insect interactions, successful pest management strategies such as push–pull systems, synthetic odorant traps, and crop cultivars with modified VOC profiles have been developed to supplement chemical pesticide applications and enable more sustainable agricultural practices.

Keywords: Secondary metabolites, phytohormone, biopesticide, sustainable agriculture

Performance of different mustard cultivars under different planting techniques

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Abstract

Different planting techniques significantly affect the growth and yield performance of mustard plants. An experiment was conducted at Sher-e-Bangla Agricultural University Farm, Dhaka-1207, Bangladesh during rabi season, November 2017 to February 2018 to find out the effect of different sowing methods and varieties on the yield of *Brassica campestris*. The treatment combination consisted of four sowing methods viz. T_0 = Broadcast method, T_1 = Line to line space 20 cm, T_2 = Line to line space 25 cm and T_3= Line to line space 30 cm and three different varieties viz. V_1 = BARI Sarisha 14, V_2 = BARI Sarisha 15 and V_3 = BARI Sarisha 17. The experiment was laid out in two factors Randomized Complete Block Design (RCBD) with three replications. Among different planting methods, the highest plant population was recorded from Broadcast methods of sowing. The tallest plant was recorded from the plot of broadcast methods. The maximum branches plant^{-1}, dry matter weight plant^{-1}, siliqua plant^{-1}and seed siliqua $^{-1}$ were recorded from the treatment line to line space 30 cm. The maximum thousand seed weight (2.97 g) was recorded from the broadcast method. The maximum yield of seed (1.11 t ha^{-1}) was obtained from the broadcast method. The highest plant population (77.25) was observed in case of BARI Sarisha 14. The tallest plant of mustard was found in case of BARI Sarisha 15. The maximum branches plant^{-1}, dry matter weight plant^{-1}, siliqua plant^{-1}, seed siliqua^{-1}, and length of siliqua were obtained from BARI Sarisha 15. The highest yield of seed (0.95 t ha^{-1}) was obtained from BARI Sarisha 15. The combinations of different sowing methods and different varieties had a significant effect on almost all the parameters. The highest biological yield (5.08 t ha^{-1}) was obtained from broadcast methods with the BARI Sarisha 15 treatment combination.

Keywords: Planting methods, broadcast, line sowing, plant density, oilseed crop

Morphological features and yield response of mungbean under waterlogging stress

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Abstract

The effect of waterlogging on growth, reproductive behavior and yield attributes of mungbean [*Vigna radiata* (L.) *Wilczek.*] was studied at the field laboratory of Sher-e-Bangla Agricultural University during the period from September to December 2010. The variety BARI mung-3 and BARI mung-4 was used as the test crops. Two experiments were conducted: experiment-I: effect of waterlogging on reproductive behavior and yield attributes of mungbean sown at September 05, 2010 and experiment-II: effect of waterlogging on reproductive behavior and yield attributes of mungbean sown at September 16, 2010. Both the experiments comprised of two factors; Factors A: mungbean variety; i) V_1= BARI mung-3; ii) V_2- BARI mung-4; Factor B: water logging (4 levels); i) L_o= Control (no water logging); ii) L_1= waterlogging for 3 days after 10 DAS; L_2 waterlogging for 4 days after 20 DAS and L_3= waterlogging for 2 days after 40 DAS. The two-factor experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. In experiment I: in case of interaction effect the highest seed yield (1.42 t ha^{-1}) from V_2L_0, while the lowest (0.92 t ha^{-1}) from V_1L_3. The highest survival percentage (100.00%) was observed from V_2L_0, while the lowest (83.33%) from V_2L_1. In experiment-II, in case of interaction effect of variety and water logging the maximum number of pods per plant (56.13) was observed from V_2L_0, while the minimum (47.53) from V_1L_3. The highest seed yield (1.39 t/ha) was observed from V_2L_0, while the lowest (0.89 t/ha) from V_1L_3. The highest survival percentage (96.67%) was observed from V_2L_0, while the lowest (80.00%) from V_2L_1. The lowest survival percentages were found in the early (10 DAS) water logging conditions and the lowest yield was obtained while waterlogged at 40 DAS (flowering stage) showing vulnerability at reproductive stage. BARI mung-4 provided better yield in all conditions than BARI mung-3.

Keywords: Yield loss, flooding, legume, anoxia, abiotic stress

Estimating potential yield and change in water budget for wheat and maize across Huang-Huai-Hai Plain in the future

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Abstract

Climate change impacts crop productivity as atmospheric conditions and water supply change, particularly in intensive cropping areas. This study used the validated AquaCrop Model, which was run with downscaled daily climate data produced by SDSM and CanESM2. The changes in the potential grain yield of winter wheat and summer maize and water budget during the cropping seasons were estimated for the Huang-Huai-Hai Plain (3H Plain) under RCP4.5 and RCP8.5 scenarios. The results show that the potential yield of winter wheat is increasing with similar spatial patterns in the 2030s, 2050s, and 2080s, with much of the increase being distributed in Shandong and northeastern parts of Henan. During the winter wheat growth period, the water budget deficit will likely improve from -210 mm in the 2030s to -202 mm in 2080s under RCP4.5 and from -206 mm in the 2030s to -191 mm in 2080s under RCP8.5 across the 3H Plain. The water budget during the winter wheat period will continue to be in deficit in the north 3H Plain and improvements are estimated mostly in the lower southern areas of the Plain. The summer maize potential yield is estimated to increase from the baseline period, but yields will decrease by 0.81%, 1.19%, and 2.10% in the 2030s, 2050s, and 2080s, respectively, under RCP8.5 compared to RCP4.5. During the summer maize growth period, the water budget is also estimated to improve from 109 mm in the 2030s to 126 mm in the 2080s under RCP4.5 and 107 mm in the 2030s to 163 mm in the 2080s under RCP8.5. This increase is mainly estimated in the central and south of the 3H Plain. The estimated ETc of winter wheat shows no significant decrease, while the reduction of 6 mm and 13 mm for summer maize is observed under RCP4.5 and RCP8.5, respectively. The study provides scientific evidence to devise adaptation and mitigation climate change strategies for agricultural productivity and water resource management.

Keywords: Huang-Huai-Hai Plain, climate change, winter wheat, summer maize, potential yield, water budget, Aqua Crop Model

Genetic control of NPF2.12-NIA1 signaling cascade improves nitrogen utilization in cereals

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Abstract

Roots are the primary biological structures of plants associated with nitrogen (N) uptake and transport, although their genetic and molecular basis have been poorly explored so far in wheat. Here, our efforts aimed to dissect genetic and genomic control of root system attributes for unraveling natural genotypic diversity, adaptive loci, and candidate genes using a genome-wide association study (GWAS). Interestingly, we found that all morphological and nodal root anatomical traits were significantly decreased under high N levels and provided substantial genotypic variation. GWAS implicated significant maker-trait associations for both root morphological and anatomical attributes in response to low N fertilization. We identified some candidate genes regulating root system traits, especially NPF2.12 gene for low-affinity nitrate transport system. Notably, we uncovered a syntenic gene, NPF2.12 for low-affinity nitrate transport. Phylogenetic analysis revealed that NPF2.12 encodes a specific MAJOR FACILITATOR SUPERFAMILY domain-containing protein highly similar between wheat and barley with transporter activity. Here we show that the variation in NPF2.12 promoter is positively associated with root growth and root-to-shoot nitrate transport by decreasing its expression under low nitrate availability. Further, loss-of-function mutant npf2.12 specifically transactivates the nitrate reductase NIA1 gene at low nitrate concentrations resulting in elevated levels of nitric oxide production leading to higher root growth and nitrate transportation compared to wild-type. Notably, multiple field trails revealed that the elite allele TaNPF2.12TT significantly enhanced N uptake, and root-to-shoot transport that subsequently increased NUE under minimum N. Collectively, our study uncovers a conserved genetic regulator of nitrate sensor in wheat and barley and NPF2.12-NIA1 signaling cascade may provide a new route to improve NUE underlying root growth to limited N availability.

Keywords: Cereal, GWAS, nitrate transport, nitrogen use efficiency, root system architecture

Rooftop garden: crop production and environment conservation with changing climate in the Dhaka city

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Abstract

The cities of the world including Dhaka are facing serious problems due to environmental vulnerability with changing civilization and climate. Meanwhile, the Department of Agricultural Extension (DAE) and Soil Resource Development Institute (SRDI) have implemented a pilot project "Urban Agriculture Production Support Project" for the expansion of urban agriculture as roof gardening in Dhaka city from 2018-2021 to increase urban food production and to reduce the increasing temperature and air pollution. However, no study has been conducted to study the effects of rooftop farming on fresh, safe and nutritious food production and environment conservation in Dhaka city with changing environment. Therefore, a research-based roof garden model was developed at Sher-e-Bangla Agricultural University with the financial help of the NATP-2 project. The experimental result showed that the maximum fruit yield of tomato was found from the bed frame than the earthen or plastic pot plant growing structure. The soil media composed of soil, cowdung, vermicompost and inorganic fertilizers (IF) is supported to produce 70% more fruit yield than the soil medium composed of soil along with IF in the rooftop garden. Another experimental result highlighted that the roof garden reduced the upper surface temperature of the roof by more than 9 °C and lower surface temperature of the roof by 1.74 °C compared to a bare roof and was believed to reduce the electricity consumption for cooling the room of the top floor of the building during the summer season. The oxygen and carbon dioxide percentages were higher and lower, respectively in the garden than the bare roof. Therefore, the results suggest that urban crop production and environmental balance can be achieved to a certain extent by increasing the intensity of roof gardening in Dhaka city.

Keywords: Roof garden, crop production, temperature, oxygen, carbon dioxide

Rainwater harvesting as a due climate-smart practice: Problems and prospects in Bangladesh agriculture

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Abstract

Recent climate science reports have determined with a high level of certainty that global climate is changing and its consequences are mostly affecting agriculture and crop production. The climate change impact on water resources is central to all other impacts. Hence, the water sector must seek alternative water resources and develop improved water management approaches that will reduce pressure on already stressed systems. The Intergovernmental Panel on Climate Change (IPCC) has listed rainwater harvesting as a key strategy for a planned adaptation in the water sector. As a monsoon climatic region, a huge amount of water precipitates from rains in Bangladesh that mostly occur during the season extended from June to September. In contrast, the remaining period passes with little or no rain leading to a water crisis in crop cultivation, especially from February to April or May. Evapotranspiration that dries up water is high during the pre-monsoon dry season which brings the situation peril for crop production. Thus, the use of rainwater harvested during the monsoon season in agricultural practices during the next dry season is a great challenge. The indigenous techniques of rainwater harvesting that vary from region to region are highlighted. The scale-up potentialities of those techniques need policy actions of the government to minimize the water crisis in agriculture. Extension activities might also be strengthened in grower level for popularizing rainwater harvesting in crop cultivation. Although the issue is very important for agricultural production throughout Bangladesh special attention should be paid to the southern coastal areas as the region is seriously affected by salinity. Thus, pertinent research integrating all types of stakeholders is the demand of time.

Keywords: Canal/channel, coastal areas, drought, evapotranspiration, pond, run-off, salinity, southwest monsoon

Effect of different agronomic practices on the chemical composition and antioxidant activity of black pepper (*Piper nigrum* L.) Grown in Sylhet

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Abstract

Black pepper (*Piper nigrum* L.) is a popular spice with numerous health benefits attributed to its phytochemical compounds and antioxidants. However, little is known about the effect of agronomic practices on the chemical composition and antioxidant activity of black pepper. This study aimed to investigate the effects of irrigation and various fertilizer treatments on the nutritional and antioxidant properties of black pepper grown in the Sylhet region. The experiment consisted of 24 black pepper plants with two irrigations and four different fertilizer treatments (Farmer's practice, well-decomposed cow dung, chemical fertilizers and 50% chemical fertilizers+50% cow dung). Irrigation was done during the dry season and fertilizers were given two times per year. Mature black peppers were subjected to proximate analysis, vitamin, and phytochemical content. Results showed that irrigated black peppers had lower dry matter (DM) and higher crude protein (CP) compared to non-irrigated ones. Fertilizer treatments showed slight variations in DM, Ash, crude fiber (CF), ether extract (EE), and nitrogen free extracts (NFE) levels, with CP content significantly higher in well-decomposed cow dung treatment. Both irrigated and non-irrigated peppers had similar vitamin B1 and B2 levels, but vitamin C content was significantly higher in non-irrigated peppers. Farmer's practice and well-decomposed cow dung resulted in elevated vitamin C content compared to chemical fertilizers. The phytochemical evaluation showed that non-irrigated peppers had higher total phenolic content (TPC), total tannin content (TTC), and total flavonoid content (TFC). Farmer's practice and well-decomposed cow dung treatments displayed the highest TPC values, while chemical fertilizers led to lower TPC and TTC levels. Non-irrigated plants consistently outperformed irrigated plants in terms of TPC and TTC, indicating a negative effect of irrigation and chemical fertilization on polyphenol levels in black pepper. Non-irrigated peppers had significantly higher antioxidant activity compared to irrigated peppers. Among the fertilizer treatments, well-decomposed cow dung treatment displayed the highest antioxidant activity, while chemical fertilizers (NPK) exhibited the lowest. This research provides valuable insights into the potential implications for optimizing the quality and health benefits of black pepper through appropriate agronomic practices.

Keywords: Black pepper, fertilizer management, king of spices, secondary metabolite

Medicinal weeds of Bangladesh: An investigation into pigments, antioxidants and free radical scavenging potential

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Abstract

Weeds pose a significant threat to cultivated crops, especially vegetables, surpassing losses caused by diseases or insects. While chemical weed control is common, its increasing use affects the nutritional value of vegetables. To address this, utilizing these weeds for medicinal purposes instead of disposal is proposed, offering a potential solution to offset losses and promote sustainability. In this study conducted in Khulna, southern Bangladesh, the pigment content, phytochemical composition, and radical scavenging ability of twenty medicinal weed species were comprehensively evaluated. Three-month-old specimens, uniform in their flowering stage, were collected using a Completely Randomized Design (CRD) and examined at the Crop Botany Department Laboratory of Khulna Agricultural University. Chlorophyll-a, chlorophyll-b, total carotenoids, total phenolic compounds, total flavonoid content and radical scavenging activity were evaluated following established protocols. Statistical analyses, including two-way ANOVA and Tukey tests, identified significant differences among species. Additionally, using R programming, the data were subjected to biplots, correlation-matrix scatter plots, principal component analysis (PCA), and two-way hierarchical clustering. *Heliotropium indicum* and Scoparia dulcis exhibited the highest Chlorophyll-a in leaves and stems, respectively. *Parthenium hysterophorus* leaves showed the highest Chlorophyll-b content, and *Oxalis corniculata* leaves displayed the highest total chlorophyll. Carotenoid content was highest in *Alternanthera sessilis* leaves and lowest in *P. hysterophorus* leaves. *Euphorbia hirta* dominated in phenolic content, Senna occidentalis claimed the highest flavonoid content overall and *P. hysterophorus* exhibited the highest DPPH radical scavenging capacity. Except for one exception, leaves consistently surpass stems, demonstrating significantly higher compound concentrations (2.07-2.93 times) and a superior antioxidant potential (1.45 times lower IC50). Further, the 20 genotypes were divided into five leaf clusters (Cluster 1: 7, Cluster 2: 1, Cluster 3: 6, Cluster 4: 3, Cluster 5: 3) and six stem clusters (Cluster 1: 5, Cluster 2: 1, Cluster 3: 8, Cluster 4: 1, Cluster 5: 4, Cluster 6: 1) by hierarchical cluster analysis, which also revealed important information about the studied components of the samples. Thus, understanding the variations in chemical composition and antioxidant properties of leaves and stems can contribute to the development of potential medicinal applications and promote sustainable utilization of these weed resources rather than throwing them out.

Keywords: Medicinal weed, free radical, antioxidants, pigments economic botany, medicinal plants

Quantification of total phenolics, flavonoids, antioxidant activity, pigments, and mineral composition in three *Dillenia* species: a comprehensive analysis

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Abstract

Dillenia (Dilleniaceae) is a genus of about 100 species of flowering plants in tropical and subtropical areas of Southern Asia, Australasia, and the Indian Ocean Islands. Until now, only eight *Dillenia* species have been reported to be used traditionally in different countries for various medical purposes. Amongst these, Chalta- *D. indica* (Linn.), Azugi/Bon chalta- *D. pentagyna* (Roxb), and Simpoh air-D. *suffruticosa* (Griffith Ex. Hook. F. & Thomsom Martelli) have been reported to be used to treat cancerous growth. The study aimed to quantify antioxidant activity, total phenolics, and flavonoids for both leaves and fruits; leaf pigments, and mineral composition only for fruits from the extract of oven-dried powder of these three species. The fresh leaf of *D. pentagyna* has higher Chlorophyll a (0.507 mg/g) while the *D. indica* leaf has higher Chlorophyll b (1.035 mg/g), and total chlorophyll (a + b) (1.520 mg/g) contain. More total phenolic content was found in the methanolic extract of both *D. Suffruticosa* leaf (34.37 mg/g) and fruit (19.62 mg/g) while less in *D. indica* leaf (14.62 mg/g) and fruit (4.18 mg/g) and the total flavonoid content ranged from 12-20.3 mg/g for leaves and 3.34-7.83 mg/g for fruits. The antioxidant activity measured by the DPPH method showed higher free radical scavenging potential in *D. suffruticosa* leaves (0.42 mg/g) and lower in *D. pentagyna* fruit (4.76 mg/g) where *D. pentagyna* recorded a maximum FRAP value ranged between 7.8-1.4 m mol/g for all samples. All the fruits contained a significant amount of microminerals named sodium, potassium, calcium, and magnesium while a considerable quantity of phosphorous and sulfur was observed in *D. suffruticosa* (4.75 mg/g) and *D. pentagyna* (1.19 mg/g). In the case of trace elements, a greater amount of Iron (39.56 mg/g), Zinc (35.53 mg/g), Copper (17.78 mg/g), and Nickel (12.57 mg/g) was found in *D. Suffruticosa*; Cobalt (0.065 mg/g), Selenium (2.8 mg/g) in D. indica; and Manganese (44.55 mg/g) in *D. pentagyna*. Toxic heavy metals like Arsenic, Cadmium, Chromium, Lead, Vanadium, and Indium were below the Maximum Residue Limits. The study revealed that among the three species, *D. Suffruticosa* leaf and fruit have a higher medicinal activity and supplement mineral value with minimal metal toxicity that can be cultivated commercially for having much potential in the pharmaceutical and processed food industry.

Keywords: phytochemicals, mineral composition, *Dillenia* species, antioxidative activity

Exploring the aquatic crops of Bangladesh: Status and prospects of water chestnut

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Abstract

Bangladesh, renowned for its abundant aquatic ecosystems, holds global significance as a hub for aquatic crop cultivation, playing a pivotal role in ensuring food security and fostering socio-economic development. However, climate change and evolving agricultural landscapes, have prompted a transformative shift towards non-traditional aquatic crops. In this changing landscape, crops like water chestnut and aquatic vegetables are gaining prominence as resilient alternatives to conventional staples. An in-depth analysis of the current cultivation practices, yield patterns, and the economic contributions of aquatic crops to the national agricultural sector is to be explored. Furthermore, the study delves into the environmental sustainability of aquatic crop cultivation, considering its impact on water ecosystems and biodiversity. Untapped wastelands hold immense potential for additional income for marginal farmers through the cultivation of water chestnuts. Despite challenges such as high human labor and land use costs, water chestnut farming proves profitable across districts, with an average benefit–cost ratio of 1.37. However, the lack of training in water chestnut farming and skill labor shortages pose challenges. With proper training and efficiency improvements, water chestnut production could increase by 20.2%. Additionally, considering water chestnuts' availability during and after the rainy season, the processed form offers year-presence. While the potential for water chestnut cultivation to uplift the income of vulnerable water-logged farmers is evident, there remains a need for more extensive research both in Bangladesh and globally to fully harness its economic and nutritional potential. Looking to the future, the exploration of innovative approaches and technologies, including precision agriculture, biotechnology, and agroecological practices, emerges as a promising avenue to address emerging challenges and maximize yield.

Keywords: Nutrition, food security, minor crops, sustainable agriculture

Fertilizer management and irrigation improve yield contributing characteristics of aged black pepper plant

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Abstract

Black pepper (*Piper nigrum* L.) is an important spice in the table dishes of the sub-continent including Bangladesh. Every household in the country has a demand for black pepper but local production is very marginal, confined mostly to the Sylhet region and produced sporadically for subsistence uses. The crop is almost negligible and lacks nourishment resulting in declined yield. Two experiments were conducted in the Jaintapur and Gowainghat upazila of Sylhet for 2 years to assess the effect of nutrient nourishment and irrigation on yield-contributing characteristics of existing Black pepper plants in farmers' fields. Under the nutrient nourishment, well-decomposed cow dung (WDC) @ 10 kg/plant (T1), N:P:K @ 50:50:150 g/plant (T2), 50% WDC +50% N:P:K (T3) were applied in two splits each year in compared to farmer's practice (Control) in six replication. Half of the plants under the experiment were irrigated in the dry spell of the year (Nov-Jan) and half were not (Control). In the first year, the effect of nutrient management and irrigation was evident but not significant in both experiments for most of the parameters. By the second year, statistically insignificant but marked improvement was observed in inflorescence length, viable fruits/10 inflorescences, total fruits/10 inflorescences, and 100 fruit weight in nourished plants in both experiments. However, treatments T1 and T3 produce the significantly lowest number of aborted berries and exhibit the highest percentage of fruit-bearing than the control in both experiments. Fruits setting was around 25% higher in WDC than control in the first year which increased by around 40% in the second year. In the case of Fertilizer mixed WDC fruit setting was around 25% higher than control which increased nearly 50% by the second year. No viable fruit in irrigated plants was almost 50% higher than the non-irrigated plant in the first year which increased up to 100% by the second year. The fruit setting percentage in the irrigated plant was around 20% higher in the first year which increased up to 50% by the second year compared to the non-irrigated plant. Consecutive two-year experiments in two locations conclude organic nourishment can improve yield contributing characteristics of existing Black pepper plants and application of fertilizer-primed organic nourishment is even better. Minimal irrigation at least during dry spells is beneficiary.

Keywords: Spice, minor crop, Organic nourishment, Good Agricultural Practices

Exploring the therapeutic treasures: Medicinal plants flourishing over the embankment of Brahmaputra River, a semi-natural habitat, at the BAU campus

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Abstract

The study was conducted to explore the diversity and therapeutic applications of medicinal plants along the banks of the Brahmaputra River adjacent to Bangladesh Agricultural University in the Mymensingh district of Bangladesh. Within the study area, a total of 93 valuable medicinal plant species, representing 39 families, were identified, with distribution among trees (25%), herbs (39%), shrubs (19%), vines (7%), and grasses (10%). These plants exhibited a range of uses, addressing common health issues such as respiratory tract problems, diabetes, inflammation, skin disorders, ulcer, bleeding, insect bites, and diarrhea. Despite their significant medicinal value, these plants face increasing threats from environmental, socio-economic, and institutional challenges. To ensure their conservation and sustainable use, especially given their potential to yield Nobel compounds, it is imperative to implement measures for the proper nurturing and cultivation of medicinal plant species.

Keywords: medicinal plants, diversity, therapeutic application, BAU campus

Bacterial diversity in the rhizosphere of black pepper plants grown in Sylhet

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Abstract

Plant growth, nourishment, and response to diseases are regulated by interactions between the roots of plants and the microbes living in the rhizosphere. The study was conducted to isolate and characterize rhizosphere bacteria associated with black pepper (*Piper nigrum* L.). Twenty eight distinct bacterial isolates, designated as RB1 to RB28, were obtained from the black pepper rhizosphere after being collected from a farmer's field in Jaintapur, Sylhet. Morphological examination of the isolates displayed diverse features in terms of colony forming unit, colony size, shape, color, elevation and surface. Biochemical tests such as the Catalase test, Oxidase test, Indole test, Methyl red test, Voges Proskauer test, Sulphide indole motility test and Triple sugar iron test were performed. The results revealed that a diversified array of rhizobacteria with a wide range of morphological and biochemical variations colonized the black pepper rhizosphere. The cell shapes of the isolates appeared spherical, rod and short rod shaped in simple staining. Seven of the bacteria isolates were identified as *Rhizobium* sp., five isolates as *Pseudomonas* sp. and four isolates as *Bacillus* sp. There were three isolates of both *Azotobacter* sp. and *Streptomyces* sp. and two isolates belong to *Enterobacter* sp. The rest of the four isolates were *Micrococcus* sp., *Acinetobacter* sp., *Escherichia* sp. and *Aeromonas* sp. The rhizosphere of black pepper grown in Sylhet revealed 10 different species of bacteria dominated by the genus *Rhizobium* sp. The results could be helpful to develop improved cultivation strategies for black pepper in Bangladesh.

Keywords: Belowground interactions, rhizosphere, black pepper, plant nutrition

Gibberellin-producing bacteria isolated from coastal soil enhance seed germination of mallow and broccoli plants under saline conditions

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Abstract

Salinity hinders plant growth, posing a substantial challenge to sustainable agricultural yield maintenance. The application of plant growth-promoting rhizobacteria (PGPR) offers an emerging strategy to mitigate the detrimental effects of high salinity levels. This study aimed to isolate and identify gibberellin-producing bacteria and their impact on the seed germination of *Malva verticillata* (mallow) and *Brassica oleracea var. italica* (broccoli) under salt stress. In this study, seven bacterial isolates (KW01, KW02, KW03, KW04, KW05, KW06, and KW07) were used to assess their capacity for producing various growth-promoting traits and their tolerance to varying amounts of salinity (100 mM and 150 mM NaCl). The findings revealed that KW05 and KW07 isolates outperformed other isolates in synthesizing indole-3-acetic acid, siderophores, and exopolysaccharides and in solubilizing phosphates. These isolates also enhanced phosphatase activity and antioxidant levels, including superoxide dismutase and catalase. Both KW05 and KW07 isolates highlight the growth-promoting effects of gibberellin by enhancing of growth parameters of Waito-C rice. Further, gas chromatography–mass spectrometry validation confirmed the ability of KW05 and KW07 to produce gibberellins (GAs), including GA_1, GA_3, GA_4, and GA_7. Seed germination metrics were enhanced due to the inoculation of KW05 and KW07. Moreover, inoculation with KW05 increased the fresh weight (FW) (7.82%) and total length (38.61%) of mallow under salt stress. Inoculation with KW07 increased the FW (32.04%) and shoot length of mallow under salt stress. A single inoculation of these two isolates increased broccoli plants' FW and shoot length under salt stress. Gibberellin-producing bacteria help in plant growth promotion by improving salt tolerance by stimulating root elongation and facilitating enhanced absorption of water and nutrient uptake in salty environments. Based on these findings, they can play a role in boosting agricultural yield in salt-affected areas, which would help to ensure the long-term viability of agriculture in coastal regions.

Keywords: Salt stress; plant growth–promoting rhizobacteria; antioxidants; percent germination; germination performance index

Characterization for lodging tolerance of BRRI developed rice varieties and advanced breeding lines in Boro season

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Abstract

Lodging is usually referred to as the condition in which the stems of crops bend at or near the surface of the ground. It tends to occur in vigorously growing rice plants after heading when ripening progresses and panicles drop. Cyclones or strong wind at the reproductive and ripening phases of rice plants intensify lodging tendencies. The morphological and anatomical features of eleven rice varieties and nine advanced breeding materials were studied to understand the lodging tendencies. The experiment was conducted at the Bangladesh Rice Research Institute (BRRI) farm with the RCBD design. A wide range of diversity among this material was observed in the aspect of canopy architecture and other lodging related parameters like morphological and anatomical data at the hard dough stage and yield contributing characters at the harvesting stage. Among them, bending moment depends on plant height and fresh weight of above ground part has the highest positive effect on lodging susceptibility. The highest flag leaf angle has a positive correlation with lodging susceptibility. According to anatomical study, more and large air space has, highest no. of outer & lowest no. of inner BV probably gives susceptibility to lodging. Among tested genotypes maximum plant height was recorded 109.67 cm in BRRI dhan67 and lowest 80.89 cm in BRRI dhan61. The highest bending moment was 1061.53 g cm in BRRI dhan81 and the minimum was 445.84 g cm in BRRI dhan61. The highest wrapping score was 31.48 recorded in BRRI dhan81 and the lowest was 26.04 in BRRI dhan100. The highest culm thickness observed was 1.02 mm in IR12A173 and the lowest was 0.94 mm in BR11318-5R63. The highest stem density was 42.66 mg/cm in BRRI dhan89 and the lowest was 28.69 mg/cm in BRRI dhan100. The highest flag leaf angle measured 22.22 in BRRI dhan89 and the lowest was 7.59 in line IR12A173. In anatomical structure, BRRI dhan96 and BRRI dhan61 have no air space like check BRRI dhan29 which has a positive relation with the resistance. But BRRI dhan67, BRRI dhan88 & IR12A173 have air space as in the susceptible variety BRRI dhan28. In BRRI dhan89, BRRI dhan81 has the highest no. of outer vascular bundle (VB) but SVIN109, BRRI dhan58 has the highest inner VB. Above tested genotypes BRRI dhan47, BRRI dhan58, BRRI dhan61, BRRI dhan81, BRRI dhan89, SVIN109, BR11318-5R-63, IR17A1694 have lodging resistance capacity considering the morphological and anatomical features. Characterization of BRRI developed variety will be helpful for parent selection and advanced breeding line will be helpful for varietal development.

Keywords: Lodging, Morphology, Anatomy, Susceptibility, Resistance

Shading effect on growth, yield and chlorophyll pigment of some soybean (*Glycine max* L.) varieties

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Abstract

Shading stress interferes with plant growth and development, resulting in morphological changes and decreased photosynthetic capacity. Soybean plants are extremely sensitive to shading conditions. Hence, how shading affects the growth of soybean plants was examined in the existing nursery field, Department of Agroforestry and Environmental Science, Sylhet Agricultural University, Sylhet. It was also aimed at finding suitable soybean varieties in Bangladesh for growing under shading stress. Three local varieties of soybean were Sohag (PB-1) (V1), BARI Soybean-5 (V2), and BARI Soybean-6 (V3), and three shading levels, i.e., 0% shade or full sunlight (T0), 25% shade (T25), and 50% shade (T50) were included as treatments of the study. The experiment was carried out with three replications utilizing a completely randomized design (CRD). There were nine treatment combinations: 1. V1T0, 2. V1T25, 3. V1T50, 4. V2T0, 5. V2T25, 6. V2T50, 7. V3T0, 8. V3T25, and 9. V3T50. The results of the study revealed that the morphological characteristics of soybeans exhibited the highest values in Sohag (V1) under full sunlight (T0), followed by 25% shade (T25). There were no significant differences between T0 and T25 for all morphological characters, but leaf length and leaf area showed notable differences between T0 and T50. A significant reduction was found in the pod number plant^{-1}, seed number pod^{-1}, seed number plant^{-1}, pod length, and pod weight in different varieties only under 50% shade level. In V1, V2, and V3, the highest grain yield was recorded at 85.91, 72.91, and 70.83 g per plant, respectively, under T0. The largest value of 1000-grain weight (616.67 g) was observed in V1 under T0, which showed no significant difference to T25 in all varieties. The maximum concentration of chlorophyll pigments like Chl. a (1.487 mg g^{-1}), Chl. b (0.523 mg g^{-1}), and Chl. (a+b) (2.01 mg g^{-1}) was found in V1 under T0, which decreased significantly only under 50% shade, but Chl. (a+b) was found to be decreased significantly under both 25% and 50% shade in V2 and V3. The growth, yield, and chlorophyll parameters of Sohag (PB-1) also did not show any significant reduction under 25% shade compared to the full sunlight condition. Therefore, it may be concluded that the variety Sohag (PB-1) had the better performance regarding the yield and chlorophyll concentration among the three tested varieties.

Keywords: Soybean; Sohag (PB-1); BARI Soybean-5; BARI Soybean-6; shade; chlorophyll pigment.

Strategies for improving salt stress tolerance in tomato plants through using abscisic acid (ABA) and gibberellic acid (GA3)

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Abstract

Salinity is a major problem for agricultural production, particularly in dry areas. Abscisic acid (ABA) and gibberellic acid (GA3) have shown promise in improving crop salinity tolerance. The study aimed to examine the ability of Abscisic acid (ABA) and gibberellic acid (GA3) to mitigate salt stress in tomato plants. The experiment used tomato cv. BARI Hybrid Tomato-5 to investigate the effects of bioregulators (control, 100 ppm ABA and 100 ppm GA3) on plant growth, physiology, and yield in normal and NaCl stressed conditions (50, 100, and 150 mM NaCl) following CRD design with three replications at the experimental shed of the Department of Agricultural Botany, Sher-e-Bangla Agricultural University, Dhaka. Tomatoes were negatively affected by salinity in terms of growth, physiology, and yield parameters. The foliar application of bioregulators (ABA and GA3) was effective on the unstressed tomato plants resulting in increasing tomato yield. There were noticeable improvements in several morpho-physiological indicators and yield measures. As evidence of bioregulators' effectiveness in promoting plant growth in salt-stressed environments, treatment with the substance led to increases in plant height, branch number, and leaf number. Additionally, bioregulators decreased the number of days necessary for the initiation of flowering and fruiting. Bioregulator application considerably increased yield-contributing characteristics such as flower cluster, flower, and fruit numbers, indicating a beneficial impact on total production. In addition, bioregulators contributed to an increase in stress tolerance by modulating photosynthetic pigments (chlorophyll a, b and carotenoid), leaf relative water content, electrolyte leakage, proline concentration, and stomatal conductance. The mineral content study demonstrated that bioregulators significantly decreased sodium (Na^+) levels while raising potassium (K^+) content in salt-stressed plants. The findings highlight bioregulators' potential to mitigate the negative effects of salinity stress on tomato cultivation, providing a possible approach for sustainable agriculture in saline regions.

Keywords: NaCl, Abiotic stress, Bioregulators, Photosynthetic pigments, Mineral content.

Physiological attributes, antioxidant defense system and growth performance of lettuce (*Lactuca sativa* L.) as affected by salinity

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Abstract

Salinity is one of the common abiotic stresses that limit the productivity of crops. Salinity in different areas is increasing constantly and day by day. Lettuce (*Lactuca sativa* L.) is a high value crop and the demand for it is increasing day by day in our country. It is salt salt-sensitive crop, and its growth and physiological performance are adversely affected by salinity. The present study investigates the effect of salt stress on growth, ion contents and physiological attributes of lettuce plants. An experiment was carried out at the Plant Physiology Laboratory and Experimental Shed of the Department of Agricultural Botany at Sher-e-Bangla Agricultural University, Dhaka, Bangladesh, to evaluate the effect of varying salinity levels on the morphological and physiological performance of lettuce plants under salt stress. BARI Lettuce-1 was used as a test crop. A complete randomized design was followed with eight treatments (Control, 50 mM, 100 mM, 150 mM, 200 mM, 250 mM, 300 mM and 350 mM NaCl) and three replications. Treatments were given at 1 month after planting and maintained throughout the growing period. Salt stress increased root and shoot Na content significantly but decreased K and Ca content. Relative water content (%RWC) and chlorophyll content also decreased by salinity. Different growth parameters like leaf area, plant height, fresh and dry weights of root and shoot decreased under salt stress. Salt stress significantly raised the methylglyoxal content. The increase of H_2O_2 and malondialdehyde levels indicates salt-induced oxidative stress. Ascorbate content decreased but dehydroascorbate content increased under salinity. Glutathione content increased due to salinity and the glutathione disulfide content increased highly as affected by salinity. Therefore, salt stress caused methylglyoxal toxicity and oxidative stress; salinity disrupted ionic homeostasis and antioxidant defense system, decreased chlorophyll content, and overall growth performance of the lettuce plant.

Keywords: Abiotic stress, antioxidant defense, ionic toxicity, leafy vegetable

Calcium-induced reduction of lead toxicity in *Amaranthus tricolor*

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Abstract

Heavy metal contamination of soil is a common phenomenon nowadays caused by either anthropogenic activities or natural events. Lead (Pb) is one of the potential heavy metals that can easily be accumulated by plants and cause substantial damage to plant growth and development. Accumulation of Pb in leafy vegetables like *Amaranthus tricolor* can result in health hazards. Considering the above-mentioned hypothesis, an experiment was conducted at the experimental shed of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh to assess the effects of different Lead and Calcium levels on the morphological, physiological, and yield performance. *Amaranthus tricolor* cv. BARI Data-2 was used as a test crop plant under various levels of Lead (0, 500, 1000 µM $Pb(NO_3)_2$) and Ca (0, 3, 6 mM $Ca(NO_3)_2$) with a complete randomized design and three replications. Control plants were grown without supplemental Pb or K. Treatments were given at 30 days after seed sowing and maintained throughout the growing period. Lead toxicity prevented plant growth. Lead decreased the levels of chlorophyll *a*, chlorophyll *b* and carotenoid. The increase of H_2O_2 and malondialdehyde levels indicates lead-induced oxidative stress. Ascorbate content decreased but dehydroascorbate content increased under Pb stress. Glutathione content increased due to Pb toxicity and the glutathione disulfide content increased highly under Pb stress. Therefore, Pb toxicity resulted in oxidative stress; disrupted antioxidant defense system, decreased photosynthetic pigment levels, and overall growth of the Amaranth plant. Exogenous application of Ca in the growing media of those Pb-affected plants improved the lead detoxification capacity through improving the glutathione level which increases the Pb detoxification capacity and also acts as an antioxidant. The ascorbate level also increased in Pb-affected plants by exogenous Ca application. Calcium supplementation also increased the shoot and root length, shoot and root fresh and dry weight of Amaranth plants. The results of the present study prove that the Pb toxicity caused considerable damage to plants whereas the exogenous supplementation of Ca decreased Pb toxicity, and improved the antioxidant defense system, and overall growth of *Amaranthus tricolor* plants.

Keywords: Heavy metal detoxification, abiotic stress macronutrient, glutathione, antioxidant defense system, leafy vegetable.

Investigating the role of 6-Benzyladenine and Melatonin in improving waterlogging tolerance of eggplant

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Abstract

Synthetic 6-Benzyladenine (6-BA) and melatonin (MT) regulate plant growth and minimize the negative consequences of abiotic stresses like waterlogging in crop plants. This study aimed to explore the mitigative effect of waterlogging stress using exogenous 6-BA and MT by regulating osmoprotectants (total soluble sugar, free amino acid, proline), stress induced products (MDA, H_2O_2), antioxidant enzymes (CAT, POD, APX), pigments and related growth indices using eggplant (BARI Hybrid Begun-6, BHB-6). BHB-6 seedlings were exposed to anoxia stress and treated with exogenous 6-BA (T3), MT (T4), and 6-BA+MT (T5). A set of untreated plants was kept as the control group (T1) and another set as the waterlogging group (T2). From the fresh root tissue, sampling was carried out when the O_2 deficiency symptoms were visible and again 8 days after the termination of waterlogging treatment second set of sampling (recovery) was performed. Results showed increased CAT (163%), POD (153%) and APX (200%) activity of BHB-6 seedlings at T3 spray compared to the waterlogging group (T2). At the recovery, CAT and APX exhibited higher activity in BHB-6 seedlings at three different spray treatments (T3-T5) whereas POD displayed a decreased trend. Total soluble sugar and proline resulted in a lower amount (T3-T5) compared to T2 at waterlogging and recovery as well. BHB-6 accumulated relatively higher total free amino acids. This might help in preventing the disruption of membrane homeostasis of the oxidative stress induced plants. Foliar application of 6-BA (T3) reduced the MDA and H2O2 concentration of BHB-6 at waterlogging and recovery as well. Results also revealed that MT alone (T4) or in combination (T5) improved growth indices i.e. root-shoot fresh weight, length and compatible generation of photosynthetic pigments like chl. a, chl. b, total chl. and carotenoids in the waterlogged plants. The findings of the study elucidated that the detrimental effects of waterlogging stress on eggplant seedlings can be diminished by the sole application of exogenous 6-BA (T3) or in combination with MT (T5) through alleviated the inhibition caused by anoxia and improved enzymatic activity.

Keywords: Eggplant, 6-benzyladenine, melatonin, waterlogging, anoxia

Assessing the salt tolerance of aromatic rice genotypes

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Abstract

Salinity is one of the major abiotic stresses that hinders crop productivity in the southern districts of Bangladesh. Salt-tolerant aromatic rice can be a potential solution to this problem. With a view to this, the Department of Crop Botany at Bangabandhu Sheikh Mujibur Rahman Agricultural University has been doing research on the development of salt-tolerant aromatic rice varieties. About 97 genotypes of aromatic rice obtained by crossing Pokkali with Kalozira and Pokkali with Badshabhoug, along with the check variety BRRIdhan34, were utilized in this experiment to screen out potential salt-tolerant genotypes. A salt treatment of $8dSm^{-1}$ was applied to the pots, and control plants were maintained by using only distilled water. Data were recorded on plant height, relative plant height, elongation rate, relative elongation rate, dry weight, relative dry weight, and days of survival. Based on the parameters, the genotypes PK37, PK50, PK51, PK52, PK85, PK86, and PB38 were identified as salt-tolerant ones. The other genotypes, including PK19, PK31, PK44, PK94 were identified as the most susceptible ones. These identified salt-tolerant genotypes can be utilized to develop salt-tolerant aromatic fine rice varieties.

Keywords: Aromatic rice, abiotic stress, local rice genotypes, salinity

Physiological and biochemical responses of waterlogging tolerance in sesame at the vegetative stage

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Abstract

Sesame is highly vulnerable to the adverse effects of waterlogging stress, leading to diminished growth, reduced yield, and oxidative stress. A pot experiment was conducted with three selected sesame genotypes (G3 and G7 relatively tolerant and G1 sensitive genotype to waterlogging stress) under four durations of waterlogging stress (0, 48, 72 and 120 hours) to evaluate the physiological and biochemical responses. Waterlogging stress was imposed at 34 days after sowing (DAS) and water level was maintained about 3 cm above the soil surface of the pots. The experiment was arranged in a randomized complete block design with five replications, measurements were taken three days after the removal of waterlogging. Results indicated that G7 and G3 genotypes exhibited not only a superior ability to recover from waterlogging damage, as evidenced by lower methylglyoxal (MG), Hydrogen peroxide (H_2O_2) and Superoxide ($O2^{\bullet-}$) accumulation but also displayed higher glyoxalase enzyme (Gly I and Gly II) activities compared to the sensitive G1 genotype. Notably, the G7 genotype demonstrated a leading role in detoxifying MG through glyoxalase enzyme (Gly I and Gly II) activities. Furthermore, waterlogging tolerance was associated with an increased capacity of anaerobic proteins such as alcohol dehydrogenase (ADH) and pyruvate decarboxylase (PDC) coupled with lower LDH enzyme activity. These results suggest that the main pathway of NAD+ regeneration in waterlogging tolerance of genotypes is not lactate fermentation but alcohol fermentation. Based on the above results it might be concluded that the relative waterlogging tolerance of G7 and G3 sesame genotypes appears to depend on a combination of physiological and biochemical responses.

Keywords: Sesame, waterlogging stress, physiological and biochemical, vegetative stage

Characterization of rice germplasm for salinity tolerance at reproductive stage under different saline conditions

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Abstract

Rice is mainly susceptible to salt stress at early vegetative and reproductive stages. Screening of rice genotypes at early vegetative and reproductive stages is important to find tolerant genotypes more concisely in net house conditions. Salinity is a complex trait and its field screening is difficult due to soil heterogeneity and environmental effects. The present investigation was done to find out the yielding ability and to determine the tolerance reaction in varying salinity levels at the reproductive stage. The experiment involved three rice germplasm namely Baismoti, Binni dhan, Gour kajol and one breeding line BR(Bio)8961-AC26-16 with tolerant check i.e. IR58443-6B-10-3 and susceptible check i.e. IRRI154 under four salinity levels (0, 6, 8 and 12 dS/m) at reproductive stage. The experiment was conducted at RCB design with three replications. Genotypes × salinity interaction showed significant results for all the tested parameters except the number of panicles per plant and panicle exertion rate. Considering the yield potentiality and tolerance ability at different salinity levels, Baismoti and Binni dhan could be selected for further breeding programs up to 8 dS/m salinity stress.

Keywords: Rice, salinity tolerance, reproductive stage, grain yield.

Kitchen waste application in the form of Biochar and ComBio improves the root morphology of red amaranth

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Abstract

In Bangladesh, the conventional practice of harvesting crops as whole plants often results in a significant portion of plant biomass being discarded as kitchen waste. To address this issue and harness the potential benefits of kitchen waste, it is imperative to adopt effective techniques for returning this waste to the fields. By doing so, we can supplement organic matter in the soil and enhance overall plant health. In our study, we converted kitchen waste into three forms: Biochar, Compost, and a combination of Biochar and Compost (ComBio). These forms were then applied to the field by blending them with 50% of the recommended dose of fertilizer (RDF) to evaluate their impact on the root morphology of red amaranth, compared to a control group that received only RDF. Thirty days after sowing, the plants were harvested, and their roots were carefully extracted without disturbance. Subsequently, the washed roots were placed in a floating condition in a tray and scanned using a flatbed scanner (STD4800) at 800 dpi resolution. The resulting grayscale images of the roots were analyzed using the open-source root analysis software, RizhoVision Explorer (RVE). The one-way ANOVA analysis pair comparison test revealed significant variations among the treatments at a significance level of 0.05. Key root characteristics, including the number of root tips, total root length (mm), average diameter (mm), total root volume (mm^3), and total surface area (mm^2), were found to be highest in the Biochar and ComBio treatments compared to the control group. However, the length, projected area, surface area, and volume of fine roots (those with a diameter less than 2 mm) were maximized in the Biochar treatment compared to the other treatments. Higher root volume indicates improved plant establishment, while a greater number of root tips and fine roots are associated with enhanced nutrient uptake from the soil. The presence of a significant number of fine roots, coupled with ample nutrient availability in the soil, can contribute to improved plant health and potentially higher yields. Our findings suggest that the application of kitchen waste in the form of Biochar or ComBio has the potential to enhance critical root characteristics, thereby boosting the yield of red amaranth.

Keywords: Waste recycling, root growth, belowground biomass, RizhoVision Explorer

Effective performance of biochar for phytotoxic glyphosate residues in soils

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Abstract

The study was carried out to detoxification of glyphosate soil residues by biochar amendments and to find the suitable biochar application rate in crops. In this study, successfully applied glyphosate to the upper 2-3 cm of the topsoil displayed moderate toxicity for seedling growth but this negative effect has been mitigated by 5% biochar application. In control, leaf chlorophyll content was higher and performed better than biochar treatment. Among all biochar treatments, Gly+ch10% indicates slightly higher shoot fresh biomass than all biochar treatments but no significant difference was found in shoot dry weight. In root morphology, the biochar amendment and glyphosate did not show a significant difference in fine root production. The optimum application of biochar influences to enlarge of the total root length, which has a positive effect on uptake the of mineral nutrients from the deeper part of the soil. On the other hand, a higher rate of biochar application harms shoots and root growth. These findings suggest that biochar amendments (5-10 % v/v) can mitigate absorbs effects of herbicidal residues and there is no toxic effect of glyphosate. A successful introduction of biochar application in the agriculture field acts as a huge amount of carbon sink and increased crop production as well as positive effect on mitigating climate change.

Keywords: Biochar, toxicity, glyphosate, leaf chlorophyll content, wheat

The life cycle of *Epuraea* sp. (Order: Coleoptera; Family: Nitidulidae): A newly emerging bottle gourd pest in the Sylhet region

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Abstract

The Sap beetle (*Epuraea* sp.) belongs to the Nitidulidae family of Coleoptera order and is the newly recorded pest of bottle gourd in the Sylhet region of Bangladesh. This beetle mainly consumes the pollens of bottle gourd's male flowers and causes pollination failure. Consequently, the fruit setting rate of bottle gourd is significantly reduced. For sustainable management of this beetle, life cycle study is very crucial. A laboratory-based study was conducted to find out the life cycle of this sap beetle. Results showed that this beetle lay their eggs on the male flowers. Newly emerged larvae consume the pollen, stamen and decomposed petals. During the larval period, it shows four colors. Newly emerged larvae are transparent and after 1-2 days it turns white. The larvae after 3-4 days larvae show a slightly brownish color and after 6-10 days larvae become brownish white. The total larval duration is 8-11 days. Pupation generally occurred just beneath the soil. Pupae are initially whitish in colour however, they turn brownish at a later stage. Pupae need 7-11 days to become adults. Newly emerged adults are reddish brown in colour later it turns brownish. Just after emerge, adults start to consume the fresh pollen of bottle gourd male flowers.

Keywords: *Epuraea sp.*, cucurbits, fruit setting, insect life cycle

Insect community analysis of cruciferous vegetables in the north-eastern part of Bangladesh

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Abstract

Cruciferous vegetables belong to the family Brassicaceae (also known as Cruciferae) with numerous genera, species, and cultivars that are commercially grown as vegetable crops. They are important Rabi season vegetable crops that include cabbage, cauliflower, broccoli, radish, turnip, and other vegetables. These vegetables help to balance the vegetarian diet and are an excellent source of minerals and vitamins. These vital cash crops are grown in several high-altitude areas, such as the north-eastern region of Bangladesh. However, they are attacked by a variety of insect pests, resulting in decreased productivity and there is no current record of the insect communities for these vegetables. Hence, we performed a common garden experiment with five species of cruciferous vegetables *viz*. radish, mustard, turnip, cabbage, and cauliflower to find out the insect community and their time of infestation based on the plant ontogenetic stage. We collected the data every seven days intervals after the seedling emergence to the reproductive stage. Our preliminary results showed that insects from Lepidoptera, Hymenoptera, Coleoptera, and Hemiptera are more common in the field. The number of individuals varied among the cultivars. Among the insects, aphids, flea beetles, cabbage butterflies, mealy bugs and white flies were very common across the species. Our study provided a clear and detailed insect community of cruciferous vegetables. This study will provide critical information to the growers about the abundance and time of insect attacks on cruciferous vegetables.

Keywords: Cruciferous vegetables, insect community analysis, pest abundance, aphids, beetles

The role of silicon supplementation in reducing major rice insect pests in Bangladesh

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Abstract

Rice (*Oryza sativa*) is a staple food for a significant portion of the global population, and its production is often hindered by the detrimental effects of insect pests. In recent years, there has been growing interest in exploring alternative and sustainable methods for pest management. Silicon (Si) supplementation has emerged as a potential solution due to its documented role in enhancing plant resistance against various stressors, including insect herbivores. This research aim was to investigate the effectiveness of silicon supplementation in reducing insect pests within the rice ecosystem. The study involved a comprehensive pot experiment with two rice varieties (BRRI dhan 74 and BRRI dhan 92) where different levels of silicon were applied and the subsequent impact on pest infestations was monitored and recorded. The research focused on key insect pests of rice crops, such as the brown plant hopper (*Nilaparvata lugens*), green leaf hopper (*Cicadella viridis*), and the stem borer (*Scirpophaga incertulas*). Various parameters, including pest population dynamics, rice plant health, crop damage (%) and yield metrics were assessed to determine the efficacy of silicon supplementation in pest management. Our preliminary results suggested that silicon supplemented (SiO_2) plants reduced the abundance of green leaf hopper and brown plant hopper populations significantly than the control. The findings of this research will provide valuable insights into the potential of silicon supplementation as a sustainable and environmentally friendly strategy for pest management in rice.

Keywords: Rice, Silicon supplementation, Pest management, Insect community

The new list of coconut insect pest in Bangladesh: Farmers' perspective

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Abstract

Global climate change has influenced insect pest infestation patterns in Bangladesh. In recent years, Bangladeshi coconut farmers have been experiencing the invasion of new insect pests like spiraling white flies, coconut bagworms etc. Farmers are facing challenges in managing the emerging insect pest threat in coconut as they have no training in the management of those newly introduced pests. To make an updated training program for farmers to manage newly invasive coconut insect pests, policymakers need an updated list of coconut insect pests from the farmers' point of view. Therefore, the present study was conducted among 240 coconut farmers across the eight upazilas under eight districts of Bangladesh belonging to the different hotspots as mentioned in Bangladesh Delta Plan 2100. Results found that a total of 11 pests including 9 insects, one mite and one small mammal squirrel, are damaging coconut crops in Bangladesh. According to Bangladeshi farmers, rugose spiraling whitefly (93.3%), mite (84.2%), and rhinoceros beetle (80.8%) are the top three insect pests in coconut. Farmers also observed a mid-level infestation of red palm weevil (56.3%), scale insect (44.6%), termite (42.5%) and Black headed caterpillar (34.2%) in coconut trees. Some farmers also noticed the infestation of leaf roller and ants in coconut. Termites mostly attack roots, whereas scale insects, black-headed caterpillars, leaf rollers, and rugose spiraling whiteflies mainly cause damage to the leaf. Red palm weevils and rhinoceros beetles are threats to the trunk, while mites cause fruit infestation. This research highlighted the updated list of coconut insect pests in different areas of Bangladesh along with their damages. Further steps are necessary for the sustainable production of coconut through the smart management techniques of the identified insect pest of coconut in Bangladesh.

Keywords: Coconut, beverage tree pest, coastal region, pest survey.

Mitigation of Cadmium toxicity in water spinach using salicylic acid modulating morphology and antioxidative defense system

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Abstract

The levels of cadmium (Cd) in many ecosystems and food staffs are in an increasing trend due to various human activities. Contamination of Cd into the food chain is a serious concern of public health. Application of phytohormones can be effective in mitigating Cd toxicity in food crops. This study was conducted to investigate the morphological and biochemical alterations in water spinach (Ipomoea aquatica L.) to Cd stress and to mitigate Cd toxicity by the application of salicylic acid (SA). The seeds of water spinach (variety LP-1) were primed with two concentrations of SA (0.5 and 1 mM) and grown in pots mixed with two levels of Cd (50 and 100 mg kg-1) in soil. The experiment was set in completely randomized design with three replications and a total of seven treatments were maintained as follows: i) Control ii) Cd50 ii) Cd100 iii) Cd50+SA0.5 iv) Cd50+SA1.0 v) Cd100+SA0.5 and vii) Cd100+SA1.0. The root and shoot length, root and shoot biomass and chlorophyll contents were significantly reduced in both Cd treated plants compared to other treatments. However, these traits were significantly higher in SA primed plants compared to sole treatments of Cd. Both Cd levels significantly enhanced lipid peroxidation (MDA content) showing greater oxidative damage while a significantly lower and higher MDA contents were found in SA treated plants compared to Cd and control treatments, respectively. The proline content, total antioxidant capacity, catalase and ascorbate peroxide activities were considerably increased in plants grown in Cd treated media with or without having SA. The application of SA increased the antioxidant activities showing a reduction in the formation of reactive oxygen species and therefore, prevented the plants from oxidative damage caused by Cd. Between two levels of SA, the seed priming with 0.5 mM performed better in case of Cd50 while SA 1 mM performed better in case of Cd100 treatments. The study concluded that seed priming with SA increased growth and antioxidative defense system in water spinach exhibiting enhanced tolerance to Cd toxicity.

Keywords: Water spinach, Cd tolerance, Phytohormone, plant biomass, Oxidative damage

Gas exchange parameters and yields of some cruciferous vegetables under different types of poly-mulching

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Abstract

An experiment was conducted to examine the growth, yield, and gas exchange parameters in broccoli, cauliflower and cabbage as influenced by mulching treatment. One broccoli (Early U), one cabbage (ATLAS 70F1) and one cauliflower (White crown) genotype were used in this experiment. In the year 2021-22, plants of cabbage and cauliflower were grown in an experiment maintaining a two factorial RCBD where three mulching treatments in each species were tested (control, black polythene paper and mulch paper). Two species and three mulching comprised 2 × 3 = 6 treatment combinations, and each treatment combination was replicated four times. For the cabbage, only polythene paper was used as a mulch alongside a control treatment, and this separate single-factor experiment was also replicated four times following RCBD. The highest cabbage curd yields were detected in mulch paper (3.76 kg/plant) treatment compared to the control (1.91 kg/plant). Broccoli with mulch paper (476 g/plant) produced the highest whereas the lowest curd yields (121 g/plant) were in the control. In cauliflower, the highest and lowest curd yields were found in mulch paper (699 g/plant) and control (134 g/plant), respectively. The broccoli with mulch paper (1340 g/plant) and the control (759 g/plant) had the greatest and smallest fresh plant masses, respectively. Also in cauliflower, the highest and lowest plant fresh masses were found in the mulch paper (1616 g/plant) and control (363 g/plant) treated plots, respectively. The broccoli with poly paper had the largest leaf area (4385 cm^2/plant), while the control broccoli had the smallest (3158 cm^2/plant). Also in cauliflower, the largest and smallest leaf areas were seen in mulch paper (6221 cm^2/plant) and the control (1735 cm^2/plant), respectively. With mulching, photosynthesis was found to be higher in broccoli and cauliflower. The crop's early development under mulching was an additional significant aspect of this experiment. Under mulching, broccoli, cauliflower, and cabbage produced curd/heads at least 10 days early. This early harvest of the main crop under mulching allowed broccoli to produce a second crop of curd on the same plant, which we counted as the ratoon curd yield. In Broccoli, the lowest and highest ratoon curd yields were received in the control (33 g/plant) and mulch (66 g/plant) treatments, respectively. In contrast, neither cabbage nor cauliflower produced any ratoons. Thus, mulch paper can be used to get higher yields in the tested three cole crops.

Keywords: Broccoli, cauliflower, mulch, photophysiology

Genetic variability and character association of quantitative characters in boro rice (*Oryza sativa* L.)

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Abstract

This investigation was conducted by implementing a randomized complete block design with three replications in the research field of Sher-e-Bangla Agricultural University, Dhaka- 1207. Boro rice with twenty-three genotypes was used to find out the potential one by the evaluation of variability, heritability, genetic advance in percent of the mean, correlation of co-efficient and path analysis. All the genotypes exhibited highly significant variation for the fourteen studied characters. PCV (phenotypic co-efficient of variation) was found to be greater than the GCV (genotypic co-efficient of variation) for all the observed traits. The number of unfilled grains per panicle comprises the highest values of PCV (48.90%) and GCV (47.72%). Leaf sheath length, number of unfilled grains per panicle, number of primary branches per panicle, panicle length and thousand grain weight exhibited high heritability associated with a high genetic advance in percent of the mean. Through the correlation co-efficient analysis, it was observed that yield per hill had a significantly positive alignment with the number of filled grains per panicle, number of unfilled grains per panicle and thousand grain weight. Positive and direct effect on yield per hill was recorded in leaf blade length, stem length, number of effective tillers, number of unfilled grains per panicle, number of primary branches per panicle, number of secondary branches per panicle and panicle length. From this observation, it was found that G20, G1, G3 and G5 could be used for further breeding purposes for their contribution to yield and various yield related traits.

Keywords: Genotypes, variability, heritability, genetic advance, correlation of co-efficient, path analysis and yield

Ornamental *Pothos* – A taxonomic dilemma

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Abstract

The ornamental *Pothos* is gaining popularity day by day as an indoor plant. It is a group of evergreen plants with thick, heart-shaped, green, waxy leaves with hints of yellow and typically grown as a hanging houseplant. However, there is controversy on the taxonomic identification of commercial *Pothos* varieties/accessions. Therefore, a study was conducted with 21 commercial *Pothos* varieties collected from different nurseries. These Pothos varieties belong to 11 species under 5 genera viz. *Monstera* (3 spp.), *Philodendron* (3 spp.), *Raphidophora* (2 spp.), *Scindapsus* (2 spp.), and only one species of *Epipremnum*. Although they bear the common name *Pothos*, none of them belongs to the genus *Pothos*, a genus of flowering plants in the monocotyledonous family Araceae. Only one species of *Pothos*, *P. scandens*, is conserved at the botanical garden of Bangladesh Agricultural University. Both true and ornamental *Pothos* possess medicinal value for example anti-oxidant, anti-bacterial, anti-fungal, anti-carcinogenic, etc., and they also act as air purifiers. A detailed study with a large number of varieties is, therefore, suggested for proper (taxonomic) identification and to enrich our knowledge of the ornamental *Pothos* plants.

Keywords: *Monstera*, *Philodendron*, *Raphidophora*, *Scindapsus*, *Epipremnum*, *Pothos*

Evaluation and characterization of eighteen F_5 lines of AUS rice for yield traits

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Abstract

The investigation was carried out under field conditions to characterize yield contributing traits of eighteen (18) advanced AUS rice lines (F5) and three commercial check varieties. The experiment was conducted in a randomized complete block design (RCBD). The field was divided into three blocks and each block was subdivided into 21 plots (lines) where genotypes were randomly assigned. The experiment was conducted during the period of the Transplanting Aus season (April 2015 to August 2015) at the genetics and plant breeding experimental field of Sher-e-Bangla Agricultural University, Bangladesh. All the genotypes were characterized and categorized as per the descriptors developed by Biodiversity International, IRRI and WARDA-2007 for the DUS test of inbred rice. All the genotypes were grouped and classified as well as described based on yield contributing characters as per descriptors so that all the observed genotypes containing described characters can be easily evaluated and identified at a glance for further studies.

Keywords: Characterization, Evaluation, Yield Traits, AUS Rice.

Medicinal potentiality of Fenugreek plant

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Abstract

Fenugreek (*Trigonella foenum-graecum* L.) is an annual herb belonging to the family Fabaceae. It has been used for centuries in folk medicine to treat a variety of diseases, ranging from diabetes to cancer. More recently, fenugreek has been recognized to have hypoglycemic and hypocholesterolemic properties and hence therapeutic potentials in diabetes and coronary heart disease. The hypoglycemic effect of fenugreek is attributable to the fiber (mainly galactomannan). Fenugreek seed gum also decreases plasma cholesterol levels. 4-hydroxyisoleucine represents up to 80% of free amino acids in fenugreek seeds and is thought to be effective in lowering blood glucose and lipid levels. Keeping all these points in mind, the present study was undertaken to carry out a proximate analysis of fenugreek seeds and to extract and purify galactomannan, a soluble fiber. Results revealed that fenugreek seeds contain 45-60% (w/w) carbohydrates (mainly galactomannan), 6-10% (w/w) lipids, and 20-30% (w/w) protein. In addition, the 4-OH-Ile is a major free amino acid in the seeds but is absent in the seed reserve proteins. Fenugreek seeds are also rich in flavonoids, shown to be potent inhibitors of LDL oxidation, platelet aggregation and adhesion. In conclusion, fenugreek seeds contain many bioactive compounds that have potential health benefits for human beings.

Keywords: galactomannan, hypoglycemic, blood glucose

Bangladesh's diabetic population's need for stevia to promote sustainability, future food security and health

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Abstract

Stevia emerges as a vital catalyst in advancing sustainability, security, and health within Bangladesh's diabetic population. Beyond its cultivation, stevia stands out as a versatile natural sugar substitute applicable in various food and beverage contexts. Special benefits of pure Stevia for diabetics as it does not alter insulin or blood sugar levels. A cautionary note is emphasized against the potential misuse of refined extracts, which could inadvertently encourage the consumption of sweet-tasting foods and undermine the health advantages associated with pure stevia. The safety of high purity stevia leaf extract for human consumption, including by specific populations, has garnered unequivocal endorsement from major regulatory organizations worldwide. The use of high purity steviol glycosides (≥95%), declared safe for human consumption in 2008 and 2009 by the United States Food and Drug Administration (FDA) and the Joint Expert Committee on Food Additives (JECFA), is accompanied by an Acceptable Daily Intake (ADI) expressed in steviol equivalents of up to 4 milligrams per kilogram of body weight per day. In 2011, the European Commission approved the use of high purity steviol glycosides (≥95%) in EU foods and beverages. High purity steviol glycosides find increasing usage in foods and beverages across the European Union, thanks to the authorization granted by the European Commission in 2011. Being organically sourced from the stevia plant, this product is deemed healthy for individuals of all age groups, with zero calories and no dental health risks. With estimates ensuring compliance with ADI and the potential to lower blood sugar, stevia continues to be a secure and suitable sweetener for various populations, including those with diabetes. Strategic stevia farming can help Bangladesh effectively solve the many issues brought on by climate change. Because of its versatility, favorable economic effects, and superior nutritional qualities, stevia is a good substitute for a variety of agricultural environments. Combining stevia with conventional farming methods addresses the pressing need for food security and may provide a way to address the growing number of health problems, including diabetes. Stevia is an important tool for overcoming the obstacles brought forth by climate change and is a sustainable component of Bangladesh's future food security and health consciousness.

Keywords: Stevia, diabetic, zero calories, climate and food

BAU Chia cultivation stands out in Bangladesh

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Abstract

BAU Chia (*Salvia hispanica* L.) is an annual short day plant belonging to the Lamiaceae family. It was first introduced to Bangladesh in 2011 and registered as "BAU Chia 1" in June 2019 for its cultivation all over the country as a compatible and drought tolerant winter crop. BAU Chia 1 is a market-driven high value product, containing 67% α-linolenic acid (ALA, an omega-3 fatty acid), 20.1-36.1% dietary fiber and antioxidants. BAU-Chia 1 containing dietary ALA (18:3) acts as a starter and it becomes DHA (22:6), which has many positive health effects such as boosting energy, stabilizing blood sugar, aiding digestion, and lowering cholesterol. Since animal products contain conjugated ALA along with bad cholesterol generating saturated fatty acids, BAU-Chia 1 may be an alternative, the cheapest and the safest source of ALA. In the initial step, it was cultivated in Mymensingh and got very promising results. Then some experiments were done to fit BAU Chia 1 in the rain-fed Aman-BAU Chia 1-AUS rice system in Chapainawabganj, Rangpur, and Bagerhat districts. BAU Chia 1 was also cultivated in the Sylhet region and some char regions of Bangladesh and farmers got a very satisfying yield. Moreover, agricultural universities, many research institutes (BRRI, BINA, BARI) and NGOs in our country are devoted to using the fallow or time space around 90-100 days by fitting short duration crops (mustard, winter vegetables, leafy vegetables, vegetable beans etc) through system research. BAU Chia 1 is a very promising crop in this context. In the very beginning, it was only available at premium markets, supermarkets or chain shops and was out of reach of ordinary people due to expensive. But nowadays, it become popular with all types of people and can be found in the local market also. Being health conscious, people are curious to buy this seed and ultimately it is creating a market position in Bangladesh. Finally, it could be concluded that BAU Chia cultivation stands out in Bangladesh.

Keywords: BAU Chia 1, Omega-3, stand out, nutrition, cultivation

Morpho-Physiological and Phytochemical investigation of *Piper chaba* hunter

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Abstract

The study has commenced to explore and characterize the collected germplasm of *P. chaba* from the southwestern parts of the country and identify potential one(s) in terms of yield and quality. The farmers are growing mainly two different types of Chui, JHAR CHUI (Bushy type), and GECHO CHUI (Climbing type). Most of the farmers were growing JHAR CHUI commercially. Initially, the survey revealed some morphological differences between the two types of Chui. The bushy one has a thick and short stem at the bottom and then branched profusely. The lateral branches are narrow and slender with a bunch of leaves. The traditional one, the Climbing type, is more elongated and slenderer. The stem of climbing types is a bit woody and hard. The shape of a leaf is Ovate, wider at the base than at the midpoint, tapers toward the apex, and has a length-to-width ratio of 1.5:1 to less than 2:1. Of the two types, the climbing types chui plants have dark green leaves in all the areas. And the bushy types had light green-coloured leaves in all areas. The colour is justified by the chlorophyll content of the leaves. Bushy types of plants contain low chlorophyll compared to those of the climbing types. The microstructure as well as the nutritional composition of those two types varied. The climbing types were found to perform better with the moringa tree as host. Although the two Chui genotypes are similar and difficult to distinguish, our initial observation depicts that the two genotypes behave differently in two different ways.

Keyword: *Piper chaba,* Chui, stem, morphology, genotype

Rooftop garden to enrich research, study and biodiversity at Habiganj Agricultural University

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Abstract

Rooftop gardens may exhibit enormous biodiversity in terms of plants, insects and microorganisms which would be used as a center of precise ecological research and study for the students of agriculture. In rooftop gardens, preparation of different planting materials through reuse and recycling of waste or old stuff to ensure sustainable smart agriculture and mitigate environmental pollution. However, green roofs have gained momentum in urban agriculture of Bangladesh which would contribute to pilot projects for the inclusion of precision agriculture. Moreover, roof gardens contribute to creating a living crop germplasm with vast plant diversity to study and research. The rooftop garden at Habiganj Agriculture University (HAU) has created enormous possibilities for practical learning for the students like crop identification, mix-cultivation, reuse, recycling, preparation of bio-fertilizers, soil quality, entomology, genetics etc. More than a hundred species enrich the roof with a vast biodiversity of plants in a small place. Students collect plant parts to create a herbarium as a part of their practical courses. Teachers of HAU collect necessary samples to study the physiology, propagation and postharvest technologies from the roof garden. HAU rooftop garden contributes to training on roof gardening, plant protection, the inclusion of rich varieties and reuse techniques of waste materials among students, staff and local farmers. Growing crops and medicinal plants on the roof contribute to the accumulation of nutritional values in the diet. In addition, the HAU rooftop garden has created a wonderful relaxing place of aesthetic view which soothes the eyes of visitors and improves mental health with natural joy. Thus, the appreciation and adequate funding for the HAU rooftop garden may contribute to the study, research and develop sustainable agriculture techniques for food security under the changing climate in future Bangladesh.

Keywords: rooftop garden, germplasm, biodiversity, herbarium, student's practical learning, training

Carbon footprint, energy budgeting and economic analysis of tobacco production in Bangladesh

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Abstract

The increasing tobacco farming in Bangladesh has sparked an intense debate about the potential long-term sustainability of such cultivation. Addressing this issue required an in-depth investigation from both an economic and environmental point of view. This research evaluated the environmental and economic sustainability of tobacco farming in Bangladesh via an extensive investigation that incorporates evaluations of energy and carbon footprints as well as cost-related issues. Data were gathered by face-to-face surveys of 400 farmers in two key tobacco-growing areas, Kushtia and Rangpur, from January 2022 to October 2023. The study revealed that Kushtia required higher input energy (51.89 GJ ha^{-1}) and output energy (2.67 GJ ha^{-1}) compared to Rangpur (36.25 GJ ha^{-1}, 2.309 GJ ha^{-1}). Notably, nitrogen-based fertilizers were the leading sources of energy consumption and CO_2 emissions. Human labor was the second-largest input, underscoring the labor-intensive nature of tobacco cultivation. The dependence on non-renewable energy was significantly higher in Kushtia (6 times) and Rangpur (3.5 times) compared to renewable energy sources. Furthermore, both regions had a high reliance on indirect energy sources, which accounted for 74.50% of total input energy in Kushtia and 61.52% in Rangpur. Furthermore, the study uncovered that net energy was negative, indicating that input energy exceeded output energy. Energy use efficiency, specific energy, and energy productivity were 0.052, 15.504 MJ Kg^{-1}, and 0.064 Kg MJ^{-1} in Kushtia and 0.061, 13.117 MJ Kg^{-1}, and 0.076 Kg MJ^{-1} in Rangpur, respectively. In terms of greenhouse gas emissions equivalent to carbon dioxide, Kustia (4553.50 kg CO_2 eq. ha^{-1}) recorded a higher figure than Rangpur (4117.47 kg CO_2 eq. ha^{-1}), attributed to increased fertilizer and human labor usage in Kushtia. The carbon footprint was measured at 0.57 and 0.67 in Kushtia and Rangpur, respectively. Finally, the study estimated the benefit-cost ratio (BCR), which was determined to be 1.90 in Kushtia and 1.64 in Rangpur. Notwithstanding these metrics, farmers in the study areas express a greater emphasis on economic benefits than considerations of energy productivity and greenhouse gas emissions. Consequently, the study underscores the imperative for adopting more sustainable and energy-efficient practices and incorporating mechanization into the tobacco cultivation process. Such initiatives have the potential to enhance farmers' livelihoods, elevate productivity, and mitigate the labor-intensive nature inherent in these agricultural activities.

Keywords: Greenhouse Gas, Energy Use Pattern, BCR, Energy Indices

Organic liquid fertilizer from kitchen waste can promote food waste recycling and sustainable agriculture

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Abstract

Improper disposal of kitchen waste can create various unwanted microorganisms, which can breed mosquitoes and flies, leading to an unhealthy environment. However, kitchen waste can also serve as a source of biofertilizer. To explore its potential, an experiment was carried out to assess the feasibility of making liquid compost from kitchen waste. This experiment aimed to manage kitchen waste in an eco-friendly way, minimize pollution and promote organic farming by converting it into liquid compost. To achieve this, kitchen waste such as vegetable peels, eggshells, tea liquor, etc. was collected and fermented to obtain liquid extracts. Later, macro and micronutrient analysis showed that the liquid extract contained significant amounts of N, P, K, S, Mg, Zn, Cu, Mn, Fe, and B, making it an ideal liquid compost. Making liquid compost can encourage organic farming, reduce the hazards created by improper disposal of kitchen waste, achieve sustainable agriculture by reducing the use of synthetic fertilizer, and provide economical elements in farm technology.

Keywords: Kitchen waste, liquid compost, eco-friendly, organic farming, sustainable agriculture

Optimization doses of urea super granule boost the efficiency of N and improve the growth, yield and quality of the potato

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Abstract

Potato is the third most important food crop after wheat and rice in Bangladesh. To determine the suitable nitrogen source by observing the growth performance to increase the yield of potato research work was carried out at the Research Farm, Sher-e-Bangla Agricultural University, Dhaka during the period from November 2018 to March 2019. The experiment consisted of eight treatments. The experiment was laid out with a Randomized Complete Block Design with three replications. Experimental results showed that nitrogen sources had a significant effect on plant height, number of effective stem hill^{-1}, wt. of tuber (g hill^{-1}), yield of tubers (kg plot^{-1}), yield of tubers (t ha^{-1}), tuber fleshy dry matter content, specific gravity, grading of tubers (% by number). Potato production increased significantly due to the application of Urea Super Granule (USG). The highest production was observed in the T_3 treatment. The application of T_3 treatment showed the highest wt. of tuber hill^{-1} (57.53g hill^{-1}), highest tuber yield (25.77 kg plot^{-1}), and highest tuber yield (29.45 t ha^{-1}) than any other sources of nitrogen treatments. The mean apparent recovery of Nitrogen by tested variety BARI Alu 7 (Diamant) was obtained with the application of USG in other treatments (except control) but the nitrogen use efficiency was highest in the T_3 treatment. Findings revealed that application of USG showed superiority over other sources of nitrogen to produce the highest tuber yield of potato and for all cases, lowest results were found in T_1 treatment receiving no fertilizer (control).

Keyword: USG, Nitrogen, Growth, Yield, Quality, Potato.

Production and Selection of Somaclones for Drought and Salinity Tolerant Cultivar

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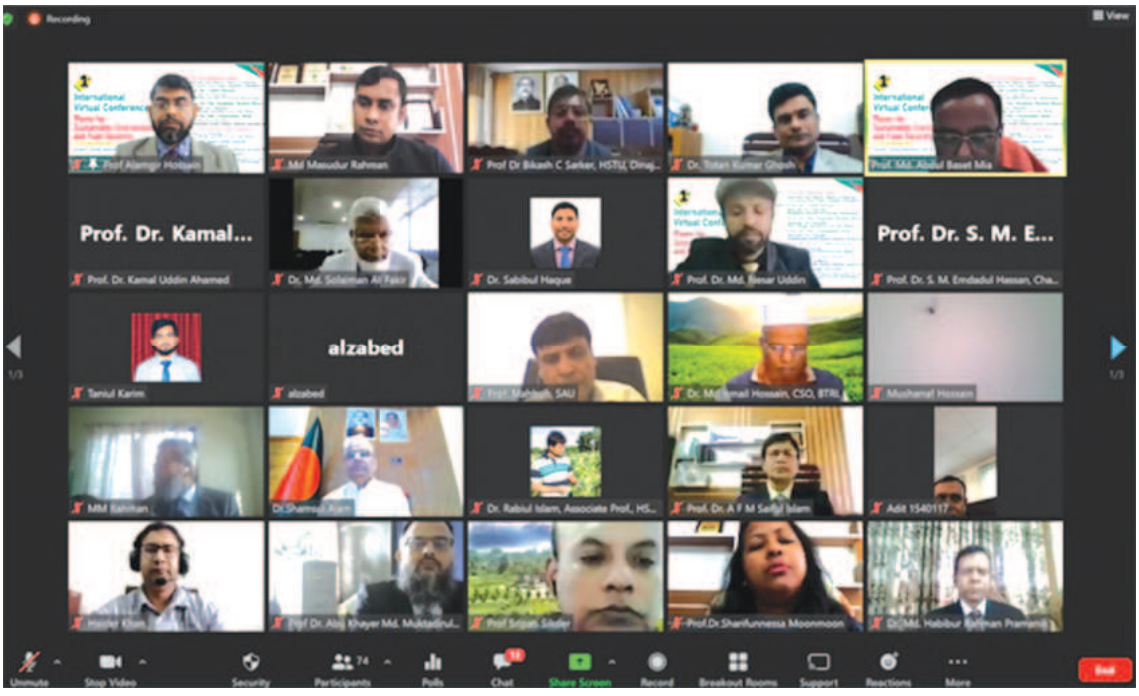
Abstract

The experiments were carried out at the Biotechnology laboratory and farm of Bangladesh Sugarcrop Research Institute, Ishurdi, Pabna, Bangladesh. The production of somaclones *in vitro* to select drought and salinity tolerant lines of sugarcane. Sugarcane varieties Isd 20, Isd 35, Isd 36, Isd 37 and Isd 38 were used for the selection of drought tolerant lines and Isd 28, Isd 35, Isd 36, Isd 37 and Isd 38 were used for the selection of salinity tolerant lines. As treatments, three types of explants such as leaf sheath, shoot apical meristem and root, different doses of 2, 4-D for callus initiation, different combinations of cytokinin for shoot initiation, different doses of auxin for root initiation, different levels of PEG and salt were used with MS medium for in vitro plantlet regeneration. The in vitro selected somaclones were evaluated in the field for two sequential years and also evaluated under induced drought and salinity stress conditions using different levels of PEG (5%, 7.5% & 10%) and salt (50 mM, 100 mM & 150 mM). Molecular characterizations were also done with the setts of selected somaclones collected from R2 generation. It begins with the initiation of healthy explants, followed by callus induction and subsequent regeneration of shoots through tissue culture. The regenerated plantlets undergo a hardening phase before exposure to controlled drought and salinity stress conditions. The selection of plants exhibiting tolerance to these stresses is based on their performance under these conditions. Under induced drought stress SC1, SC2, SC3 of Isd 20, SC2, SC3 of Isd 35 and SC2, SC3 of Isd 37 and under induced salinity stress SC3 of Isd 28, SC3 of Isd 35 and SC2, SC3 of Isd 37 showed better performance in PVC pipe. Those somaclones also performed better in morpho-physiological performance at field conditions in two sequential years and also produced polymorphic bands when we characterized with SCAR marker for selecting drought tolerant genotypes. The survival mechanism of plants under drought and salinity is almost the same. Field trials assess the somaclones' performance under natural conditions, evaluating agronomic traits and yield. Successful candidates are released as improved, drought, and salinity-tolerant sugarcane cultivars. This intricate process requires collaboration among experts in tissue culture, molecular biology, and plant breeding, ensuring a comprehensive approach to the development of resilient sugarcane varieties.

Keywords: Sugarcane, in vitro, drought, salinity tolerant



1st International Virtual Conference of BSPST, 11-12 December 2021

Technical Session at the 2nd Conference of BSPST, 23-24 January 2023 at Cox's Bazar

Certificate Giving Ceremony at 2nd Conference

Participants of 2nd Conference at the Cox's Bazar Sea Beach

'শিক্ষা নিয়ে গড়ব দেশ
শেখ হাসিনার বাংলাদেশ'

হাজী মোহাম্মদ দানেশ বিজ্ঞান ও প্রযুক্তি বিশ্ববিদ্যালয় (হাবিপ্রবি), দিনাজপুর

ফোনঃ ০২-৫৮৯৯২২৩২২, ফ্যাক্সঃ ০২-৫৮৯৯২২৩১১, E-mail: vice-chancellor@hstu.ac.bd, web:www.hstu.ac.bd

বিজ্ঞান ও প্রযুক্তি নির্ভর, প্রাগ্রসর বিশ্বের সঙ্গে সঙ্গতি রক্ষা ও সমতা অর্জনের লক্ষ্যে ১১ সেপ্টেম্বর ১৯৯৯ সালে দিনাজপুরে মাননীয় প্রধানমন্ত্রী শেখ হাসিনা কর্তৃক ভিত্তিপ্রস্তর স্থাপনের মাধ্যমে এ বিশ্ববিদ্যালয়ের কার্যক্রম শুরু হয়

------- এই বিশ্ববিদ্যালয়কে আমরা Centre of Excellence হিসেবে গড়ে তুলতে চাই যা হবে কৃষি ভিত্তিক। তবে এখানে শুধু একটা অনুষদ থাকবে না, বিজ্ঞানের নতুন নতুন প্রযুক্তি উদ্ভাবন হচ্ছে সেসব বিষয়েও যাতে আমাদের ছেলেমেয়েরা লেখাপড়া শিখতে পারে তারও ব্যবস্থা অবশ্যই থাকবে।

-- শেখ হাসিনা, মাননীয় প্রধানমন্ত্রী, গণপ্রজাতন্ত্রী বাংলাদেশ সরকার, ১১ সেপ্টেম্বর ১৯৯৯

হাবিপ্রবি-এ ৯টি অনুষদের অধীনে ৪৫টি বিভাগের মাধ্যমে একাডেমিক কার্যক্রম চলছে যেখানে স্নাতক পর্যায়ে ২৩টি ও স্নাতকোত্তর পর্যায়ে মাস্টার্স ও পিএইচডি ডিগ্রি প্রদান করা হয়। বর্তমানে এখানে প্রায় ১২ হাজার শিক্ষার্থী পড়াশুনা করছে যার মধ্যে ১৩০ জন বিদেশী (নেপাল, ভূটান, ভারত, নাইজেরিয়া ও সোমালিয়া) শিক্ষার্থী।

অনুষদ, বিভাগ, ইনস্টিটিউট, সেল, উচ্চতর গবেষণাগার ও কমিউনিটি সার্ভিসসমূহ

কৃষি অনুষদঃ কৃষিতত্ত্ব, উদ্যানতত্ত্ব, মৃত্তিকা বিজ্ঞান, কীটতত্ত্ব, উদ্ভিদ রোগতত্ত্ব, কৌলিতত্ত্ব ও উদ্ভিদ প্রজনন, ফসল শারীরতত্ত্ব ও পরিবেশ, কৃষি সম্প্রসারণ, কৃষি রসায়ন, কৃষি বনায়ন ও পরিবেশ, বায়োকেমিস্ট্রি অ্যান্ড মলিকুলার বায়োলজিঃ

কম্পিউটার সায়েন্স অ্যান্ড ইঞ্জিনিয়ারিং অনুষদঃ কম্পিউটার সায়েন্স অ্যান্ড ইঞ্জিনিয়ারিং, ইলেকট্রিক্যাল অ্যান্ড ইলেকট্রনিক ইঞ্জিনিয়ারিং, ইলেকট্রনিক্স অ্যান্ড কমিউনিকেশন ইঞ্জিনিয়ারিংঃ

বিজনেস স্টাডিজ অনুষদঃ একাউন্টিং, ম্যানেজমেন্ট, ফিন্যান্স অ্যান্ড ব্যাংকিং, মার্কেটিংঃ

ফিসারিজ অনুষদঃ ফিসারিজ বায়োলজি অ্যান্ড জেনেটিক্স, ফিসারিজ ম্যানেজমেন্ট, ফিসারিজ টেকনোলজি, একোয়াকালচারঃ

ইঞ্জিনিয়ারিং অনুষদঃ এগ্রিকালচারাল অ্যান্ড ইন্ডাস্ট্রিয়াল ইঞ্জিনিয়ারিং, ফুড প্রসেসিং অ্যান্ড প্রিজারভেশন, ফুড ইঞ্জিনিয়ারিং অ্যান্ড টেকনোলজি, ফুড সায়েন্স অ্যান্ড নিউট্রিশন, আর্কিটেকচার, সিভিল ইঞ্জিনিয়ারিং, মেকানিক্যাল ইঞ্জিনিয়ারিংঃ

ভেটেরিনারি অ্যান্ড এনিম্যাল সায়েন্স অনুষদঃ মাইক্রোবায়োলজি, প্যাথলজি অ্যান্ড প্যারাসাইটোলজি, ডেইরি অ্যান্ড পোল্ট্রি সায়েন্স, এনাটমি অ্যান্ড হিস্টোলজি, এনিম্যাল সায়েন্স অ্যান্ড নিউট্রিশন, জেনেটিক্স অ্যান্ড এনিম্যাল ব্রিডিং, মেডিসিন, সার্জারি অ্যান্ড অবস্টেট্রিক্স, ফিজিওলজি অ্যান্ড ফার্মাকোলজিঃ

বিজ্ঞান অনুষদঃ রসায়ন, পদার্থবিজ্ঞান, গণিত, পরিসংখ্যানঃ

সোস্যাল সায়েন্স অ্যান্ড হিউমিনিটিস অনুষদঃ অর্থনীতি, ইংরেজি, সমাজবিজ্ঞান, ডেভেলপমেন্ট স্টাডিজঃ

পোস্টগ্র্যাজুয়েট স্টাডিজ অনুষদঃ মাস্টার্স এবং পিএইচডিঃ

ইনস্টিটিউটঃ ইনস্টিটিউট অব রিসার্চ অ্যান্ড ট্রেনিং (আইআরটি)ঃ

সেলঃ ইনস্টিটিউশনাল কোয়ালিটি এস্যুরেন্স সেল (আইকিউএসি) ও আইটি সেলঃ

উচ্চতর গবেষণাগারঃ কেন্দ্রীয় গবেষণাগারঃ

কমিউনিটি সার্ভিসঃ কৃষক সেবা কেন্দ্র, ক্যারিয়ার অ্যাডভাইজরি সার্ভিস ও ভ্রাম্যমান ভেটেরিনারি ক্লিনিক।

বাংলাদেশ ধান গবেষণা ইনস্টিটিউটের অর্জন

বাংলাদেশ ধান গবেষণা ইনস্টিটিউট (ব্রি)

বঙ্গবন্ধু ধান১০০

১৯৭০ সালের ১ অক্টোবর প্রতিষ্ঠার পর থেকে এ পর্যন্ত বাংলাদেশ ধান গবেষণা ইনস্টিটিউট (ব্রি) খাদ্য নিরাপত্তা ও জাতীয় অগ্রগতিতে তাৎপর্যপূর্ণ অবদান রেখেছে। এ অবদানের উলেখযোগ্য দিকগুলো হচ্ছে–

- আটটি হাইব্রিডসহ ১১৫টি উচ্চ ফলনশীল ধানের জাত উদ্ভাবন। এদের ফলন সনাতন জাতের চেয়ে তিন গুণ বেশি।
- ব্রির এসব উদ্ভাবনের মধ্যে রয়েছে লবণাক্ততা সহনশীল ১২টি, আকস্মিক বন্যা মোকাবিলার দুটি, অলবণাক্ত জোয়ার-ভাটা এলাকার উপযোগী তিনটি, খরা সহনশীল তিনটি, স্বল্প জীবনকালের আগাম জাত ছয়টি, জিঙ্ক সমৃদ্ধ সাতটি, সর্বাধিক ফলনের পাঁচটি , সুগন্ধি ও রপ্তানি উপযোগী নয়টি জাত।
- আধুনিক ধান চাষের জন্য মাটি, পানি ও সার ব্যবস্থাপনার ক্ষেত্রে ৫০টির বেশি উন্নত প্রযুক্তি উদ্ভাবন।
- ৫১টি লাভজনক ধানভিত্তিক শস্যক্রম উদ্ভাবন।
- ৩৪টি কৃষি যন্ত্রপাতি উদ্ভাবন ও উন্নয়ন।
- ধানের ৩২টি রোগ (১০টি প্রধান) ও ২৬৬টি ক্ষতিকর পোকা (২৫টি প্রধান) শনাক্তকরণ এবং বালাই ব্যবস্থাপনা উদ্ভাবন।
- দেড় লক্ষাধিক কৃষি কর্মকর্তা ও কৃষককে বিভিন্ন মেয়াদি প্রশিক্ষণ প্রদান এবং ৩৮৯টি বই-পত্র প্রকাশ।
- দেশ-বিদেশের প্রায় সাড়ে আট হাজারেরও বেশি ধানের জার্মপ্লাজম ব্রি জিন ব্যাংকে সংরক্ষণ।
- প্রতি বছর ব্রি থেকে প্রায় দেড় শতাধিক টন ব্রিডার বীজ উৎপাদন করে বিভিন্ন সরকারি-বেসরকারি প্রতিষ্ঠানকে সরবরাহ করা হয় যা পরে বর্ধিত আকারে বীজ নেটওয়ার্কের মাধ্যমে সারাদেশের কৃষকের কাছে যায়।
- দেশে আবাদকৃত উফশী ধানের শতকরা প্রায় ৮০ ভাগ জমিতে ব্রি উদ্ভাবিত ধানের জাত চাষ করা হয় এবং এ থেকে পাওয়া যায় দেশের মোট ধান উৎপাদনের প্রায় ৯১ ভাগ।
- ধান গবেষণা ও সম্প্রসারণে প্রতি এক টাকা বিনিয়োগ থেকে ৪৬ টাকা মুনাফা অর্জন।
- ১৪টি দেশে ব্রি উদ্ভাবিত ২৩টি জাতের ধান চাষ করা হচ্ছে।
- বিজ্ঞান ও কৃষি উন্নয়নে অবদানের জন্য ব্রি ও এর কয়েকজন বিজ্ঞানীর তিনবার স্বাধীনতা দিবস স্বর্ণ পদক ও তিনবার প্রেসিডেন্ট স্বর্ণ পদক, পরিবেশ পদক ২০০৯ এবং এমসিসিআই এওয়ার্ড ২০১৪, বঙ্গবন্ধু জাতীয় কৃষি পুরস্কার ২০১৬, ডিজিটাল ওয়ার্ল্ড এওয়ার্ড ২০১৬, বঙ্গবন্ধু জাতীয় কৃষি পুরস্কার ২০১৭, স্ট্যান্ডার্ড চার্টার্ড ব্যাংক অ্যাগ্রো এওয়ার্ড ২০১৭, আরটিভি কৃষি পুরস্কার ২০২১, একুশে পদক ২০২১, ডিজিটাল বাংলাদেশ পুরস্কার ২০২২ সহ জাতীয় ও আন্তর্জাতিক পর্যায়ে মোট ২৮টি পুরস্কার লাভ।

বাংলাদেশ ধান গবেষণা ইনস্টিটিউট, গাজীপুর
Bangladesh Rice Research Institute, Gazipur
Phone: 49272061, PABX: 88-02-49272005-14, Fax: 88-02-49272000
E-mail: dg@brri.gov.bd; brrihq@yahoo.com,
Website: www.brri.gov.bd

খাদ্য ও পুষ্টি নিরাপত্তায় বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউট এর সাফল্যসমূহ

বারি আম-৪

- হাইব্রিড, নাবি জাত;
- টিএসএস ২৪.৫%;
- ফলের গড় ওজন ৬০০ গ্রাম।

বারি কাঁঠাল-৬

- উচ্চ ফলনশীল বারোমাসি জাত;
- পাকা শুষ্ক, উজ্জ্বল হলুদ বর্ণের ও আঠা বিহীন;
- কুল টিএসএস পরিমাণ ২৪.৮%।

বারি মাল্টা-১

- ফলের পুষ্প প্রান্ত পয়না সদৃশ্য;
- সুস্বাদু, টিএসএস ৭.৮%;
- ফলের গড় ওজন ১৫০ গ্রাম।

বারি হাইব্রিড টমেটো-৮ (গ্রীষ্মকালীন)

- এ জাতটি সারা বছর ফলন দেয়;
- ফল চ্যাপ্টা গোলাকার আকর্ষণীয় উজ্জ্বল লাল বর্ণের;
- ফলন: ৪০-৪৫ টন/হেক্টর।

বারি বেগুন-১২

- ফলের আকার বড়া, লোমশতাহীন, সবুজ বর্ণের ও আঠাটি চলে পড়া রোগ প্রতিরোধী;
- প্রতি গাছে গড়ে ১০-১২টি ফল ধরে, ফলের গড় ওজন ৬০০-৭০০ গ্রাম;
- ছাল সহনশীল হওয়ায় অঙ্কুরোদ্গম হার মৌসুমে চাষোপযোগী।

বারি পেঁয়াজ-৫ (গ্রীষ্মকালীন)

- গ্রীষ্মকালে চাষোপযোগী স্বল্পকালীন ফলন;
- কন্দের গড় ওজন ৩০-৫০ গ্রাম;
- ফলন: ১৯-২০ টন/হেক্টর।

বারি মসুর-৮

- মাটির বন্দ্যতাসহ, উচ্চফলনশীল এবং জিংক (Zn) ও আয়রন (Fe) সমৃদ্ধ একটি জনপ্রিয় জাত;
- ফলন: ২.০-২.৫ টন/হেক্টর।

বারি মুগ-৬

- দেশের দক্ষিণাঞ্চলে কৃষকের মাঠে একটি জনপ্রিয় জাত;
- হলদে মোজাইক ও পাতার দাগ রোগ সহনশীল;
- ফলন: ১.৬-২.০ টন/হেক্টর।

বারি চিয়া-১

- উচ্চমাত্রায় ওমেগা-৩ ফ্যাটি এসিড সমৃদ্ধ;
- গুলম: ১০০৮-১১০০ কেজি/হেক্টর;
- জীবনকাল:৯৮-১০৪দিন।

বারি কফি-১

- ফল/বিন গোলাকৃতি সুরক্ষাত্ত বাদামী;
- চারা রোপণের ২ বছর থেকে ফল দেয়;
- খরা সহিষ্ণু ও আংশিক ছায়াযুক্ত স্থানে চাষ উপযোগী।

বারি তিল-৬

- বীজ কালো ও দিনক্ষণ কোটা বিশিষ্ট;
- আংশিক জলাবদ্ধতা সহনশীল;
- ফলন: ১,৯০০-১,৮০০ কেজি/হেক্টর।

বারি মিষ্টিআলু-১৭

- এ জাতটি এন্থোসায়ানিন সমৃদ্ধ;
- ১০০ গ্রাম পাঁশে এন্থোসায়ানিন এর পরিমাণ ৩৫.০৩ মিলিগ্রাম;
- ফলন: ২২-২৫ টন/হেক্টর।

বারি চীনাবাদাম-৯

- বীজ হালকা বাদামী ও মাঝারি আকারের;
- প্রতিটি গাছে পরিপক্ক ফলের সংখ্যা ৫৬-১১০টি;
- ফলন: ২-৩ টন/হেক্টর।

আলমান কৃষি প্রযুক্তি

- আলমান কৃষি প্রযুক্তিতে সর্বোচ্চ চাষ

হলুদ আঠালো ফাঁদ প্রযুক্তি

- জাব পোকা, জ্যাসিড ও সাদা মাছি নিয়ন্ত্রণে হলুদ আঠালো ফাঁদ প্রযুক্তি অত্যন্ত কার্যকরী।

বারি শস্য কর্তন যন্ত্র

- প্রতি ঘন্টায় ০.১৫-০.২০ হেক্টর (৩৫-৫০ শতাংশ) ধান, পাট ও গমিজাতীয় ফসল কাটা যায়;
- কাটা ধান, পাট ও গমিজাতীয় ফসল পরিষ্কারভাবে পাশে বা সারিতে কাটা যায়;
- প্রতি ঘন্টায় জ্বালানী খরচ হয় ০.৯ লিটার (পেট্রোল)।

- বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউট (বিএআরআই) দেশের সর্ববৃহৎ বহুবিধ ফসল গবেষণা প্রতিষ্ঠান
- বিএআরআই এ পর্যন্ত বিভিন্ন ফসলের ৬২৫টি উচ্চ ফলনশীল নতুন জাত উদ্ভাবন করেছে।
- বিএআরআই এ পর্যন্ত ৬১২ টি নতুন প্রযুক্তি উদ্ভাবন করেছে।
- গবেষণার স্বীকৃতিস্বরূপ বিএআরআই ১৯৭৪ সালে বঙ্গবন্ধু গোল্ড মেডেল লাভ করে।
- ২০১২ সালে বঙ্গবন্ধু জাতীয় কৃষি পুরস্কার লাভ করে।
- ২০১৪ সালে স্বাধীনতা পুরস্কার (১৪১৭ বঙ্গাব্দ) লাভ করে।

বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউট
গাজীপুর-১৭০১

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