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2021-22

Programme Leader
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CITRUS RESEARCH STATION

BANGLADESH AGRICULTURAL RESEARCH INSTITUTE
JAINTAPUR, SYLHET-3156

Annual Research Programme
2021-22

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Contents

1.	Program	:	Fruit improvement
2.	Project	:	Varietal improvement
3.	**Experiment No. 01**	**:**	**Advanced yield trial of banana line cv. Sabri (MS Jai-024)**
4.	Objective (S)	**:**	To find out the superior line to develop variety of banana
5.	Rational	**:**	Banana (*Musa* spp.) is a herbaceous perennial monocotyledonous plant, which belongs to the family Musaceae of order Scitamineae. It is one of the largest produced and consumed amongst all fruits cultivated in Bangladesh. It is a crop of subsistence being cultivated from prehistoric time in with great socio-economic significance and is grown in all over Bangladesh. It provides well balanced diet to millions of people around the globe and also contributes to livelihood through crop production, processing (Singh, 2002) and thus, plays a key role in the economy of many developing countries. Bangladesh Agricultural Research Institute has already developed five banana varieties. Among three are as table banana (one Sagor, one Kobri and one Champa) and two for cooking purpose. Sobri banana is one of the most important banana cultivar in Bangladesh used for table purpose. There is a lot of variability among sobri banana genotypes all over the country. The scientists of Citrus Research Station, BARI Jaintapur, Sylhet collected several genotypes of Sobri banana few years back and evaluated them for finding a superior one(s). Among the collected germplasm one accession performed better with higher yield and superior fruit quality was selected. This superior genotype should be evaluated critically for releasing as variety. Keeping this view in mind the present study was undertaken.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Sobri banana germplasm
8.	Design	:	RCBD
	i) Treatment	:	Local check and advanced line MS Jai-024
	ii) Replication	:	-
9.	Plot size	:	
10.	Planting system/spacing	:	Single row plantation
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	Growth, yield and Fruit quality attributes
14.	Investigator (s)	:	M.H.M.B. Bhuyan, J.C. Sarker, F. Ahmed, and S. M.L Rahman
15.	Season	:	-
16.	Date of initiation	:	June 2021
17.	Date of completion	:	2025
18.	Exp. outcome/benefit	:	Sobri banana variety will be developed
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk. 1,00,000/-
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal development of ber
03.	**Experiment No. 02**	**:**	**Evaluation of local/sour type ber germplasm**
04.	Objective(s)	:	i) To select suitable ber varieties for different regions ii) To conserve fruit genetic resources
05.	Rationale	:	Ber is one of the important fruits rich in vitamin C. It is available in January to March when there is scarcity of other seasonal fruits. It provides a good scope for cultivation on marginal land. Many land races are grown dispersedly throughout the country besides the released varieties. Some of them may be suitable for cultivation. Collection and evaluation of promising land races is the first and foremost task to develop high yielding varieties with desirable attributes. Therefore, this experiment has been undertaken.
06.	Materials and Methods	:	-
07.	Crop/Variety	:	Ber
08.	Design	:	Augmented/ RCBD
	i) Treatments	:	Nine ber germplasm (ZM Kha-005, ZM Kha-008, ZM Kha-013, ZM Kha-017, ZM Kha-021, ZM Kha-023, ZM Kha-024, ZM Kha-026, ZM Kha-030) Khagrachari, 4 (ZM Jai-011, ZM Jai-012, ZM Jai-013, ZM Jai-014) Jaintapur, 2 (ZM Raj-001 to ZM Raj-016) Binodpur, 3 (Joydebpur)
	ii) Replications	:	3
09.	Plot size	:	-
10.	Planting system/ spacing	:	Square (5 x 5 m)
11.	Fertilizer dose and methods of application	:	As per FRG-2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Fruit yield/plant (by number & weight) iii) Incidence of pests and diseases
14.	Investigator(s)	:	M. H. Waliullah, M. R. Alam, M. A. Alam and M. M. Rahman, A. S. M. M. Uddin, A. Akter, M. A. A. Malek, G. Rahman, M. R. Ahmad, F. Ahmed, J. C. Sarker, M. H. M. B. Bhuyan and S. M. L. Rahman
15.	Season	:	-
16.	Date of initiation	:	1st week of April 2013, 2014, 2017,2020
17.	Date of completion	:	2022-2024
18.	Exp. Output/benefit	:	Suitable ber variety will be developed
19.	Location	:	Binodpur, Jashore, Joydebpur, Jamalpur, Khagrachari and Jaintapur
20.	Status	:	4th year
21.	Estimated cost	:	Tk. 20,000/- per station/year
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

1.	Program	:	Fruit improvement
2.	Project	:	Varietal development of pineapple
3.	**Experiment No. 03**	**:**	**Conservation and evaluation of pineapple germplasm**
4.	Objective(s)	:	i) To study the genetic diversity of pineapple in Bangladesh ii) To select suitable germplasms releasing as variety
5,	Rationale	:	Pineapple (*Ananas comosus*) is one of the most delicious tropical fruits. It belongs to the family of Bromeliaceae. Pineapple is a good source of natural antioxidants (Islam et al., 2015). It has good flavor and taste. It is also high in fiber, minerals, vitamins and other nutrients. Pineapple is acidic food having pH almost 3.5 to 4 (Sairi et al., 2004). In Bangladesh, pineapple cultivation is concentrated in Dhaka, Tangail, Mymensingh, Gazipur, Sylhet, Moulvibazar, Hobiganj, Chottogram, Bandarban, Khagrachari and Rangamati districts. The people of Bangladesh like to consume the ripe pineapple and use the pineapple to make jam jelly and pickles (Hossain and Islam, 2017). Different types of pineapple cultivars growing in the countries but there is no recognized variety. In Sylhet region, farmers growing pineapple in different shape, size and flavor as a result price also varied in the market. In contest of agro-industrial and commercial agriculture, variability should be identified for the farmers, consumers and researchers. Its high time to release variety through systematic research. Generally, the genotypes of fruits are recognized and identified based on phonological traits. Majority of the traits are quantitative in nature and therefore it misguides the plant scientist to recognize a particular genotype and it is often difficult to use their criteria. Therefore, recently advent molecular characterization along with morphological traits would be the best solution. Characterization as well as diversity analysis of germplasm will provide the information to plant breeder for helping them selecting the parent for hybridization in varietal improvement Program. Therefore, the objective of the study is to characterize and to evaluate the genetic diversity of pineapple germplasms using morphological traits and molecular markers.
6.	Materials and Methods	:	Pineapple germplasm collected from different areas of Bangladesh with the help of officials from department of agricultural extension. The collected germplasm to be planted in the field of citrus research station, Jaintapur, Sylhet for further evaluation.
7.	Crop/Variety	:	Pineapple genotypes
8.	Design	:	RCBD
	i) Treatments	:	5 (AC Jai-011, AC Jai-012, AC Jai-013, AC Jai-014, AC jai-015). More genotypes will be included
	ii) Replications	:	4
9.	Plot size	:	-
10.	Planting system	:	Line sowing maintaining the standard spacing for pineapple
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Fruit yield (by number and weight) iii) Incidence of pests and diseases
14.	Investigator(s)	:	S. M. L. Rahman, J. C. Sarker, M. H. M. B. Bhuyan and F. Ahmed
15.	Season	:	-
16.	Date of initiation	:	2nd week of June 2019
17.	Date of completion	:	2022
18.	Exp. Output/benefit	:	New pineapple variety will be developed and information would be generated for future research
19.	Location	:	Jaintapur
20.	Status	:	3rd year
21.	Estimated cost	:	Tk.80,000/-
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

1. Program : Fruit improvement
2. Project : Varietal development
3. **Experiment No. 04 : Hybridization in satkara**
4. Objective(s) : i) To incorporate desirable characters
   ii) To develop new variety
5. Rationale : Satkara is the most important citrus fruit in terms of its popularity in Sylhet region and also for export potentiality. It has been grown in homesteads for a long time in this region. It has been observed and reported from the farmers and extension personnel for several years in this region that in satkara, there is a slow growing tendency which causes delay bearing of fruits. This is unexpected which causes decreasing the cultivation of this fruit in Sylhet region day by day. Hence, the study has been undertaken to incorporate suitable characters for quality satkara with quick growing tendencies.
6. Materials and methods : Hybridization will be done with the following cross combinations

Cross combination			Main Objectives
(♀)		(♂)	
BARI Satkara-1	×	BARI Batabilebu-1	To transfer quick growing habit
BARI Satkara-1	×	Ashkar lebu (Citron)	To transfer quick growing with pest & disease resistance

7. Crop/Variety : BARI Satkara-1, BARI Batabilebu-1and Ashkar lebu
8. Design : -
   i) Treatment : -
   ii) Replication -
9. Plot size : -
10. Planting system/ spacing : -
11. Fertilizer dose and methods of application : -
12. Irrigated/ rainfed : Irrigated
13. Data to be recorded : No. of flower crossed, No. of fruit set, No. of fruit harvested
14. Investigator(s) : S.M.L.Rahman, M.S.Zaman, F. Ahmed, J.C. Sarker and M.H.M.B. Bhuyan
15. Season : Winter
16. Date of initiation : Feb 2021
17. Date of completion : 2031
18. Exp. Outcome/benefit : High yielding Satkara variety will be developed with desirable quick growing and profuse bearing habit
19. Location : Jaintapur and Akbarpur
20. Status : New
21. Estimated cost : Tk. 300,000/-
22. Sources of fund : HRC, BARI
23. Priority : 1st

1. Program : Fruit improvement
2. Project : Varietal development
3. **Experiment no. 05 : Hybridization in mandarin**
4. Objective(s) : i) To incorporate desirable characters
   ii) To develop new variety
5. Rationale : Mandarin orange is very popular and high valued citrus fruit in the world. Our climatic conditions of hilly regions are quite suitable for its cultivation. A project namely "Orange Development Project" has been completed by distributing BARI Kamala-1 to the growers of the hilly regions of greater Sylhet and other selected areas of the country. For the last ten years several thousands of seedlings/saplings were planted in the farmers' fields. Advanced growers are also produced their own saplings/seedlings and they continued their plantation. But unfortunately, in recent years it has been observed that mandarin in Sylhet as well as all over the country is less sweet in taste, which decreases its popularity day by day. Our modern sweet orange variety BARI Malta-1 is very sweet in taste which can be incorporated in BARI Komala-1. With this view in mind, the experiment has been undertaken to develop a hybrid variety with desirable sweetness.
6. Materials and methods : Hybridization will be done with the following cross combinations

Cross combination			**Main Objectives**
(♀)		(♂)	
BARI Komala-1	×	BARI Komala-2	To transfer profuse bearing habit
BARI Komala-1	×	BARI Malta-1	To transfer sweetness

7. Crop/Variety : BARI Komala-1, BARI Malta-1 and BARI Komala-2
8. Design : -
   i) Treatment : -
   ii) Replication : -
9. Plot size : -
10. Planting system : -
11. Fertilizer dose and methods of application : -
12. Irrigated/ rainfed : Irrigated
13. Data to be recorded : No. of flower crossed, No. of fruit set, No. of fruit harvested
14. Investigator(s) : S.M.L.Rahman, M.S.Zaman, F. Ahmed, J.C. Sarker and M.H.M.B. Bhuyan
15. Season : Winter
16. Date of initiation : Feb 2021
17. Date of completion : 2031
18. Exp. Outcome/benefit : High yielding mandarin variety will be developed with desirable sweetness and profuse bearing habit
19. Location : Jaintapur and Akbarpur
20. Status : New
21. Estimated cost : Tk. 3,00,000/-
22. Sources of fund : HRC, BARI
23. Priority : 1st

1.	Program	:	Fruit improvement
2.	Project	:	Varietal development of citrus
3.	**Experiment No. 06**	**:**	**Evaluation of local and exotic mandarin germplasm**
4.	Objective(s)	:	i) To select suitable lines ii) To develop new mandarin variety
5.	Rationale	:	Mandarin (*Citrus reticulata*) is the most delicious and popular citrus fruit in Bangladesh. It is rich in vitamins and minerals. We have already developed 3 mandarin varieties. Variety development is a continuous process and all the varieties do not grow well in all the regions for all time. They respond differently in respect of available climatic conditions. North-eastern region is very rich in citrus bio-diversity. Hence, the present experiment has been undertaken to find out the suitable lines in order to release as variety(s).
6.	Materials and Methods	:	-
7.	Crop/Variety	:	Mandarin germplasm
8.	Design	:	RCBD/Augmented
	i) Treatments	:	24 (CR Jai-011, CR Jai-012, CR Jai-013, CR Jai-014, CR Jai-015, CR Jai-016, CR Jai-018, CR Jai-019, CR Jai-020, CR Jai-201, CR Jai-202, CR Jai-203, CR Jai-204, CR Jai-205, CR Jai-206, CR Jai-207, CR Jai-208, CR Jai-209, CR Jai-210, CR Jai-211, CR Jai-212, CR Jai-213, CR Jai-214) and BARI Komla-1 and BARI Komla-3 as check (Jaintapur)
	ii) Replications	:	3 and 5
9.	Plot size	:	-
10.	Planting system/ spacing	:	Square system with 3 x 3m spacing
11.	Fertilizer dose and methods of application	:	As per FRG-2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics (As per IBPGR descriptor) ii) Yield / plant (by number and weight) iii) Incidence of pests and diseases
14.	Investigator(s)	:	J. C. Sarker, S. M. L. Rahman, M. A. Sumi and M. S. Alam
15.	Season	:	-
16.	Date of initiation	:	2nd week of November, 2017, 2020
17.	Date of completion	:	October, 2022
18.	Exp. Output/benefit	:	It will help to develop suitable varieties for north eastern region as well as all over the country, which will enhance farmers income
19.	Locations	:	Jaintapur and Akbarpur
20.	Status	:	4th year
21.	Estimated cost	:	1,20,000/-
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal development of citrus
03.	**Experiment No. 07**	**:**	***In situ* assessment of mandarin under north-eastern hilly area of Bangladesh**
04.	Objective(s)	:	i) To release suitable variety(s) ii) To enrich gene pool
05.	Rationale	:	Citrus is the number one horticultural crop of Bangladesh. Citrus is the highest income generating fruit crop. Citrus in Bangladesh is predominantly mandarin (*Citrus reticulata* Blanco.) although sweet orange, lemons, lime and grapefruits are also produced. Mandarin in Bangladesh are reported to be of two types: *Sajek* (Cultivated in Chottogram hill tract of Bangladesh) and *Khasi* (Cultivated in Khasia-Jaintia hills of Bangladesh) (Dorjee *et al*., 2006). Despite the steady increase in mandarin production in country, the cultural practices being followed are still minimal. Most of the mandarins are local cultivars grown from either self raised or purchased from other farmers. There is no authentic history of citrus cultivation in Bangladesh (NPPC, 2007). The collection of local citrus germplasm has been the research priority. Citrus Research Station (CRS) in different regions collect the accessions from their respective areas in the country. The characterization of accessions and study of the diversity is still a major task ahead. Therefore, this study was aimed at characterization and *In-situ* assessment of morphological diversity for mandarin accessions maintained at CRS, Jaintapur in Bangladesh.
06.	Materials and Methods	:	-
07.	Crop/Variety	:	Mandarin germplasm
08.	Design	:	Augmented
	i) Treatments	:	7 (CR Jai-201, CR Jai-202, CR Jai-203, CR Jai-204, CR Jai-205, CR Jai-206, CR Jai-207) and BARI Komala-1 as check
	ii) Replications	:	Non-Replicated
09.	Plot size	:	-
10.	Planting system	:	Square
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/rain fed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Yield and yield components and iii) Incidence of pest and diseases
14.	Investigator(s)	:	J. C. Sarker, S. M. L. Rahman, M. H. M. B. Bhuyan and F. Ahmed
15.	Season	:	-
16.	Date of initiation	:	2nd week of November, 2019
17.	Date of completion	:	2022
18.	Exp. Output/benefit	:	Improved variety will be developed and genetic resources will be conserved for exploitation in future
19.	Location	:	Jaintapur
20.	Status	:	3rd year
21.	Estimated cost	:	Tk.60,000/-
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal development of pummelo
03.	**Experiment No. 08**	**:**	**Evaluation of local pummelo germplasm**
04.	Objective(s)	:	i) To select superior pummelo lines for releasing as a variety ii) To conserve genetic resources
05.	Rationale	:	Pummelo is one of the important citrus fruits grown all over Bangladesh. It contains vitamin C more than double of other citrus fruits. Production of this fruit in Bangladesh is poor as compared with other citrus producing countries due to lack of high yielding variety. Four pummelo varieties have already been released. There exists further scope for development of good quality and high yielding varieties of the crop. That's why the experiment has been proposed to evaluate local Pummelo germplasm
06.	Materials and Methods	:	-
07.	Crop/Variety	:	Pummelo lines
08.	Design	:	Augmented/ RCBD
	i) Treatments	:	As per plantation at each location Raikhali 13 (CGrai006, CGrai007, CGrai008, CGrai009, CGrai010, CGrai011, CGrai014, CGrai017, CGrai021, CGrai028, CGrai030, CGrai047 and CGrai052) (For Jaintapur 7 (CG Jai-053, CG Jai-054, CG Jai-055, CG Jai-061, CG Jai-062, CG Jai-063, CG Jai-064) and BARI Batabi lebu-3 and BARI Batabi lebu-5 as check and Jashore 21 pummelo germplasm
	ii) Replications	:	4
09.	Plot size	:	-
10.	Planting system/ spacing	:	4 x 3.5 m
11.	Fertilizer dose and methods of application	:	Well decomposed cow dung @ 15 kg/plant, 230g N, 185 g P_2O_5 and 300g K_2O per plant per year and will be applied three equal installments during February, May and October.
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Tree growth, flowering and fruit characteristics ii) Fruit yield/plant (by number & weight) iii) Incidence of pests and diseases
14.	Investigator(s)	:	M. A. Alam, M. R. Alam, J. C. Sarker, S. M. L. Rahman, M. H. M. B. Bhuyan, F. Ahmed S. M. L. Rahman, M. G. Rahman M. Islam, M. E. Hoque and M. A. Hossain
15.	Season	:	-
16.	Date of initiation	:	1st week of September, 2007, 2020, 2012
17.	Date of completion	:	2022
18.	Exp. Output/benefit	:	Improved pummelo variety will be developed
19.	Location	:	Jashore, Jaintapur, Khagrachari and Raikhali
20.	Status	:	3rd year
21.	Estimated cost	:	Tk. 20,000/- per station
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

1.	Program	:	Fruit improvement
2.	Project	:	Varietal improvement
3.	**Experiment No. 09**	**:**	**Morphophysiological characterization and evaluation of seedless lemon germplasm**
4.	Objective (S)	**:**	i) To identify suitable germplasm for releasing as variety ii) To enrich gene pool for future research
5.	Rational	**:**	Citrus fruits are widely grown in Bangladesh. Among the various citrus fruits, lemons are the most important and cultivated. Seedless lemon, an indigenous lemon cultivar is generally grown for greater adaptability, high yield and tolerance to citrus diseases. Moreover, it is exported to the mainstream market of Europe from Bangladesh. Lemons are also known to posses curative value for certain diseases of bones and joints, bilious diseases, prevention of capillary bleeding, piles, dysentery, cold, influenza, constipation and scurvy. Lemon juice in hot water or tea is very popular in present Covid-19 pandemic situation. Seedless lemon having 1-6 seeds is heterozygous in nature. As many of the farmers propagate lemons by seeds this cultivar exhibits wider variability in seedling population. Moreover due to vegetative propagation by graftages and cuttings some clonal variation also arose which should be characterized for releasing new varietie(s). Keeping this view im mind the present study was undertaken.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Seedless lemon germplasm
8.	Design	:	RCBD
	i) Treatment	:	As per collections
	ii) Replication	:	5
9.	Plot size	:	
10.	Planting system/spacing	:	Single row plantation
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	Growth, yield and Fruit quality attributes
14.	Investigator (s)	:	M.H.M.B. Bhuyan, M.M. Rahman, F. Ahmed, J.C. Sarker and S. M.L Rahman
15.	Season	:	-
16.	Date of initiation	:	June 2021
17.	Date of completion	:	2025
18.	Exp. outcome/benefit	:	Seedless lemon variety will be developed
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk. 2,00,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal development of minor fruits
03.	**Experiment No. 10**	**:**	**Evaluation of minor fruits germplasm**
04.	Objective(s)	:	i) To find out the suitable genotype(s) of minor fruit lines ii) To conserve the minor fruit lines for diversification of genetic resources
05.	Rationale	:	Flacourtia (Paniala), Indian dillenia (Chalta), Bullocks heart (Ata), Bel, Latkon, Orboroi, Wood apple, Jamun are the minor fruits of Bangladesh. These fruits are rich in vitamins and minerals have high medicinal value. These fruits species are on the verge of extinction due to their non-commercial use. Moreover, the available genetic variability within the fruit species has yet been collected, properly evaluated and systematically conserved. Therefore, it is essential to identify superior genotypes, collection and planting in the research field for critical evaluation in order to test their potentiality and release for commercial cultivation as well as strengthen the base of the fruit industry of the country. With this view in mind, this experiment has been undertaken.
06.	Materials and Methods	:	-
07.	Crop/Variety	:	Flacourtia (Paniala), Indian dillenia (Chalta), Bullock's heart (Ata), Bael, Latkon, Indian gooseberry (Orboroi), Wood apple, Jamun, Water chestnut, *Betul* and other available lines in the country
08.	Design	:	Augmented/ RCBD
	i) Treatments	:	12 (Joydebpur)
	ii) Replications	:	3
09.	Plot size	:	-
10.	Planting system	:	Square (4 x 4 m)
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Yield / plant (by number and weight) iii) Incidence of pests and diseases
14.	Investigator(s)	:	A. S. M. M. Uddin and S. M. L. Rahman
15.	Season	:	-
16.	Date of initiation	:	1st week of February, 2013
17.	Date of completion	:	2023
18.	Exp. Output/benefit	:	Improved variety (ies) will be developed
19.	Location	:	Joydebpur and Jaintapur
20.	Status	:	9th year
21.	Estimated cost	:	Tk. 50,000/- per station
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal development of golden apple
03.	**Experiment No. 11**	**:**	**Evaluation of golden apple germplasm**
04.	Objective(s)	:	i) To select superior golden apple lines ii) To develop improved variety(ies)
05.	Rationale	:	Golden apple (*Spondius dulcis*) is one of the important fruits in Bangladesh. The fruit is good source of vitamins and minerals. The fresh fruit is used in the preparation of pickle, jam etc. The fruit is also important for its medicinal uses. The commercial cultivation of Golden Apple is confined only to the southern districts of Bangladesh. Since there is considerable amount of variability in the farmers' field. There is a scope for selection of superior variety. With this view, the present experiment was under taken to select the superior Lines.
06.	Materials and Methods	:	-
07.	Crop/Variety	:	Golden apple germplasm
08.	Design	:	Augmented
	i) Treatments	:	Existing golden apple lines at Rahmatpur and as per collection at Jaintapur
	ii) Replications	:	Non replicated
09.	Plot size	:	-
10.	Planting system	:	Square (6 x 6 m)
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, Flowering and fruit Characteristics ii) Fruit yield/plant (kg) iii) Incidence of pest and diseases
14.	Investigator(s)	:	M. R. Islam , M. H. M. B. Bhuyan, S. M. L. Rahman, J. C. Sarker and F. Ahmed
15.	Season	:	-
16.	Date of initiation	:	August 2013
17.	Date of completion	:	2022
18.	Exp. Output/benefit	:	Superior lines will be identified
19.	Location	:	Rahmatpur and Jaintapur
20.	Status	:	9th year
21.	Estimated cost	:	Tk. 20,000/-
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal development of burmese grape
03.	**Experiment No. 12**	:	**Collection and evaluation of burmese grape germplasm**
04.	Objective(s)	:	i) To find out superior burmese grape genotypes for developing as a variety(s). ii) To find out suitableble early and late Burmese grape genotypes
05.	Rationale	:	Burmese grape (*Baccaurea ramiflora* Lour.) belongs to the family *Euphorbiaceae* is an important minor fruit in Bangladesh. It is native to of Sumatra, Borneo and Java (Uji *et al*., 1992) and widely cultivated in South-East Asia through Myanmar, Nepal, Bangladesh, India, Srilanka, South china, Indo-China, Thailand, The Andaman Islands and Peninsular Malaysia (FAO website). Burmese grape is a minor fruit grown commercially in some pocket areas of the country. The fruits are mainly used as fresh fruit consumption and also used in stews and pickle or ferment to make wine. Lot of variabilities exists in different areas of the country. Moreover, it is necessary to increase the availability period of Burmese grape. BARI has developed only one variety that is not much impressive. Even no systematic research yet not been done on this crop. With these views, the experiment has been undertaken to develop good quality variety(s) with early or lateness.
06.	Materials and Methods	:	-
07.	Crops/variety	:	Burmese grape genotypes
08.	Design	:	RCBD
	i) Treatments	:	6 (Jaintapur), 10 Jojdebpur (set-1) 11 (set-2)
	ii) Replications	:	03
09.	Plot size	:	6.0 × 6.0 m
10.	Planting spacing/system	:	Rectangular (5 x 5 m)
11.	Fertilizer dose and methods of application	:	Cowdung (CD) : 25kg/pit P : 500 g/pit K : 250 g/pit Gypsum : 50g/pit B : 20 g/pit
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Yield per tree (by number and weight) iii) Incidence of disease and insect Characters will be taken as per IBPGR Descriptors
14.	Investigator(s)	:	M. H. M. B. Bhuyan, S. M. L. Rahman, J. C. Sarker, F. Ahmed and A. S. M. M. Uddin
15.	Season	:	-
16.	Date of initiation	:	2nd week of December, 2017
17.	Date of completion	:	2025
18.	Expected output/benefit	:	Early and late variety (ies) of bermese grape will be developed.
19.	Location	:	Jaintapur and Joydebpur
20.	Status	:	5th year
21.	Estimated cost	:	40,000/-
22.	Source of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal development of bael
03.	**Experiment No. 13**	**:**	**Evaluation of bael germplasm**
04.	Objective(s)	:	i) To select superior lines ii) To develop variety(s)
05.	Rationale	:	Bel is the minor fruit of Bangladesh. This fruit rich in vitamins and minerals has high medicinal value. This fruit species is on the verge of extinction due to their non-commercial use. Moreover, the available genetic variability within the fruit species has not yet been collected, properly evaluated and systematically conserved. Therefore, it is essential to identify superior genotypes, collection and planting in the research field for critical evaluation in order to test their potentiality and release for commercial cultivation as well as strengthen the base of the fruit industry of the country. With this view in mind, this experiment has been undertaken.
06.	Materials and Methods	:	-
07.	Crop/Variety	:	Bel germplasm
08.	Design	:	RCBD
	i) Treatments	:	4 (Jaintapur), 22(Chapainawabgang), 52(Debiganj)
	ii) Replications	:	3
09.	Plot size	:	-
10.	Planting system/ spacing	:	Rectangular, 2.5 x 2.5 m
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Tree growth, flowering and fruit characteristics ii) Yield and Yield component iii) Incidence of pests and diseases
14.	Investigator(s)	:	M. O. Hoque, J. C. Sarker, M.H.M.B. Bhuyan, S. M. L. Rahman, F. Ahmed, A. S. M. Y. Ali, M. Z. Uddin, M. K. Islam, M. M. Rahman M. S. Rahman and S. C. Das
15.	Season	:	-
16.	Date of initiation	:	2nd week of April, 2015
17.	Date of completion	:	2022
18.	Exp. Output/benefit	:	Improved variety will be developed and genetic resources will be conserved for exploitation in future
19.	Location	:	Burirhat, Jaintapur, Chapainawabgang (Evaluation), Jamalpur (*In-situ* evaluation) and Debiganj
20.	Status	:	7th year
21.	Estimated cost	:	Tk. 50,000/- per station
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal development of Indian olive
03.	**Experiment No. 14**	**:**	**Evaluation of Indian olive germplasm**
04.	Objective(s)	:	i) To select the superior lines for releasing variety ii) To develop Indian olive variety (ies)
05.	Rational	:	Indian olive (*Eleocarpus floribandus*) is one of the most important minor fruit in Bangladesh. It is cultivated throughout India, as well as in Sri Lanka, but in Bangladesh its commercial cultivation is limited or nil. It has a reputation in India for being able to grow in places that other trees cannot. It copes with a wide range of soil conditions (pH range 5-8). Therefore, this fruit can be a key to cultivate the problem soils of Bangladesh like north western and south eastern part where the pH level of soil is low. As Bangladesh is one of the primary centers of origin of this fruit therefore a wide range of genetic variability is present that may be used for varietal development. On the other hand, BARI has released only one variety of Indian olive. Therefore, it has become imperative to develop more variety of Indian olive.
06.	Materials and Methods	:	-
07.	Crop /variety	:	Indian olive / existing germplasm of Hathazari and Jaintapur
08.	Design	:	Augmented
	i) Treatments	:	10 (Jaintapur)
	ii) Replications	:	Non replicated
09.	Plot size	:	-
10.	Planting system/ spacing	:	Row planting (5 plants in a row) / 4 x 4 m
11.	Fertilizer dose and methods of application	:	Recommended dose for Indian olive fruit will be used as per Fertilizer Recommendation Guide 2012 and those fertilizers will be applied as basal.
12.	Irrigation/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Yield and other yield components iii) Incidence of pests and diseases
14.	Investigator(s)	:	F. Ahmed, M. H. M.B. Bhuyan, J. C. Sarker and S. M. L. Rahman
15.	Season	:	-
16.	Date of initiation	:	2nd week of November, 2016
17.	Date of completion	:	2022
18.	Expected output/benefit	:	Superior variety of Indian olive will be developed
19.	Location	:	Jaintapur
20.	Status	:	5th year
21.	Estimated cost	:	Tk. 20,000/- per location
22.	Source of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit Improvement
02.	Project	:	Varietal Development of palmyra palm
03.	**Experiment No. 15**	**:**	**Evaluation of palmyra palm germplasm**
04.	Objective(s)	:	i) To find out the suitable germplasm for higher yield and better fruit quality ii) To identify and collect the superior germplasm
05.	Rationale	:	Palmyra palm (*Borassusflabellifer* L.) grows well in India, Bangladesh, Srilanka and many places of tropical Africa. Palmyra palm is a monocot dioecious plant and is propagated by seed. Each and every part of tree, inflorescence, fruit and seeds of palmyra palm is useful. The ripen fruit pulp of palmyra palm is highly nutritious and the tubers from palmyra seed are largely used as food product in Bangladesh. So far recorded, only the local strains are being cultivated and there is no released variety of palmyra palm in Bangladesh. With these views, the study has been undertaken in order to identify the superior palmyra palm lines for developing variety in Bangladesh.
06.	Materials and Methods	:	Quality fruits will be collected through survey and i*n situ* evaluation. Then the seeds of the selected germplasm will be collected for propagation.
07.	Crop/Variety	:	Palmyra palm germplasm
08.	Design	:	Augmented
	i) Treatments	:	03(Joydebpur)
	ii) Replications	:	Non replicated
09.	Plot size	:	-
10.	Planting system/ spacing	:	The collected seeds will be sown along the boundaries of the Fruit Research Field maintaining a considerable spacing. For Jaintapur, as per collection (Seeds from two locations has been collected and planted in the research field. More genotypes will be collected in this year).
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Plant height (m) and base girth (cm), ii) Date of harvest, iii) No. of bunch/tree, iv) No. of fruits/bunch, v) Individual fruit weight (g/kg), vi) Length and diameter of fruits, vii) Peeling quality, viii) Bract weight, skin weight and seed weight, ix) No. of seeds per fruit, x) Percent Edible portion, xi) TSS% of fruit pulp, xii) Bitterness, xiii) Bio-chemical characteristics, xiv) Incidence of pest and diseases, xv) Yield/plant
14.	Investigator(s)	:	M. R. Karim, S. M. L. Rahman, M.H.M.B. Bhuyan, J. C. Sarker and F. Ahmed
15.	Season	:	-
16.	Date of initiation	:	2nd week of February, 2019
17.	Date of completion	:	2032 (Normally it does not come into bearing before ten to twelve years of age)
18.	Exp. Output/benefit	:	Superior and Suitable palmyra palm variety/varieties will be developed
19.	Location	:	Joydebpur and Jaintapur
20.	Status	:	3rd year
21.	Estimated cost	:	50,000/- per year/location
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal development of coffee
03.	**Experiment No. 16**	**:**	**Collection and evaluation of coffee germplasm**
04.	Objective	:	i) To select the suitable coffee lines in respect of yield and quality
05.	Rationale	:	Coffee is a brewed drink prepared from roasted coffee beans, the seeds of berries from certain *Coffea* species. Dried coffee seeds (referred to as "beans") are roasted to varying degrees, depending on the desired flavor. Roasted beans are ground and then brewed with near-boiling water to produce the beverage known as coffee. Coffee is darkly coloured, bitter, slightly acidic and have a stimulating effect in humans, primarily due to its caffeine content. It is one of the most popular drinks in the world. The two most commonly grown coffee bean types are *C. arabica and C. robusta*. Coffee is not being much commercially grown in Bangladesh. Now, the scenario has been changing gradually in the hills. Coffee cultivation is gaining popularity in the Chittagong Hill Tracts recently while many hill framers have already introduced coffee in a small scale. The available genetic resources within the species have not yet been collected and properly evaluated. Therefore, it is essential to identify the superior germplasm, collection and planting in the research field for critical evaluation in order to test their potentiality and release for commercial cultivation as well as strengthen the base of the fruit industry of our country. With this view in mind, the present experiment has been undertaken.
06.	Materials and Methods	:	-
07.	Crop/Variety	:	Coffee germplasm
08.	Design	:	Augmented
	i) Treatments	:	As per collection
	ii) Replications	:	Non replicated
09.	Plot size	:	-
10.	Planting system/ spacing	:	2.5 × 2 m
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Tree growth, flowering and fruit characteristics ii) Yield/plant (by number & weight) iii) Incidence of pests and diseases
14.	Investigator(s)	:	M. R. Ahmed, S. M. Faisal, M. T. Islam, M. A. H. Khan, M. L. Iqbal, M. S. Zaman, M. J. Rahman, M. M. Zaman, Z. U. Noor, M. A. Hossain and M. Islam
15.	Season	:	-
16.	Date of initiation	:	2nd week of January, 2021
17.	Date of completion	:	2026
18.	Exp. Output/benefit	:	Superior germplasm of coffee will be available for variety development
19.	Location	:	Khagrachari, Raikhali, Ramgarh, Bandarban, Madhupur, Jaintapur, Akbarpur, Gazipur, Haluaghat, Jhenaigati
20.	Status	:	New
21.	Estimated cost	:	Tk. 30,000/-per location
22.	Sources of fund	:	"Research, development and extension of Cashew nut and Coffee Project" -BARI part
23.	Priority	:	1st

1	Program	: Fruit improvement
2	Project	: Varietal development of cashew nut
3	**Experiment No. 17**	**: Evaluation of cashew nut germplasm**
4	Objective	: i) To select superior lines for release as a variety
5	Rationale	Cashew**,** (*Anacardium occidentale*) is an evergreen shrub or tree of the family Anacardiaceae, cultivated for its characteristically curved edible seeds, which are commonly called cashew "nuts" though they are not true nuts. The fruit of the cashew tree is an accessory fruit (sometimes called a pseudocarp or false fruit). The true fruit of the cashew tree is a kidney– or boxing-glove–shaped drupe that grows at the end of the cashew apple. The drupe develops first on the tree, and then the pedicel expands to become the cashew apple. The true fruit contains a single seed, which is often considered a nut in the culinary sense. Commercial cashew cultivation at Chattogram Hill Tracts, will make the scope of trade and employment. It may be useful for protecting soil erosion perspective as well. The available genetic resources within the species have not yet been collected and properly evaluated. Therefore, it is essential to identify superior germplasms, collection and planting in the research field for critical evaluation in order to test their potentiality and release for commercial cultivation as well as strengthen the base of the fruit industry of our country. With this view in mind, this experiment has been undertaken.
6	Materials & Methods	:
7	Crop/Variety	: cashew nut
8	Design i) Treatments ii) Replications	: Augmented : As per collection : Not replicated
9	Plot size	: -
10	Planting system	:Square (6 × 6 m)
11	Fertilizer doses and application methods	: As per FRG – 2018
12	Irrigated/rain fed	: Irrigated
13	Data to be recorded	: i) Tree growth, flowering and fruit characteristics ii) Yield and yield components iii) Incidence of pests and diseases
14	Investigator(s)	M. A. Hossain, M. Islam, M. R. Ahmed, S. M. Faisal, M. T. Islam, M. A. H. Khan, M. L. Iqbal, M. S. Zaman, M. J. Rahman, M. M. Zaman, and Z. U. Noor
15	Season	: -
16	Date of initiation	: 1st week of January, 2020, 2021
17	Date of Comp.	: 2026, 2030
18	Expected output/benefit	: Superior germplasm of Cashew nut will be available for variety development
19	Location	: Bandarban, Raikhali, Khagrachari, Ramgarh, Madhupur, Jaintapur, Akbarpur, Gazipur, Haluaghat, Jhenaigati
20	Status	: 2nd year
21	Estimated cost	: 30,000/-per location
22	Source of Fund	: "Research, development and extension of Cashew nut and Coffee Project" -BARI part
23	Priority	: 1st

01.	Program	:	Fruit improvement
02.	Project	:	Varietal improvement of dragon fruit
03.	**Experiment No. 18**	**:**	**Evaluation of dragon fruit germplasm**
04.	Objective(s)	:	i) To find out the suitable germplasm for higher yield and quality ii) To develop variety (ies)
05.	Rationale	:	Dragon fruit (*Hylocereus* sp.), a species native to Central America, is a climbing cactus species, which has received worldwide recognition as an ornamental plant and also a fruit crop. It has been established as a new crop in various tropical countries due to its precocious yielding ability and its acceptability in the market; hence considered as a new fruit crop for the future. Bangladesh Agricultural Research Institute (BARI) has developed a dragon fruit variety. Collection and conservation of various dragon fruit is the basic activities towards improvement of the dragon fruit. With these views, the study has been undertaken in order to identify the superior dragon fruit lines.
06.	Materials and Methods	:	-
07.	Crop/variety	:	Dragon fruit germplasm
08.	Design	:	Augmented/ RCBD
	i) Treatments	:	3 Raikhali (BARI developed varieties as check) 4 Jaintapur- (SC Jai-001(Red skin with red flesh), SU Jai-002 (Red skin with white flesh), SM Jai 003 (Yellow skin with white flesh), BARI Dreagon fruit-1 as check)
	ii) Replications	:	Non replicated/ 4
09.	Plot size	:	-
10.	Planting system/spacing	:	3 × 2 m
11.	Fertilizers doses	:	-
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	i) Fruit set (%) ii) Fruit length (cm) iii) Fruit breadth (cm) iv) Individual fruit weight (g) v) Fruit shape vi) Days to fruit harvest from pollination vii) Fruit drop (%) viii) TSS% ix) Edible portion (%) x) Number of wings xi) Yield
14.	Investigator(s)	:	M. Islam, M. E. Hoque, M. A. Hossain, J. C. Sarker, S. M. L. Rahman, M. H. M. B. Bhuyan, F. Ahmed, S. C. Das and M. Islam
15.	Season	:	-
16.	Date of initiation	:	1st week of June, 2020
17.	Date of completion		2025
18.	Expected output/benefit	:	High yielding variety will be developed and ultimately farmers will be benefited
19.	Location	:	Raikhali, Jaintapur, Debiganj and Joydebpur
20.	Status	:	2nd year
21.	Estimated cost		1,00,000/-
22.	Source of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Propagation technique of mandarin
03.	**Experiment No. 19**	**:**	**Influence of rootstock on the growth, yield and quality of mandarin**
04.	Objective (s)	:	i) To find out the suitable rootstock for mandarin ii) To increase yield and quality of mandarin
05.	Rationale	:	Generally, mandarins are propagated by seeds. But plants grown on their own roots are infected by soil borne diseases and take 7-8 years to bear fruits. On the other hand, the grafted plants bear earlier (3-4 years) and quality fruits. Soil and disease problems, water stress etc. can be overcome up to certain extent through grafting on proper rootstock. This trial has been undertaken to select suitable rootstocks for mandarin
06.	Materials and Methods	:	Scion: BARI Komala-1 Rootstock: Rangpur lime, Rough lemon, Clopetra mandarin, Calamonsi
07.	Crops/Variety	:	Mandarin / BARI Komala-1 and BARI Komala-2
08.	Design	:	RCBD
	i)Treatments	:	4 (Rangpur lime, Rough lemon, Clopetra mandarin, Calamonsi)
	ii)Replications	:	4
09.	Plot size	:	-
10.	Plant system/spacing	:	4 × 4 m
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Yield components and yield iii) Incidence of pests and diseases
14.	Investigator(s)	:	M. H. M. B. Bhuyan, J. C. Sarker, F. Ahmed and S. M. L. Rahman, M. G. Rahaman and M. A. A. Malek
15.	Season	:	-
16.	Date of initiation	:	2nd week of September, 2020
17.	Date of completion	:	2022
18.	Exp. Output/benefit	:	Suitable rootstock will be selected
19.	Location	:	Jaintapur and Khagrachari
20.	Status	:	2nd year
21.	Estimated cost	:	Tk. 10,000/- per station
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Propagation technique of sweet orange
03.	**Experiment No. 20**	**:**	**Influence of rootstock on the growth, yield and quality of sweet orange**
04.	Objective (s)	:	i) To find out the suitable rootstocks for sweet orange ii) To increase yield and quality of sweet orange
05.	Rational	:	It is well known that there is a close interaction between the two basic elements of budding or grafting, viz. rootstock and scion. Rootstock has positive influence on yield and quality of fruits. Generally mandarin is propagated by seeds. But plants grown on their own roots are infected by soil borne diseases and take 7-8 years to bear fruits. On the other hand, the grafted plants bear earlier (3-4 years) and quality fruits. Soil and diseases problems, water stress etc. can be overcome up to certain extent through grafting on proper rootstock. This trial has been undertaken to select suitable rootstocks for mandarin.
06.	Materials and Methods	:	BARI Malta -1 Rootstock: Rangpur lime, Rough lemon, Cleopatra mandarin and Calamonsi
07.	Crop/variety	:	Sweet Orange / BARI Malta-1
08.	Design	:	RCBD
	i) Treatments	:	4 (Rangpur lime, Rough lemon, Cleopatra mandarin, pummelo and Calamonsi, Karun Jamir)
	ii) Replications	:	4
09.	Plot size	:	-
10.	Plant spacing/ system	:	Square (4 × 4 m)
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Yield and yield components iii) Incidence of pests and diseases
14.	Investigator(s)	:	J. C. Sarker, M. H. M. B. Bhuyan, F. Ahmed, S. M. L. Rahman and M. R. Islam
15.	Season	:	-
16.	Date of initiation	:	2nd week of May, 2016
17.	Date of completion	:	2022
18.	Expected output/benefit	:	Suitable rootstock will be selected
19.	Location	:	Jaintapur and Rahmatpur
20.	Status	:	6th year
21.	Estimated cost	:	Tk. 50,000/- per Station
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

1.	Program	:	Fruit improvement
2.	Project	:	Cultural management
3.	**Experiment No. 21**	**:**	**Effect of different rootstock on the growth and yield of navel orange (CS Jai-003)**
4.	Objective (S)	**:**	i) To identify the best rootstock for navel sweet orange CS Jai-003
5.	Rational	**:**	Sweet orange (*Citrus sinensis* L) occupies an important cultivar among the citrus grown in the world due to its good productive potential and acceptable juice quality. Rootstocks have had a substantial role in the development of the citrus industry in the world. The use of the proper rootstock can determine the success of a citrus operation. In a plant system consisting of scion and rootstock, the two parts are joined via a process called grafting. Grafting involves wounding, healing, and the restoration of vascular continuity between two different organisms. Besides the importance of rootstocks to prevent diseases, other reasons for using rootstocks are tolerance to abiotic stresses, such as freezing temperatures, drought, flooding, high salinity, and pH of the soil. Citrus rootstock also exerts an important influence on tree size and vigor. Due to some unique aspects of fruit development and physiology, resulting in a fruit that is completely filled with juice vesicles, and rootstock effects on water relations, rootstock can also modulate quality and size of the fruits (Castle 2010). Several rootstock varieties show tolerance to HLB (Albrecht and Bowman 2012) when grown on their own roots. In our country there is no complete report on navel orange rootstock. So the present investigation was undertaken to find out best rootstock for navel type sweet orange (CS Jai-003).
6.	Materials and methods	:	-
7.	Crop/Variety	:	CS Jai-003
8.	Design	:	-RCBD
	i) Treatment	:	T_1 = Rangpur lime T_2 = Local Malta T_3 = Local komla T_4 = Rough lemon T_5 = Decibre T_6 = karun jamir T_7 = Pummelo T_8 = Askar jamir T_9 = Sweet lime T_{10} = Cleopatra mandarin
	ii) Replication	:	3
9.	Plot size	:	
10.	Planting system/spacing	:	Single row plantation
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	Growth and Fruit quality attributes
14.	Investigator (s)	:	F. Ahamed S.M.L Rahman, J.C. Sarker, and M.H.M.B. Bhuyan
15.	Season	:	-
16.	Date of initiation	:	October 2021
17.	Date of completion	:	2028
18.	Exp. outcome/benefit	:	Best rootstock for navel orange (CS Jai-003) will be identified
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk. 2,00,000/-
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Propagation technique of mandarin and sweet orange
03.	**Experiment No. 22**	**:**	**Propagation of BARI Komala-1 and BARI Malta-1 by shoot tip grafting**
04.	Objective	:	i) To produce disease free mother plants
05.	Rational	:	Mandarin and oranges are very much important commercial crop in Bangladesh. Natural infection of this crop by various virus and bacteria is comon in Sylhet region. These diseases are graft transmissible through infected but wood. Therefore, raising of diseases free foundation plants is imperative to provide certified bud wood to growers and to encourage the planting of graftage instead of seedlings. Therefore, the present study has been undertaken to produce disease free mother plants by shoot tip grafting.
06.	Materials and Methods	:	-
07.	Crop/variety	:	BARI Komala -1 and BARRI Malta-1
08.	Design	:	CRD
	i) Treatments	:	Rootstock: Rough Lemon, Rongpur lime, Cleopatra and local Mandarin. Scion: BARI Komala-1 and BARI Malta-1
	ii) Replications	:	3
09.	Plot size	:	-
10.	Plant spacing/ system	:	-
11.	Fertilizer dose and methods of application	:	As per FRG – 2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i)Success of Micro-grafting ii) Growth parameters of micro-bud
14.	Investigator(s)	:	M. H. M. B. Bhuyan, F. Ahmed, J. C. Sarker and S. M. L. Rahman
15.	Season	:	-
16.	Date of initiation	:	2nd week of May, 2020
17.	Date of completion	:	2022
18.	Expected output/benefit	:	Rapid multiplication and diseases free planting materials will be produced
19.	Location	:	Jaintapur
20.	Status	:	2nd year
21.	Estimated cost	:	Tk. 50,000/-
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Cultural management of sweet orange
03.	**Experiment No. 23**	**:**	**Effect of lime on the yield performance of sweet orange (*Citrus sinensis*) var. BARI Malta-1 in the hilly region**
04.	Objective	:	i) To find out the effect of lime for maximizing yield and quality of sweet orange.
05.	Rationale	:	Sweet orange (*Citrus sinensis*) is an economically potential fruit and cultivated in a large scale. In Bangladesh, it is the most popular and commonly known as Malta. One of the sweet orange varieties grown extensively in Bangladesh is 'BARI Malta-1". Now a days, cultivation of BARI Malta-1is gaining popularity in Bangladesh as it is a midseason variety, yellowish green in colour, high in soluble solids, very rich in vitamin-C and good source of minerals as well as vitamin-A. It grows well and adaptable to wide range of soils. Ideal pH for citrus is considered between 5.5 and 7.5. But evidence shows that with suitable management it can be grown with success in acidic soil (pH 4.5). It was observed that premature drop of fruits and leaves and die-back of twigs can be easily controlled by applying lime in citrus cultivation. Chapman (1968) found that inadequate supply of calcium causes small and deformed fruit size. De Villiers and Boyer (1961) also reported that profuse blossoming and excessive drop of young and mature fruits are frequently occurred due to imbalance use of calcium, phosphorus and potassium resulting uptake of more nutrient elements by the plants. It was reported that lime reduced the acidity of citrus and increased the sweetness of fruits (Bose and Mitra, 1990). In this context, the present investigation was undertaken to find out the effect of lime for maximizing yield and improving quality of sweet orange.
06.	Materials and methods	:	
07.	Crop/variety	:	BARI Malta-1
08.	Design	:	RCBD
	i) Treatments	:	T_1: 0 g/plant T_2: 100 g/plant T_3: 200 g/plant T_4: 300 g/plant T_5: 400 g/plant T_6: 500 g/plant
	ii) Replications	:	3
09.	Plot size	:	-
10.	Plant spacing	:	3 × 3m
11.	Fertilizer dose & Methods of fertilizer application	:	As per FRG-2018
12.	Irrigated/Rainfed	:	Irrigated/Rainfed
13.	Data to be recorded	:	i) Yield and yield contributing characters of sweet orange ii) Incidence of pests and diseases
14.	Investigator (s)	:	J. C. Sarker, M.H.M.B. Bhuyan, F. Ahmed and S.M.L. Rahman
15.	Season	:	-
16.	Date of initiation	:	Last week of September 2021
17.	Date of completion	:	Last week of September 2025
18.	Expected output/ benefit	:	Appropriate dose of lime for quality sweet orange production will be standardized
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk.30,000/-
22.	Source of fund	:	HRC, BARI.
23.	Priority	:	1st

1.	Program	:	Fruit improvement
2.	Project	:	Cultural management of mango
3.	**Experiment No. 24**	**:**	**Study on bagging for quality mango production in high rainfall area of the northeastern region of Bangladesh**
4.	Objective (s)	**:**	i) To mitigate the incidence of pest and disease ii) To produce safe fruits
5.	Rational	**:**	Mango (*Mangifera indica* L.) belonging to the family *Anacardiaceae*, commonly known as the "King of Fruits," is a popular tropical fruit. In Bangladesh, it's the national tree and one of the most critical commercial fruits for all age people. The outbreak of different mango diseases and insect-pest attack reduces the target mango yield every year. To control these problems, farmers are using 15-62 times higher pesticides in their mango orchard, and it's increasing as an alarming ratio. Preventing the losses caused by biotic and abiotic factors, several good agricultural practices are becoming popular throughout the World.Techniques to improve the appearance and quality of fruits increased recently. Moreover, managing diseases and insect infestations arealso important to reduce consumers' anxiety over agrochemicals toxicity. Thus, more emphasis is being placed on reducing the use of pesticides to ensure worker safety, consumer health, and environmental protection. Among several such alternatives, the pre-harvest bagging technique of fruits has been used extensively in several fruit crops to improve skin color and to reduce the incidence of diseases, insect pests, mechanical damages, sunburn of the skin, agrochemical residues on the fruits, and bird damages. Therefore, the present research work is undertaken to compare the effectiveness of bagging in mango fruit.
6.	Materials and Methods	:	-
7.	Crop/Variety	:	BARI Aam-1, BARI Aam-2, BARI Aam-3, BARI Aam-4, BARI Aam-8
8.	Design	:	RCBD
	i) Treatments	:	Four types of fruit bag 1. Control, 2. Polypropyline bag (Clear), 3. Polypropyline bag (Opaque), 4. Paper fruit bag (White), 5. Paper fruit bag (Brown)
	ii) Replications	:	3
9.	Plot size	:	-
10.	Planting system/spacing	:	-
11.	Fertilizer dose and method of application	:	As per FRG-2018
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, Flower and Fruit characteristic ii) Yield iii) Incidence of pest and disease
14.	Investigator(s)	:	M. M. Rahman, J. C. Sarker, F. Ahamed, and M. H. M. B Bhuyan
15.	Season	:	-
16.	Date of initiation	:	1st week of April, 2021
17.	Date of completion	:	2024
18.	Exp. Output/benefit	:	Quality fruit production technique will be developed
19.	Location	:	Jaintapur
20.	Status	:	2nd year
21.	Estimated cost	:	Tk. 150,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Cultural management of mandarin and sweet orange
03.	**Experiment No. 25**	**:**	**Protective culture of BARI Komala-1 and BARI Malta-1**
04.	Objective (s)	:	i) To standardize protective cultivation procedure for BARI Komala-1 and BARI Malta-1. ii) To increase mass production of BARI Komala-1 and BARI Malta-1**.**
05.	Rationale	:	BARI Komala-1 and BARI Malta -1 are very important citrus variety for Bangladesh. Due to damage of different insects the production of these fruits decline. On the other hand, some insects transmit different viruses and bacteria which reduce the yield. In an observation trial, these varieties successfully grown in net house at the research station at Jaintapur. So protective cultivation by dense planting may be an alternative for commercial cultivation in an urgent need. Therefore, the present study has been undertaken.
06.	Materials and Methods	:	-
07.	Crops/Variety	:	BARI Komala-1 and BARI Malta-1
08.	Design	:	RCBD
	i) Treatments	:	2 T_1: Net culture with dense plantation T_2: Conventional practice
	ii) Replications	:	5
09.	Plot size	:	-
10.	Planting system/spacing	:	-
11.	Fertilizer dose and Methods of application	:	As per FRG – 2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Fruit yield/plant (by number and weight) iii) Incidence of pests and diseases
14.	Investigator(s)	:	M. M. Rahman and J. C. Sarkar
15.	Season	:	-
16.	Date of initiation	:	2nd week of March, 2014
17.	Date of completion	:	2022
18.	Exp. Output/benefit	:	Improved production technology of BARI Mandarin-1 and BARI Sweet Orange-1 will be developed
19.	Location	:	Jaintapur
20.	Status	:	6th year
21.	Estimated cost	:	Tk. 50,000/-
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

1. Program : Fruit improvement
2. Project : Cultural management of citrus and banana
3. **Experiment No. 26 : Evaluation of organic fertilizers for soil health management and safe fruit production**
4. Objective (s) : i) Improve soil health avoiding chemical fertilizer
   ii) To ensuring high yield and safe fruit production
5. Rationale : A possible connection between the health of soils, plants, animals, and people is an idea that traces to ancient times. In ancient Greece, Hippocrates is famously quoted as saying, "let food be thy medicine and medicine be the food," and this idea still resonates, especially among the growing section of the public interested in the role of natural foods in promoting health. Despite the increasing popularity of the concept, the part of healthy soils in plant and animal health is mainly unexplored by the scientific community (Doran et al., 1996). After modest beginnings in the early 20th century, since the 1980s, organic agriculture has gained increasing scientific and consumer recognition (Heckman, 2006; Vogt, 2007; Paull, 2011; Carr et al., 2013a). Therefore, experiment's goal is to influence soil health by applying organic fertilizers to increase the productivity of selected fruit crops. Also, a clearer understanding of the possible links between soil health, plants, and people is the key to improving the quality and healthfulness of foods grown in any farming system.
6. Materials and Methods : -
7. Crop/Variety : BARI Lebu-4
8. Design : RCBD
   i) Treatments : Fertilizers and manures
      1. Native nutrients
      2. Farmers practice
      3. Farmyard manure
      4. Vermicompost
      5. Trichocompost
      6. Mustard oil cake
   ii) Replications : 3
9. Plot size : -
10. Planting system/spacing : In row/line
    Spacing as per recommendation
11. Fertilizer dose and methods of application : As per FRG-2018
12. Irrigated/rainfed : Irrigated
13. Data to be recorded : i)Growth ii) yield attributes, yield and quality iii) BCR
14. Investigator(s) : M. M. Rahman, J. C. Sarker, F. Ahamed and M. H. M. B. Bhuyan
15. Season : -
16. Date of initiation : 2nd week of March, 2020
17. Date of completion : 2022
18. Exp. Output/benefit : Quality fruit production procedure maintaining soil health will be developed
19. Location : Jaintapur
20. Status : 2nd year
21. Estimated cost : Tk. 200,000/-
22. Sources of fund : Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23. Priority : 1st

1.	Program	:	Fruit improvement
2.	Project	:	Disease and pest management of citrus and banana
3.	**Experiment No. 27**	**:**	**Controlling disease and pest for safe fruit production for enhancing the export potentiality**
4.	Objective (s)	**:**	i) To manage pest and diseases for safe fruit production ii) To enhance export potentiality
5.	Rational	**:**	Pests and diseases cause substantial economic losses to fruit growers by directly reducing 30–100% of fruit production. Additionally, they deteriorate the physical appearance, market value, and quality and nutritive value of fruits by sucking, chewing, or boring into different reproductive parts, causing spots, cracks, and holes and rotting of fruits. Chemical pesticides have been in use for a long time to control insect pests and fungal diseases (Aktar et al. 2009). Pesticides used in fruit crops accumulate toxic residues in fruits used for human consumption causing health hazards to consumers. Their continuous use is adversely affecting the environment by inducing the development of resistance in many pests, resurgence, and an outbreak of new pests and health hazards to production workers and farm laborers due to incorrect or lack of knowledge of handling and use and pesticide poisoning (Groner 1990). Therefore, attempts are initiated to replace the chemical pesticides with eco-friendly compounds, which are safe to humans and the environment for controlling insect pests and diseases for safe fruit production and reducing human health hazards (Burgel et al. 2005; Cheok et al. 2014).
6.	Materials and Methods	:	-
7.	Crop/Variety	:	BARI Lebu-5
8.	Design	:	-
	i) Treatments	:	i. Control/Farmers practice ii. Mahogany seed extract iii. Neem leaf extract iv. Tricholechete v. Garlic extract vi. Bordeaux mixture
	ii) Replications	:	-
9.	Plot size	:	-
10.	Planting system/spacing	:	Square (3 x 3m)
11.	Fertilizer dose and methods of application	:	As per FRG-2018
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth and yield attributes ii) yield, and quality
14.	Investigator(s)	:	M. M Rahman, J. C. Sarker, F. Ahamed, and M. H. M. B. Bhuyan
15.	Season	:	-
16.	Date of initiation	:	2nd week of March, 2020
17.	Date of completion	:	2022
18.	Exp. Output/benefit	:	Insect and disease-free safe quality fruit production protocol will be developed, which may further enhance the export potentiality of different fruits from the northeastern region
19.	Location	:	Jaintapur
20.	Status	:	2nd year
21.	Estimated cost	:	Tk. 150,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

1.	Program	:	Fruit improvement
2.	Project	:	Disease and pest management of citrus and banana
3.	**Experiment No. 28**	**:**	**Evaluating beneficial microorganisms for safe and quality fruit production**
4.	Objective	**:**	i) To evaluate beneficial microorganisms for safe fruit production and enhancing their export potentiality
5.	Rationale	**:**	Studies have shown the high effectiveness of the beneficial microorganisms in the stimulation of vegetative growth and yielding of horticultural plant species. Some bacterial strains have a protective effect against fungal pathogens. The most effective strains and species of microorganisms are used as components of the newly developed biological preparations: bio-stimulants, composts, and bacterial and mycorrhizalinocula. The knowledge of the role of symbiotic microorganisms that have the most considerable influence on the availability and uptake of nutrients will contribute to the development of sustainable, safe fruit cultivation methods. The results of the field experiments demonstrated a positive influence of the organic process of cultivating vegetable and fruit crops with the use of beneficial microorganisms on the occurrence of user groups of microbes in the rhizosphere of those plants, including an increase in the population of diazotrophs and the community of spore-forming bacteria. As a result of the application of beneficial microorganisms in organic cultivation significantly higher yields of the tested vegetable and fruit species were achieved, with better storage and processing qualities, compared to conventional production. Therefore, the use of beneficial microorganisms in safe fruit production will multiply the positive impact on the yield potential of fruit and improve the quality of soils, which will further help to improve the yield and quality of fruit crops and increase the profitability of farmers by reducing production costs.
6.	Materials and Methods	:	-
7.	Crop/Variety	:	BARI Lebu-5
8.	Design	:	RCBD
	i) Treatments	:	06 i) Control ii) Plant growth-promoting rhizobacteria iii) Effective microorganisms iv) Clybio v) Biofertilizer vi) *Bacillus* sp.
	ii) Replications	:	3
9.	Plot size	:	-
10.	Planting system/spacing	:	Square (3 x 3m)
11.	Fertilizer dose and methods of application	:	As per FRG-2018
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth and yield attributes ii) yield iii) quality iv) incidence of pests and diseases
14.	Investigator(s)	:	M. M Rahman, J. C. Sarker, F. Ahamed, and M. H. M. B. Bhuyan
15.	Season	:	-
16.	Date of initiation	:	2nd week of March, 2020
17.	Date of completion	:	2022
18.	Exp. Output/benefit	:	Safe and quality fruit production protocol will be developed, which may further enhance the export potentiality of different fruits from the northeastern region
19.	Location	:	Jaintapur
20.	Status	:	2nd year
21.	Estimated cost	:	Tk. 150,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Insect pest management of citrus
03.	**Experiment No. 29**	**:**	**Incidence of major pest and disease of citrus at nursery level in Sylhet region**
04.	Objective	:	i) To find out the incidence pattern of major pest and disease at nursery level in Sylhet region
05.	Rationale	:	Bangladesh citrus mainly consists of mandarins (*Citrus reticulata*), sweet orange/malta (*Citrus sinensis*), pomelo (*Citrus maxima*), lemons (*Citrus aurantifolia*) and limes (*Citrus limon*). Citrus is a promising crop for the north-eastern hilly region of Bangladesh. The agro-climate of this region is very suitable for citrus cultivation. But citrus is attacted by many pests (Trunk borer (*Anoplophora versteegi*), bark eating caterpillar (*Inderbela quadrinotata*), citrus butterfly (*Papilio* spp.), leaf miner (*Phyllocnistis citrella*), whitefly (*Dialeurodes citri*), psylla (*Diaphorina citri*), fruit fly (*Dacus dorsalis*) etc) and diseases (Huanglongbing (HLB) (also known as greening disease, powdery mildew and viral diseases such as strains of Citrus tristeza virus etc.). Citrus greening (official name: huanglongbing; HLB) caused by '*Candidatus Liberibacter* spp. (*CaL*)' which is transmitted by grafting and by citrus psyllid bug, *Diaphorina citri* has emerged as potential threat for expansion of mandarins (komala) and sweet orange (malta) cultivation (The Daily Star, November 11, 2016; Tipu et al.2017). Nursery is a place where plants are grown, nurtured and sold out. Generally various commercial crop growers require a good quality saplings or grafts of genuine type. Now a day, seedling of private nursery in Sylhet region is greatly affected by different pest and disease. Therefore, the aim of this study was to provide baseline information that could be develop management strategies for pest and disease at nursery level in Sylhet region.
06.	Materials & Methods	:	A comprehensive survey will be conducted at the nursery level of Sylhet region in Bangladesh. Selected nursery will be visited and incidence and severity of major pest and diseases will be recorded.
07.	Crop/variety	:	-
08.	Design	:	Augmented
	i) Treatments	:	-
	ii) Replications	:	Non replicated
09.	Plot size	:	-
10.	Plant spacing	:	-
11.	Fertilizer dose & Methods of fertilizer application	:	As per FRG, 2018
12.	Irrigated/Rainfed	:	Irrigated
13.	Data to be recorded	:	i) Pest and disease incidence ii) disease severity.
14.	Investigator(s)	:	J. C. Sarker, M. M. Rahman, F. ahmed and Scientist of Entomology & Pathology Section, HRC.
15.	Season	:	-
16.	Date of initiation	:	2nd week of March, 2019
17.	Date of completion	:	2023
18.	Expected output/ benefit	:	It will help to examine incidence and severity of major pest and diseases at nursery level of Sylhet region
19.	Location	:	Sylhet region
20.	Status	:	3rd year
21.	Estimated cost	:	Tk. 80,000/-
22.	Source of fund	:	HRC, BARI
23.	Priority	:	1st

1.	Program	:	Fruit improvement
2.	Project	:	Soil and water management of mandarin
3.	**Experiment No. 30**	**:**	**Micronutrient management in mandarin and sweet orange in acid soil of north eastern hilly region of Bangladesh**
4.	Objective(s)	:	i) To find out the suitable dose of micronutrients for increasing the yield of mandarin ii)To establish an efficient micronutrient management package for mandarin production
5.	Rationale	:	Mandarin is a popular citrus fruit of Bangladesh. Its nutritional and economic importance has been widely recognized. In Sylhet region, mandarin is mostly cultivated in the homesteads including some gardens. The commercial mandarin gardens in the Sylhet region are facing severe micro nutrient deficiency. Acidic soil is also a problem. Therefore, increasing yield and fruit quality through micronutrient management is an urgent need for mandarin production. Hence, this study has been undertaken to develop an efficient micronutrient management package for mandarin production.
6.	Materials and methods	:	-
7.	Crops/Variety	:	BARI Komala-3
8.	Design	:	CRD-Pot experiment (Net house), RCBD-Field experiment
	i) Treatments	:	04 T_1: Control T_2: Micronutrient as per STV (Soil application) T_3: Micronutrient as per leaf analysis (Foliar application) T_4: Micronutrient as per deficiency symptom (Foliar application)
	ii) Replications	:	3
9.	Plot size	:	-
10.	Plant system/ spacing	:	Square (3 × 3 m)
11.	Fertilizer dose and Methods of application	:	i) As per treatments ii) Dolochun (For pH control); Ring method
12.	Irrigated/ rainfed	:	Both
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Yield contributing characters and yield iii) Sign of nutrient deficiency iv) Incidence of pests and diseases v) Soil and plant sample analysis data
14.	Investigator(s)	:	M. H. M. B. Bhuyan, S. M. L. Rahman, J.C. Sarker and F. Ahmed
15.	Season	:	Rabi/Kharif
16.	Date of initiation	:	1st week of July 2021
17.	Date of completion	:	Last week of 2025
18.	Exp. Outcome/benefit	:	Micronutrient doses for quality mandarin production will be identified
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk. 120,000/-
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruits improvement
02.	Project	:	Soil and water management of mandarin
03.	**Experiment No. 31**	**:**	**Effect of vermicompost application on the growth, yield and quality of mandarin**
04.	Objective	:	To find out the appropriate vermicompost dose for successful mandarin production
05.	Rationale	:	Citrus occupies a prominent position in fruit industry of the world and is cultivated with an area of 832.2 thousand hectares with 13.9 MT production (FAOSTAT, 2009). Productivity of citrus depend on many abiotic (climate, site, soil, nutrition, and irrigation management) and biotic (rootstock, cultivar, insect pest and disease management) factors (Davies and Albrigo, l994; Iglesias *et al*., 2007). It was observed that due to consistent depletion of organic matter and higher availability of potassium in vertisols induced high acidity in the fruits, which take comparatively longer time for ripening that result in poor fruit yield and quality. The vermicompost application is one of the effective methods to rejuvenate the depleted soil fertility and enrich the available pool of nutrients and conserve more water, maintain soil quality and conserve more biological resources. Therefore, the present study was undertaken to investigate the influence of vermicompost application on the growth, productivity and fruit quality of *Citrus reticulata*, cv. BARI Mandarin-1.
06.	Materials and Methods	:	Vermicompost, FYM and chemical fertilizers
07.	Crop/variety	:	BARI Mandarin-1
08.	Design	:	RCBD
	i) Treatments	:	T_1: Farmers Practice T_2: Recommended dose (20 kg FYM + 500:400:300 g NPK/tree) T_3: 10 kg vermicompost and 20 kg FYM/Tree T_4: 20 kg vermicompost/tree T_5: 30 kg vermicompost/Tree
	ii) Replications	:	3
09.	Plot size	:	-
10.	Plant spacing	:	Square (3 x 3 m)
11.	Fertilizer dose &Methods of fertilizer application	:	As per treatment
12.	Irrigated/Rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics (As per IBPGR descriptor) ii) Yield / plant (by number and weight) iii) Incidence of pests and diseases
14.	Investigator(s)	:	J. C. Sarker and M. M. Rahman
15.	Season	:	-
16.	Date of initiation	:	1st week of April, 2017
17.	Date of completion	:	2030
18.	Expected output/ benefit	:	Development of optimum dose of vermicompost for quality mandarin production
19.	Location	:	Jaintapur
20.	Status	:	5th year
21.	Estimated cost	:	Tk.60,000/-
22.	Source of fund	:	HRC, BARI.
23.	Priority	:	1st

1.	Program	:	Fruit improvement
2.	Project	:	Post harvest management of jackfruit
3.	**Experiment No. 32**	:	**Influence of fruit maturity stages and storing methods on the quality of jackfruit seeds**
4.	Objective (S)	:	i) To identify the best time for harvesting Jackfruit for best quality seeds ii) To select proper storing method(s) for decreasing postharvest loss an achieving best quality after storage period
5.	Rational	:	Jackfruit (*Artocarpus heterophyllous*) is the world's largest fruit belongs to family Moraceae widely grown in Bangladesh. The whole fruit is composed of three parts rind, flesh, and seed. Total fruit weight comprises 10-25% of seed (Kushwaha et al., 2019). They are a rich source of carbohydrate and protein. The nutritional content of the seed is dependent on the varieties and cultivated region as well as maturity indices of the fruit. Therefore, harvesting of fruits at the proper stage of maturity is very much important both for maintaining quality and marketing. Previously described, the seed quality may vary with the maturity state as well as the storing prerequisites. Immature seed may parish in a shorter duration while and an over matured seed may germinate inside fruit. Therefore, the maturity index is very important for storing Jackfruit seeds for a longer duration. Moreover, seeds may undergo quality deterioration if they are not stored properly; hence, finding out the proper storing method and storage condition is equally important. Keeping these views in mind the present study was undertaken.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Jackfruit germplasm
8.	Design	:	RCBD
	i) Treatments	:	i) Maturity states; days after fruit set (DAF); 100, 110, 120 ii)Seed state; Fresh seed (cleaned/Unclean), Dry seed (cleaned/Unclean) iii) Drying method (Fresh air dried/Fresh sundried/Steamed air dried/Steamed sundried/Boiled air dried/Boiled sundried) iv) Storing vassal (Earthen pot/plastic pot/Polypropylene packets) v) Storing media (None/Ash/Sand/Paper chopping) vi) Storing condition (Room temperature/Refrigerator (4°C)/Freezer (≤0°C))
	ii) Replications	:	3
9.	Plot size	:	
10.	Planting system/spacing	:	-
11.	Fertilizer dose and methods of application	:	-
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	**i) Maturity index** [Fruit weight, Circumference, Length, Diameter, Spine density, Spine flatness, Edible portion, TSS, Dry mater content, Total sugar, Reducing sugar, Vit A, Vit C] **ii) Seed quality attributes** [Seed length, Seed width, Seed thickness, Geometric mean diameter, Sphericity, Surface area, Aspect ratio, Bulk density, Proximate composition (Moisture, Fat, Protein, Ash, Crude fiber)]
14.	Investigator (s)	:	M. H. M. B. Bhuyan, M. M. Rahman, F. Ahamed, J. C. Sarker, S. M. L. Rahman
15.	Season	:	-
16.	Date of initiation	:	Last week of June, 2021
17.	Date of completion	:	Last week of August, 2023
18.	Exp. outcome/benefit	:	Best stages for jackfruit harvest for seed purpose and best method of seed preservation for quality seeds will be developed
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk. 1,00,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

1.	Program	:	Fruit improvement
2.	Project	:	Adaptive trial of lemon
3.	**Experiment No. 33**	**:**	**Adaptive trial of BARI released lemon varieties**
4.	Objective(s)	:	i) To observe the performance of BARI released lemon varieties ii) To verify the adaptation ability of lemon varieties
5.	Rationale	:	Lemon is one of the popular citrus fruits. It has nutritional, medicinal and economic importance. This fruit is available throughout the country. BARI has released numbers of lemon varieties those are not enough in mitigating the local demand. Adaptation ability of these varieties has not yet been verified. The present investigation therefore, undertaken to observe the adaptability of lemon varieties in Narsingdi and Sylhet region.
6.	Materials and methods	:	BARI Lebu-4, BARI-Lebu-5, BARI Jara lebu-1 and local lemon line will be planted in Narsingdi and Sylhet region
7.	Crop/Variety	:	Lemon germplasm
8.	Design	:	RCBD
	i) Treatment	:	4 (BARI Lebu-4, BARI Lebu-5, BARI Jara lebu-1 and Local lemon line)
	ii) Replication	:	3
9.	Plot size	:	12.0 x 9.0 m
10.	Planting system/ spacing	:	3.0 x 3.0 m
11.	Fertilizer dose and methods of application	:	As per FRG-2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Overall growth condition (fair, good, excellent) ii) Plant height iii) Days to flowering iv) Fruit characteristics v) Incidence pests and diseases
14.	Investigator(s)	:	S. M. L. Rahman, A. K. M. M Rahman, M. H. Rahman and R. Akter
15.	Season	:	-
16.	Date of initiation	:	Last week of September, 2021
17.	Date of completion	:	Las week of August, 2023
18.	Exp. Outcome/benefit	:	Suitable lemon varieties for these regions will be identified
19.	Location	:	Narsingdi and Jaintapur
20.	Status	:	New
21.	Estimated cost	:	50,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Adaptive trial of coffee
03.	**Experiment No. 34**	**:**	**Adaptive trial of coffee in some selected areas of Bangladesh**
04.	Objective(s)	:	i) To popularize the Coffee cultivation in Bangladesh
05.	Rationale	:	The two most commonly grown coffee bean types are *C. arabica* and *C. robusta*. Coffee is not being much commercially grown in Bangladesh. Now the scenario has been changing gradually in the hills. Coffee cultivation is gaining popularity in the Chittagong Hill Tracts recently while many hill framers have already introduced coffee in a small scale. Therefore, it is essential to popularize the coffee cultivation in the hill areas. With this view in mind, this experiment has been undertaken.
06.	Materials and Methods	:	
07.	Crop/Variety	:	Coffee species
08.	Design	:	N/A
	i) Treatments	:	N/A
	ii) Replications	:	Non replicated
09.	Plot size	:	2000 sq m
10.	Planting system/ spacing	:	Robusta (3 × 3 m), Arabica (2.5 x 2.0 m)
11.	Fertilizer dose and methods of application	:	-
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Yield/plant (by number & weight) ii) Incidence of pest and diseases iii) Cost Benefit analysis
14.	Investigator(s)	:	M. A. Hossain, M. Islam, M. Tanharul Islam, M. R. Ahmad, S. M. Faisal, Z. A. Firoz, L. Iqbal, M. Moniruzzaman, M. S. Rahman, A. H. Khan and B. C. Sarker
15.	Season	:	-
16.	Date of initiation	:	1st week of March, 2021
17.	Date of completion	:	Last week of June, 2026
18.	Exp. Output/benefit	:	Coffee cultivation (area & production) will be increased in Bangladesh
19.	Location	:	Raikhali, Khagrachari, Ramgarh, Bandarban, Gazipur, Akbarpur, Jaintapur, Tangail, Mymensingh, Sherpur
20.	Status	:	New
21.	Estimated cost	:	Tk. 30,0000/-per year
22.	Sources of fund	:	"Research, development and extension of Cashew nut and Coffee Project" -BARI part
23.	Priority	:	1st

1.	Program	:	Vegetable improvement
2.	Project	:	Cultural management
3.	**Experiment No. 35**	**:**	**Effect of beneficial microorganisms for safe vegetables (cv. BARI Begun-10) production**
4.	Objective (s)	**:**	To evaluate beneficial microorganisms for safe vegetable production and enhancing their export potentiality
5.	Rational	**:**	The global human population is projected to reach 8.9 billion by 2050, with the developing countries of Asia and Africa to absorb the vast majority of the increase (wood, 2001). Decreasing irrigational water supplies and other environmental concerns exacerbate the challenges we face to meet the nutritional requirements of the growing population. The various ways, in which microorganisms have been used over the past 50 years to advance medical technology, human and animal health, food processing, food safety, and quality, genetic engineering, environmental protection, agricultural biotechnology, and in the more effective treatment of agricultural and municipal wastes collectively having the most impressive record. Microorganisms are valid only when they are provided with suitable and optimum conditions for metabolism, including the available water, oxygen, ph, and temperature of the ambient environment. The types of microbial cultures and inoculants available in the market today have increased rapidly, owing to new technologies. Microorganisms are being used as biofertilizers and biopesticides containing efficient microorganisms that improve plant growth in many ways and thus help in the sustainability of the environment and safe vegetable production.
6.	Materials and methods	**:**	-
7.	Crop/variety	**:**	Naga chili (advance line)
8.	Design	**:**	-
	i) treatment	**:**	1. Control 2. Plant growth-promoting rhizobacteria 3. Effective microorganisms 4. Clybio 5. Biofertilizer 6. *Bacillus* sp.
	ii) replication	**:**	3
9.	Plot size	**:**	-
10.	Planting system/spacing	**:**	-
11.	Fertilizer dose and methods of application	**:**	According to FRG
12.	Irrigated/rainfed	**:**	Irrigated/Rainfed
13.	Data to be recorded	**:**	Growth and yield attributes; yield, and quality
14.	Investigator (s)	**:**	MM Rahman, JC Sarker, F Ahamed, and MHMB Bhuyan
15.	Season	**:**	Kharif
16.	Date of initiation	**:**	March 2020
17.	Date of completion	**:**	2022
18.	Exp. Outcome/benefit	**:**	Safe and quality vegetable production method will be developed, which may further enhance the export potentiality of different fruits from the northeastern region
19.	Location	**:**	Jaintapur
20.	Status	**:**	New
21.	Estimated cost	**:**	Tk. 150,000/-
22.	Sources of fund	**:**	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	**:**	1st

1.	Program	:	Vegetable improvement
2.	Project	:	Disease and pest management
3.	**Experiment No.36**	**:**	**Controlling disease and pest for safe vegetable Production**
4.	Objective (S)	**:**	i) Managing pest and diseases for safe vegetable production ii) Enhancing export potentiality
5.	Rational	**:**	Bangladesh is an overpopulated country. Food shortages and malnutrition have, therefore, become general problems in our country. The issue of existing acute malnutrition and food shortages can be overcome by significantly producing more vegetables, which will ultimately lead to the building of a healthy nation (Zaman, 2010). The losses caused by insects pest and diseases are a severe problem to higher vegetable production. Botanicals, as well as other organic pest and disease controlling entities, are a promising source for safe vegetable production as well as controlling human health hazards (Rahman et al., 2007). Alternatively, the use of bio-pesticides (botanical and microbial) is widely promoted as a safe and environmentally friendly means to combat the pest and diseases, also reducing the harmful effects of chemical pesticides. Eco-friendly pest management, such as the use of botanical extracts, offers an excellent opportunity to save beneficial soil microorganisms. Most botanical extracts are also cost-effective and available to farmers on time. It would help to prevent environmental pollution caused by chemicals and thus become the most rewarding in our existing socio-economic conditions and an ecological threat. Given the above circumstances, the study has been taken to find out the insecticidal efficacy of botanical products for sustainable vegetable production in Bangladesh.
6.	Materials and methods	:	-
7.	Crop/Variety	:	BARI Sheem-1, 6, BARI Begun-10, BARI Lau-4,5
8.	Design	:	RCBD
	i) Treatment	:	1. Control/Farmers practice 2. Mahogany seed extract 3. Neem leaf extract 4. Tricholechete 5. Garlic extract 6. Bordeaux mixture
	ii) Replication	:	3
9.	Plot size	:	5×1.2 m
10.	Planting system/spacing	:	In bed/pit
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	Growth and yield attributes; yield, and quality
14.	Investigator (s)	:	MM Rahman, JC Sarker, F Ahamed, and MHMB Bhuyan
15.	Season	:	Kharif
16.	Date of initiation	:	March 2021
17.	Date of completion	:	2022
18.	Exp. outcome/benefit	:	Insect and disease-free safe quality vegetable production protocol will be developed, which may further enhance the export potentiality of different fruits from the northeastern region
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk. 150,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

1.	Program	:	Vegetable improvement
2.	Project	:	Soil and water management
3.	**Experiment No. 37**	**:**	**Soil health management for safe vegetable production by organic fertilizers**
4.	Objective (S)	**:**	i) Increasing soil health avoiding chemical fertilizer ii) Ensuring high yield and safe vegetable production
5.	Rational	**:**	The growing demand for food determines the need to increase the yield of crops i.e. vegetables, or fruit from a unit area (Keating et al., 2014). The most popular and also effective treatment to achieve the goal mentioned above is proper fertilization (Fageria et al., 2008). Mineral fertilization, along with agronomic treatments, not always pleasantly affects the soil properties. But organic fertilizers improve soil reaction and humus, which fundamentally shapes the physical, chemical, and biological properties of the soil (Bot and Benites, 2005). Thus, it has an indirect effect on yielding plants. Natural and organic fertilizers are also the sources of essential nutrients for plants, such as nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur, as well as microelements. Therefore, natural and organic fertilizers (including manure, compost, or slurry) for fertilizing purposes may solve the problem of nutrient storage and reduces the need for disposing of mineral fertilizers. In addition to the typical organic fertilizers, other sources of substrates are also being searched for the production of new organic fertilizers.
6.	Materials and methods	:	-
7.	Crop/Variety	:	BARI Sheem-1, 6, BARI Begun-10, BARI Lau-4,5
8.	Design	:	RCBD
	i) Treatment	:	Fertilizers and manures 1. Native nutrients 2. Farmers practice 3. Farmyard manure 4. Vermicompost 5. Trichocompost 6. Mustard oil cake 7. Spent mushroom substrate
	ii) Replication	:	3
9.	Plot size	:	5×1.2 m
10.	Planting system/spacing	:	In bed or Pit
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	Growth and yield attributes; yield, quality
14.	Investigator (s)	:	MM Rahman, JC Sarker, F Ahamed, and MHMB Bhuyan
15.	Season	:	Kharif
16.	Date of initiation	:	March 2020
17.	Date of completion	:	2022
18.	Exp. outcome/benefit	:	Quality as well as safe vegetable production procedure will be developed, which may further enhance export
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk. 150,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Varietal development of Chili
3.	**Experiment No. 38**	:	**Regional yield trail of naga chili (Set-III)**
4.	Objective (S)	:	❖ To study the for regional adaptability ❖ To select promising naga chili line for releasing variety
5.	Rational	:	Naga Chili (*Capsicum chinense* Jacq.) is a member of the Solanaceae family known as the world's hottest chili entered in the Guinness book of world record (2006) with a pungent level of 879,953 to 1,001,304 SHU (Adriana et al., 2008). Due to its extra-ordinary pungency level, oleoresin powder extracted from Naga chili is predicted to dominate the world market in coming years as the mainstay for riot control (Ritesh *et al*., 2000). People like this chili for hotness and special type of flavor. The demand of this chili is increasing day by day. It is mostly cultivated in the north east parts of Bangladesh and traditionally cultivated in hilly orchard along with citrus. There are huge variations among the unselected strains of Naga chili, with a wide range in fruit sizes and amount of fruit production per plant, and offers a huge potential for developing much better strains through selection. The agro-ecological condition favors the production of chili throughout the year. CRS collected and evaluated some of Naga lines. Considering the higher yield with better qualities, two promising lines were selected which could be studied for regional adaptability and release as variety in future. Keeping in mind a study is taken with above objectives.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Naga chili germplasm
8.	Design	:	RCBD
	i) Treatment	:	Two promising chili lines such as CS Jai-010 and CS Jai-018
	ii) Replication	:	3
9.	Plot size	:	4.2 m×1 m
10.	Planting system/spacing	:	35-40 days old seedlings will be planted at 50 cm x 70 cm spacing
11.	Fertilizer dose and methods of application	:	Cow dung -5t/ha. N100 P52 K100 S22kg/ha. Entire quantity of cow dung, p, 1/3rd k and s will be applied at the time of final land preparation. N and K will be applied in three equal splits at 25, 50 ,75 and 100 days after planting.
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	Plant height (cm), number of fruit/plant, weight of single fruit (g), fruit length and breadth (cm), green chilli yield/plant (kg), red ripe chilli yield/plant (kg), Storability as green chilli (Room temperature and 40 C - 50C) and disease and pest infestation
14.	Investigator (s)	:	J.C Sarker, F. Ahmed, S.M.L. Rahman , R. Ara, M.H.M.B. Bhuyan and concern scientists of different spices centers/sub centre.
15.	Season	:	Rabi
16.	Date of initiation	:	October, 2020
17.	Date of completion	:	Long term program
18.	Exp. outcome/benefit	:	Naga chili variety will be developed
19.	Location	:	Jaintapur, Faridpur, Bogura, Joydebpur, Magura and Lalmonirhat
20.	Status	:	2nd year
21.	Estimated cost	:	Tk. 1,50,000/-
22.	Sources of fund	:	SRC, BARI.
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Varietal development of minor spices
3.	**Experiment No. 39**	:	**Collection, conservation and characterization of small and large cardamom germplasm**
4.	Objective (S)	:	• To collect small and large cardamom germplasm • To study the morphophysiological behavior of small and large cardamom
5.	Rational	:	Cardamom is a important spices crop of the world. Its called queen of the spices. It's used all over the country. It's a flavoring agent in culinary use of our country. It is not cultivated in Bangladesh but some farmers try to cultivate they cannot success in cultivation. We are try to adopted in this crops of our country. It's also used in medicinal purpose over the world in ancient times. So this experiment will be conducted by spices research center, BARI, Bogura.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Cardamom germplasm
8.	Design	:	-
	i) Treatment	:	PN Jai-101 and BARI Golmorich-1 used as check.
	ii) Replication	:	-
9.	Plot size	:	
10.	Planting system/spacing	:	-
11.	Fertilizer dose and methods of application	:	-
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	Tillers per clump, no of bearing tillers per plant, tiller height, leafs per tiller, leaf breadth, panicle length, racemes per panicle, capsule per racemes, fruit set percent, seeds per capsule, internodal length for panicle, fresh yield per plant, dry yield per plant, no of fresh capsule per panicle, thousand capsule weight (wet and dry) etc.
14.	Investigator (s)	:	MM Hasan; MA Alam; AHF Fahim: SN Mozumder and MS Islam
15.	Season	:	Round the year
16.	Date of initiation	:	September 2019 (Bogra); September 2020 (Jaintapur)
17.	Date of completion	:	2025
18.	Exp. outcome/benefit	:	Promising line(s) for small and large cardamom production
19.	Location	:	SRC, Bogura and Jaintapur, Sylhet
20.	Status	:	2nd year
21.	Estimated cost	:	Tk. 2,00,000/-
22.	Sources of fund	:	SRC, BARI.
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Varietal development of minor spices
3.	**Experiment No. 40**	**:**	**Evaluation of black pepper lines**
4.	Objective (S)	**:**	To select suitable line(s) for commercial cultivation.
5.	Rational	**:**	Black pepper (*Piper nigrum* L.) is known as the King of Spice, belongs to the family Piperaceae. It is a perennial climbing vine grown for its berries, mainly used as spices and condiments. Black pepper is also known as one of the oldest and most popular spices in the world. Black pepper is traditionally cultivated in hilly orchard along with betel nut, jackfruit, Mango and other wild tree. There are huge variations among the unselected strains of black pepper, with a wide range in fruit sizes and amount of fruit production per plant and offers a huge potential for developing much better strains through selection. Therefore, the present study was undertaken to select suitable line(s) for commercial cultivation.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Black pepper
8.	Design	:	-
	i) Treatment	:	PN Jai-101 and BARI Golmorich-1 used as check.
	ii) Replication	:	-
9.	Plot size	:	
10.	Planting system/spacing	:	-
11.	Fertilizer dose and methods of application	:	-
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	Growth, flowering and fruit characteristics (As per IPGRI descriptor) 2. Yield / plant 3. Quality 3. Incidence of pests and diseases
14.	Investigator (s)	:	F. Ahmed, J. C. Sarker, M.H.M.B. Bhuyan and S.M.L. Rahman
15.	Season	:	-
16.	Date of initiation	:	September 2021
17.	Date of completion	:	2025
18.	Exp. outcome/benefit	:	Khasia paan variety will be developed
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk.1,00,000/-
22.	Sources of fund	:	SDP, BARI.
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Varietal development of minor Spices
3.	**Experiment No. 41**	**:**	**Evaluation of cinnamon genotypes**
4.	Objective (S)	**:**	Characterization of cinnamon genotypes collected from different region of Bangladesh. To select suitable germplasm releases as variety.
5.	Rational	**:**	Cinnamon is a spice obtained from the inner bark of several tree species from the genus cinnamomum. Cinnamon is used mainly as an aromatic condiment and flavoring additive in a wide variety of cuisines, sweet and savory dishes, breakfast cereals, snack foods, tea, and traditional foods. The aroma and flavor of cinnamon derive from its essential oil and principal component, cinnamaldehyde, as well as numerous other constituents, including eugenol. In Bangladesh, cinnamon is not very common. Some farmers are growing this spice crop in homestead, and don't know the processing of the bark. Therefore, quality also varied in the market. In the context of commercial agriculture, variability should be identified for the farmers, consumers, and researchers. Bangladesh agricultural research institute has already released a variety of cinnamon for farmers' cultivation. But still, there is an opportunity to release new varieties for farmers' uses. Moreover, location specific variety for problem soils and extreme climatic regions should also be selected and released. Yet, it is high time to release a variety through systematic research for the northeastern part as this region is famous for growing spices crops. The spices research sub-station, under citrus research station, BARI, Jaintapur, is long maintaining three cinnamon germplasm collected locally, and their performance is quite impressive in this extreme climatic zone. Hence, these germplasm should be characterized and evaluated for releasing them as variety and keeping this view in mind; this experiment was undertaken.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Three (3) promising germplasm of cinnamon viz. CC Jai 001, CC Jai 002 and CC Jai 003 with BARI Daruchini 1 as check
8.	Design	:	RCBD
	i) Treatment		04
	ii) Replication	:	3
9.	Plot size	:	-
10.	Planting system/spacing	:	Existing plants
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	Growth characters, yield, dry matter and quality
14.	Investigator (s)	:	JC Sarker, F Ahmed, MHMB Bhuyan And S.M.L. Rahman
15.	Season	:	Rabi and Kharif
16.	Date of initiation	:	July, 2020
17.	Date of completion	:	2025
18.	Exp. outcome/ benefit	:	The improved variety will be developed, and genetic resources will be conserved for exploitation in future
19.	Location	:	CRS, Jaintapur
20.	Status	:	2nd year
21.	Estimated cost	:	Tk.60,000/-
22.	Sources of fund	:	SRC, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Varietal development of minor spices
3.	**Experiment No. 42**	**:**	**Evaluation of bay leaf germplasm**
4.	Objective (S)	**:**	To select the superior line(s) for releasing a variety.
5.	Rational	**:**	Bay leaf is an important spices in the kitchen of every Bangladeshi family. Every year Bangladesh produced a lot of bay leaf most of that produced in Sylhet region. Bangladeshi bay leaves also have demand in the market of Singapore and other Asian countries. There is three to four distinct type of germplasm is available at the garden of CRS, Jaintapur which have not yet been evaluated. Therefore, keeping this view in mind the present study was undertaken to evaluate the germplasm to find out a suitable variety.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Bay leaf germplasm
8.	Design	:	RCBD
	i) Treatment		Variable (As per collection)
	ii) Replication	:	-
9.	Plot size	:	-
10.	Planting system/spacing	:	-
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	Leaf length (cm), leaf breadth (cm), Leaf thickness (Fresh and dry) (mm), Length of internodes between leaf (cm), Pungency, Number of primary branch, secondary branch., Yield/plant (kg), Fresh and dry weight ratio, Moisture %, Harvesting time, Incidence of insect and disease
14.	Investigator (s)	:	M.H.M.B. Bhuyan, S.M.L. Rahman, J. C. Sarker, F. Ahmed
15.	Season	:	Rabi and Kharif
16.	Date of initiation	:	July, 2013
17.	Date of completion	:	Will be continued (Long term)
18.	Exp. outcome/ benefit	:	Suitable variety will be developed
19.	Location	:	CRS, Jaintapur
20.	Status	:	9th year
21.	Estimated cost	:	Tk.60,000/-
22.	Sources of fund	:	SRC, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Varietal Improvement
3.	**Experiment No. 43**	**:**	**Collection and evaluation of khasia paan (*Piper betle* L.)**
4.	Objective (S)	**:**	i) To identify suitable germplasm for releasing as variety ii) To enrich gene pool for future research
5.	Rational	**:**	The green heart shaped leaves of betel vine (*Piper betle* L.) are locally called as Khasia Pan has been traditionally cultivated as a cash crop in the Sylhet area of Bangladesh. The Khasiatribes people, living within the fringe of reserved forests of Sylhet district, traditionally have been growing betel leaf on naturally growing trees. Moreover, it is exported to the mainstream market of Europe from Bangladesh. Leaves of *Piper betle* possess several bioactive components and are used in traditional medicinal systems. Pan leaves are used as a post meal mouth freshener and the crop is grown in Bangladesh, India, Sri Lanka, Malaysia, Philippines, Thailand, Taiwan and other southeast Asian countries. Moreover due to vegetative propagation by cuttings some clonal variation also arose, which should be characterized for releasing new variety(s). Keeping this view im mind the present study was undertaken.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Khasia paan
8.	Design	:	RCBD
	i) Treatment	:	As per collections
	ii) Replication	:	5
9.	Plot size	:	
10.	Planting system/spacing	:	Single row plantation
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	Growth, yield and leaves quality attributes
14.	Investigator (s)	:	J.C. Sarker, M.H.M.B. Bhuyan, F. Ahmed and S.M.L Rahman
15.	Season	:	-
16.	Date of initiation	:	June 2021
17.	Date of completion	:	2025
18.	Exp. outcome/benefit	:	Khasia paan variety will be developed
19.	Location	:	Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk. 40,000/-
22.	Sources of fund	:	SDP, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Varietal development of minor spices
3.	**Experiment No. 44**	**:**	**Collection and evaluation of indigenous spices crop under Sylhet region**
4.	Objective (S)	**:**	Collection of indigenous spices germplasm to enrich gene pool.
5.	Rational	**:**	Bangladesh is a point of crop diversity, but many of the crop cultivars and in some cases species already extinct due to climatic change as well as anthropogenic activities. Geographically Sylhet region is surrounded by hills from all three sides. Its burgeoning economy has contributed to the regional attractions of landscapes filled with fragrant citrus, pineapple, agar, rubber, and tea as well as spice crops like black pepper, Naga chili, betel leaf and bay leaf plantations. The region has a high rain fall in monsoon with a highly acidic pH of the soil. Therefore, every year a number of germplasm are lost forever. Hence this question warrants research on collection, documentation and conservation of the spices germplasm. On the other hand BARI has a released black pepper variety BARI Golmorich-1 which is suitable for cultivation in acidic soil and suitable for hilly ecosystem of Sylhet. After establishment of Spices Research Sub-station, Jaintapur, Sylhet, a systematic efforts have been made periodically to collect indigenous germplasm of spices and its wild relatives. Germplasm conservatories have been established for black pepper, chui jhal' (piper chaba), bay leaf, Naga chili, pepper, capsicum, plum (Alubhokara), allspice etc. Representing the available variability. But still a substantial number of germplasm exists in farmers field, which should be collected, documented and conserved for future breeding program.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Black pepper, chui jhal' (piper chaba), bay leaf, naga chili, capsicum, plum (Alubhokara), allspice, Cinnamon and Cardamom etc.
8.	Design	:	RCBD
	i) Treatment		Variable (As per collection)
	ii) Replication	:	3
9.	Plot size	:	-
10.	Planting system/spacing	:	-
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	1. Growth, flowering and fruit characteristics 2. Yield and yield components 3. Incidence of pest and diseases
14.	Investigator (s)	:	J.C. Sarker, M.H.M.B. Bhuyan, F. Ahmed, and S.M.L. Rahman
15.	Season	:	Rabi and Kharif
16.	Date of initiation	:	September, 2019
17.	Date of completion	:	Will be continued (Long term)
18.	Exp. outcome/ benefit	:	Gene pool will be enriched and suitable variety will be developed
19.	Location	:	CRS, Jaintapur
20.	Status	:	4th year
21.	Estimated cost	:	Tk.50,000/-
22.	Sources of fund	:	SRC, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Cultural management
3.	**Experiment No. 45**	**:**	**Effect of spacing on the yield of naga chili**
4.	Objective (S)	**:**	To select the proper spacing for better growth and yield of Naga chili
5.	Rational	**:**	The Naga chili is recognized by guinness world records as the hottest pepper in the world. The pepper is mostly cultivated in the northeast parts of Bangladesh. It is an interspecies hybrid, mostly *Capsicum chinense* with some *C. frutescens* genes. The farmers are traditionally growing this chili without any scientific method. Therefore, it is necessary to develop production packages.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Naga chili advanced germplasm CC Jai-010
8.	Design	:	RCBD
	i) Treatment		
		:	• T_1= 50 cm ×50 cm • T_2= 50 cm × 60 cm • T_3= 50 cm ×70 cm • T_4= 60 cm ×60 cm • T_5= 60 cm × 70 cm • T_6= 70 cm × 70 cm
	ii) Replication	:	3
9.	Pot size	:	As per treatments
10.	Planting system/spacing	:	-
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	Growth characters, yield, and yield attributing traits, disease and pest susceptibility
14.	Investigator (s)	:	M.H.M.B. Bhuyan, F. Ahmed, J.C. Sarker, and S.M.L. Rahman
15.	Season	:	Year round
16.	Date of initiation	:	July 2020
17.	Date of completion	:	2024
18.	Exp. outcome/ benefit	:	Proper spacing for Naga chili cultivation will be developed
19.	Location	:	CRS, Jaintapur
20.	Status	:	2nd year
21.	Estimated cost	:	Tk.80,000/-
22.	Sources of fund	:	SRC, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Cultural management
3.	**Experiment No. 46**	**:**	**Standardization of single node cutting for quick multiplication of black pepper**
4.	Objective (S)	**:**	To standardize rapid multiplication method of black pepper using single node cutting
5.	Rational	**:**	Black pepper (Piper nigrum L., Family: Piperaceae) popularly known as "king of spices" is the oldest and most important spice crop grown in the Indian sub-continent. It is grown in 26 countries of the world, including India, Indonesia, Sri Lanka, Thailand, China, Vietnam, Cambodia, Brazil, Mexico, and Guatemala. Black pepper is a widely used spice in the world, and it is an indispensable item in the preparation of processed meat, sauces, soups, curry powders, and pickles. Although black pepper is not native to Bangladesh, its cultivation is increasing due to one black pepper variety developed by Bangladesh Agricultural Research Institute (BARI), named as BARI Golmorich-1. Cuttings taken from runners shoots and orthotropic shoots are used commercially for vegetative propagation. But the availability of an adequate amount of quality planting material for large scale multiplication is one of the significant constraints. Moreover, the traditional method yields 50-60% success. Therefore, shortage of seedling hindering the way in increasing the productivity of pepper in Bangladesh. Although we standardize the rapid multiplication method previously, new methods should be adopted to increase the number of cutting from a limited amount of vines. In this context, single nodded cuttings have great potential to play a vital role in improving the rooting for the rapid multiplication of black pepper.
6.	Materials and methods	:	-
7.	Crop/Variety	:	BARI golmorich-1.
8.	Design	:	CRD (factorial)
	i) Treatment	:	placement area and shade level 1. Above ground+50% shade 2. Above ground+70% shade 3. Trench +50% shade 4. Trench +70% shade Factor b: water spraying interval 1. Three times a day 2. Four times a day 3. Six times a day
	ii) Replication	:	3
9.	Pot size	:	6×5 in
10.	Planting system/spacing	:	-
11.	Fertilizer dose and methods of application	:	Previously standardized potting media (cocodust+ vermin compost; 1:1) and rooting hormone will be used.
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	1. Days to first rooting 2. Rooting percentage 3. Days to first shooting 4. Per cent success 5. Per cent survivability
14.	Investigator (s)	:	M.H.M.B. Bhuyan, F. Ahmed, J.C. Sarker, and S.M.L. Rahman
15.	Season	:	Year round
16.	Date of initiation	:	September 2020
17.	Date of completion	:	2023
18.	Exp. outcome/ benefit	:	Single node cutting method will be standardized
19.	Location	:	CRS, Jaintapur
20.	Status	:	2nd year
21.	Estimated cost	:	Tk.60,000/-
22.	Sources of fund	:	SRC, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Cultural management
3.	**Experiment No. 47**	**:**	**Effect of different living and non-living standards on the establishment, growth and yield of black pepper var. BARI Golmorich-1**
4.	Objective (S)	**:**	To find out suitable standards on the establishment, growth and yield of black pepper var.BARI golmorich-1.
5.	Rational	**:**	Black pepper (Piper nigrum L.) is an important and widely used spice in the world. India is the major producer and exporter of this crop. Due to the huge requirement of planting material (vine) in Bangladesh, traditional methods including runner shoot multiplication; serpentine method and bamboo multiplication technique are being used for the large scale production of planting materials (Ravindran, 2000). Black pepper vines require support for their establishment. Both living and non-living standards are used to trail black pepper. So the present study has been undertaken to find out suitable standards on the establishment, growth and yield of black pepper var.BARI golmorich-1.
6.	Materials and methods	:	-
7.	Crop/Variety	:	BARI golmorich-1.
8.	Design	:	RCBD
	i) Treatment		03
		:	T1 : RCC Pillars T2: Bhadi (*Lannea grandis* D.) T3 : Madar tree (*Erythrina indica*)
	ii) Replication	:	3
9.	Plot size	:	-
10.	Planting system/spacing	:	Square planting system
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/Rainfed
13.	Data to be recorded	:	1. time of flowering, fruits set, fruits maturity, 2.Fruit yield and quality 3. incidence of pests and diseases
14.	Investigator (s)	:	JC Sarker, S.M.L. Rahman, F Ahamed, and MHMB Bhuyan
15.	Season	:	Year round
16.	Date of initiation	:	July 2018
17.	Date of completion	:	2025
18.	Exp. outcome/ benefit	:	It will help to select suitable standards on the establishment, growth and yield of black pepper var. BARI golmorich-1.
19.	Location	:	CRS, Jaintapur
20.	Status	:	5th year
21.	Estimated cost	:	Tk.50,000/-
22.	Sources of fund	:	SRC, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Cultural management
3.	**Experiment No. 48**	**:**	**Prospects of BARI Golmorich-1 cultivation as a bush pepper**
4.	Objective (S)	**:**	• To validate suitability of BARI Golmorich -1 as a bush pepper. • To identify suitable method of bush pepper cultivation.
5.	Rational	**:**	Black pepper is regarded as "King of Spices" and "Black Gold" (Parthasarathy et al., 2008). Today is the era of rapid urbanization and modernization. Area under cultivation is decreasing in a rapid rate. Cities are entirely dependent on outskirt supplies of consumable products. Black pepper is a very costly spice crop. If can be grown in home and domestically processed, it can not only save a part of family income but can also help the surplus production to be exported in foreign countries. Considering all the above facts it can be considered that if black pepper can be grown in homestead conditions, it can easily serve the domestic requirement. Black pepper vines are usually cultivated by allowing them to climb on either living (on trees) or non living (RCC posts, granite pillars, teak poles etc.) supports. Black pepper vines while climbing on these supports put forth fruiting branches called laterals which produce flowers and fruits. The normal way of producing planting material of black pepper is to use rooted cuttings (single or 3 nodded) of runner shoots or climbing shoots. This ensures that the plant turn into vine after climbing on a support and produce fruiting branches (Plagiotropes) all around the support. But when the laterals are used as planting material, the resultant plants grow like a "Bush". These plants produce numerous laterals throughout the year, unlike vines. Spices Research Centre, BARI has developed one black pepper variety namely BARI Golmorich 1 in 1987. But cultivating BARI Golmorich 1 as a bush pepper is not verified yet. Thus the present study is taken.
6.	Materials and methods	:	The One year old healthy fruiting branches will be selected with 3 to 5 nodes and all the leaves except the flag leaf will be removed. Cuttings will be treated immediately by dipping in fungicide (Autostine @ 2 g/L) then allowed to dry in cool shady place. After drying the lower end of cuttings will be dipped in the 3000 ppm IBA solution. Then the cuttings will be planted immediately in the prepared polybag field with potted soil.
7.	Crop/Variety	:	BARI Golmorich 1
8.	Design	:	CRD
	i) Treatment	:	T_1 = Planting in pot T_2 = Planting in pit
	ii) Replication	:	10
9.	Plot size	:	-
10.	Planting system/spacing	:	-
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	Seedling mortality and seedling establishment, Stem growth rate, Number of branches per seedling, Days to first and 50% spike initiation, Days to first and 50% fruit initiation, Number of fruits per spike, Disease infestation, Fruit yield (kg/clump)
14.	Investigator (s)	:	A. H. F. Fahim, M.H.M.B. Bhuyan, J. C. Sarker, F. Ahmed and G.Paul
15.	Season	:	Kharif
16.	Date of initiation	:	March, 2021
17.	Date of completion	:	2025
18.	Exp. outcome/ benefit	:	BARI Golmorich 1 will be verified for bush pepper cultivation
19.	Location	:	SRC, Bogura, CRS, Jaintapur and HARS, Khagrachari
20.	Status	:	2rd year
21.	Estimated cost	:	Tk.40,000/-
22.	Sources of fund	:	SRC, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Soil and water Management
3.	**Experiment No. 49**	**:**	**Effect of organic fertilizer for safe naga chili production**
4.	Objective (S)	**:**	i) Increasing soil health avoiding chemical fertilizer ii) Ensuring high yield and safe vegetable production
5.	Rational	**:**	The growing demand for food determines the need to increase the yield of crops i.e. Spices, vegetables, or fruit from a unit area (Keating et al., 2014). The most popular and also effective treatment to achieve the goal mentioned above is proper fertilization (Fageriaet al., 2008). Mineral fertilization, along with agronomic treatments, not always pleasantly affects the soil properties. But organic fertilizers improve soil reaction and humus, which fundamentally shapes the physical, chemical, and biological properties of the soil (Bot and Benites, 2005). Thus, it has an indirect effect on yielding plants. Natural and organic fertilizers are also the sources of essential nutrients for plants, such as nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur, as well as microelements. Therefore, natural and organic fertilizers (including manure, compost, or slurry) for fertilizing purposes may solve the problem of nutrient storage and reduces the need for disposing of mineral fertilizers. In addition to the typical organic fertilizers, other sources of substrates are also being searched for the production of new organic fertilizers.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Naga Chili advanced germplasm CC Jai-010
8.	Design	:	RCBD
	i) Treatment	:	Fertilizers and manures T_1= Native nutrients T_4= Vermicompost T_2= Farmers practice T_5= Trichocompost T_3= Farmyard manure T_6= Mustard oil cake
	ii) Replication	:	3
9.	Plot size	:	2×1.2 m
10.	Planting system/spacing	:	In bed/pit
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	Growth and yield attributes; yield, quality
14.	Investigator (s)	:	MM Rahman, JC Sarker, F Ahamed, AND MHMB Bhuyan
15.	Season	:	Kharif
16.	Date of initiation	:	October 2020
17.	Date of completion	:	2022
18.	Exp. outcome/ benefit	:	Quality as well as safe naga chili production procedure will be developed, which may further enhance export
19.	Location	:	Jaintapur
20.	Status	:	2rd year
21.	Estimated cost	:	Tk.150,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Soil and water management
3.	**Experiment No. 50**	**:**	**Effect of limes on the growth and yield of Naga chili**
4.	Objective (S)	**:**	i) Performance of Naga chili in different dose of limes ii) Select a suitable dose of lime
5.	Rational	**:**	Naga chili popularly known as Naga morich is the hottest chilly in the world. Naga chili is cultivated due to its extraordinary pungency level. The cultivation of Naga chili in our country is relatively low than other countries. Most of the agricultural soils of Sylhet region are acidic in nature with pH value of 4.9-6.1 (Hossain and Sattar, 2002). Dolomitic lime is calcium containing inorganic mineral increases the pH of acidic soil and improves water penetration. It also improves the uptake of major plants nutrients growing on acid soil. Soil with extreme low pH may need liming for having a good yield. On the other hand, too much addition of lime can decrease the availability of micronutrients, especially Fe, Mn, Zn and Cu sufficiently to cause deficiencies of those plant nutrients (Haynes, 1982). Also, over dose of lime application makes insoluble form of phosphate combined with Ca and Mg (Westermann, 1992; Murphy and Sims, 2012). A judicious application of lime and fertilizer may help to overcome this problem of soil acidity. Determination of an accurate lime requirement for an acid soil is important to bring soil pH in suitable range for facilitating nutrient availability to plants and thereby encourage proper growth and yield of crops. So the present investigation was undertaken to find out influence of lime on growth and yield of Naga chili
6.	Materials and methods	:	-
7.	Crop/Variety	:	Naga chili advanced germplasm CC Jai-010
8.	Design	:	RCBD
	i) Treatment	:	T_1= Nil (0 t/ha) T_4= 1.5 t/ha T_2= 0.5 t/ha T_5= 2.0 t/ha T_3= 1.0 t/ha T_6= 2.5 t/ha
	ii) Replication	:	3
9.	Plot size	:	2×1.2 m
10.	Planting system/spacing	:	In bed/pit
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated
13.	Data to be recorded	:	1.Growth characteristics, Yield and quality 2.Incidence of pest and diseases
14.	Investigator (s)	:	F. Ahmed, M.H.M.B. Bhuyan, J. C. Sarker and M.M. Rahman
15.	Season	:	-
16.	Date of initiation	:	October 2020
17.	Date of completion	:	2022
18.	Exp. outcome/ benefit	:	Optimum dose of limes for Naga chili will be found
19.	Location	:	Jaintapur
20.	Status	:	3rd year
21.	Estimated cost	:	Tk.40,000/-
22.	Sources of fund	:	SRC, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Disease and insect pest management
3.	**Experiment No. 51**	**:**	**Controlling disease and pest for safe Naga chili production**
4.	Objective (S)	**:**	i) Managing pest and diseases for safe vegetable production ii) Enhancing export potentiality
5.	Rational	**:**	Bangladesh is an overpopulated country. Food shortages and malnutrition have, therefore, become general problems in our country. The issue of existing acute malnutrition and food shortages can be overcome by significantly producing more vegetables, which will ultimately lead to the building of a healthy nation (Zaman, 2010). The losses caused by insects pest and diseases are a severe problem to higher vegetable production. Botanicals, as well as other organic pest and disease controlling entities, are a promising source for safe vegetable production as well as controlling human health hazards (Rahman et al., 2007). Alternatively, the use of bio pesticides (botanical and microbial) is widely promoted as a safe and environmentally friendly means to combat the pest and diseases, also reducing the harmful effects of chemical pesticides. Eco friendly pest management, such as the use of botanical extracts, offers an excellent opportunity to save beneficial soil microorganisms. Most botanical extracts are also cost effective and available to farmers on time. It would help to prevent environmental pollution caused by chemicals and thus become the most rewarding in our existing socio economic conditions and an ecological threat. Given the above circumstances, the study has been taken to find out the insecticidal efficacy of botanical products for sustainable vegetable production in Bangladesh.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Naga chili advanced germplasm CC Jai-010
8.	Design	:	RCBD
	i) Treatment	:	1. Control/farmers practice 2. Mahogany seed extract 3. Neem leaf extract 4. Tricholechete 5. Garlic extract 6. Bordeaux mixture
	ii) Replication	:	3
9.	Plot size	:	2×1.2 m
10.	Planting system/spacing	:	In bed/pit
11.	Fertilizer dose and methods of application	:	As per FRG
12.	Irrigated/rainfed	:	Irrigated/rainfed
13.	Data to be recorded	:	Growth and yield attributes; yield, and quality
14.	Investigator (s)	:	MM Rahman, JC Sarker, F Ahamed, and MHMB Bhuyan
15.	Season	:	-
16.	Date of initiation	:	March 2020
17.	Date of completion	:	2022
18.	Exp. outcome/ benefit	:	Insect and disease free safe quality Naga chili production protocol will be developed, which may further enhance the export potentiality of different fruits from the northeastern region
19.	Location	:	Jaintapur
20.	Status	:	2nd year
21.	Estimated cost	:	Tk. 150,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

1.	Program	:	Spices improvement
2.	Project	:	Post harvest technology
3.	**Experiment No. 52**	**:**	**Effect of storing methods on seed quality of Naga chili**
4.	Objective (S)	**:**	To select the suitable storing method on seed quality of Naga Chili.
5.	Rational	**:**	Naga chili is one of the hottest chili in the world and cultivated for its extra-ordinary pungency level. Although it is an indigenous spices crop, its popularity is increasing in Bangladeshi cuisine due to its pungency, taste, and appealing flavor. Moreover, a significant amount of naga chili is recently being exported to different countries. As a result the cultivation area is also increasing day by day. But a substantial problem for expanding the cultivation area is the peculiar behavior of Naga chili seeds during storage and germination. These seeds lose viability quickly. Local experience showed that a higher germination percentage could be found up to 3 months of storage. However, it is reported that Naga chili seeds express maximum vigor at physiological maturity stage (Vasudevan*et al.* 2008, Sahoo, 2014). Hence seed drying is very crucial for seed viability and vigor. Therefore, for understanding the viability and vigor of Naga chili seeds both inside the fruit and extracted at the day of harvest for the entire storage period should be investigated.
6.	Materials and methods	:	-
7.	Crop/Variety	:	Naga chili advanced germplasm CC Jai-010
8.	Design	:	CRD (factorial)
	i) Treatment	:	26

Factor a: seed condition	Factor b: methods of preservation	Factor c: Storage temperature
C_1: open seeds	M_1: farmers practice	T_1: room temperature (25°c)
C_2: whole chili	M_2: plastic pots	T_2: refrigeration (4°c)
	M_3: earthen pots	T_3: freezing (0°c)
	M_4: metal pots	
	M_5: glass jar	

	ii) Replication	:	3
9.	Plot size	:	-
10.	Planting system/spacing	:	N/A
11.	Fertilizer dose and methods of application	:	N/A
12.	Irrigated/rainfed	:	N/A
13.	Data to be recorded	:	1. Seeds quality and percent germination at 15 days interval, 2. Various attributes during the experimentation
14.	Investigator (s)	:	J.C. Sarker, M.H.M.B. Bhuyan, F. Ahmed and S.M.L Rahman
15.	Season	:	-
16.	Date of initiation	:	September 2020
17.	Date of completion	:	2022
18.	Exp. outcome/ benefit	:	Suitable preservation method and preserving temperature for good quality seed of Naga chili will be developed
19.	Location	:	Spices Research Sub-station, CRS, Jaintapur
20.	Status	:	New
21.	Estimated cost	:	Tk. 80,000/-
22.	Sources of fund	:	SRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Maintenance and conservation of fruit germplasm
03.	**Activity # 1**	**:**	**Enrichment and maintenance of elite fruit tree multiplication block**
04.	Objective(s)	:	i) To supply true-to-type quality planting materials to the partner organizations as well as to the nursery associations for the establishment of FMTOs
05.	Rationale	:	Establishment of elite fruit tree multiplication block will ensure the production of quality planting materials (scion-sticks/saplings) for distribution to the partner organizations (DAE, BADC, BRAC & Proshika) as well as to the nursery associations for the establishment of required number of foundation mother tree orchards (FMTOs). Establishment of elite fruit tree multiplication blocks have already been initiated in 2005 at Burirhat, Jamalpur, Akbarpur and Hathazari stations of HRC, BARI with the BARI released varieties of fruits. While the plants were established in the elite multiplication blocks in 2005 and 2006 would need regular care and other prospective varieties (developed by BARI and agricultural universities as well as popular traditional varieties) also need to be established there considering farmers' demands.
06.	Materials and Methods	:	4-10 true-to-type and healthy plants of each selected variety propagated from proven mother trees will be planted in each elite multiplication block. Each plant will be labeled properly in order to ensure trace back of its mother tree. Intercultural operations, such as irrigation, fertilizer application, weeding and pest control will be done as per standard practice. Before distribution of planting material to the partner organization, the elite plants must be fruited to confirm that plants held in the said block are indeed the variety it is claimed.
07.	Crop/Variety	:	Elite fruit germplasm
08.	Design	:	-
	i) Treatments	:	-
	ii) Replications	:	-
09.	Plot size	:	-
10.	Planting system/ spacing	:	-
11.	Fertilizer dose and methods of application	:	As per FRG, 2018
12.	Irrigated/ rainfed	:	-
13.	Data to be recorded	:	i) Vegetative growth (If any off-type plant is observed, it will be uprooted and filled up immediately with appropriate plant) ii) Incidence of pests and diseases
14.	Investigator(s)	:	M. Z. Uddin, B. C. Sarker, M. S. Rahman, M. M. Rahman, S. M. Faysal and M. Islam
15.	Season	:	-
16.	Date of initiation	:	2005
17.	Date of completion	:	Will be continued
18.	Exp. Output/benefit	:	It will help to produce and distribute quality planting materials of improved varieties of fruits to establish FMTOs
19.	Location	:	Burirhat, Jamalpur, Akbarpur, Hathazari, Jashore and all the other HRC Stations
20.	Status	:	On-going
21.	Estimated cost	:	10,00,000/- (Tk. 50,000/- per station)
22.	Sources of fund	:	HRC, BARI
23.	Priority	:	1st

01.	Program	:	Fruit improvement
02.	Project	:	Technology transfer activity of citrus
03.	**Activity # 2**	**:**	**Mother orchard establishment of BARI released citrus fruit varieties**
04.	Objective	:	i) To supply true to type quality planting materials released varieties
05.	Rational	:	Establishment of mother orchard will ensure the production of quality planting materials (scion/sapling) for distribution to the partner organizations (DAE, BADC, BRAC and Proshika) as well as to the nursery. Establishment of mother orchard have already initiated in 2013 at Jaintapur, BARI with the BARI released citrus fruits.
06.	Materials and Methods	:	-
07.	Variety	:	-
08.	Design	:	Single row plantation accommodating 5 plants/row
	i) Treatments	:	As per collection
	ii) Replications	:	3-5
09.	Plot size	:	4 × 4 m
10.	Planting system/spacing	:	Square system
11.	Fertilizer dose and Methods of application	:	As per FRG-2018
12.	Irrigated/ rainfed	:	Irrigated
13.	Data to be recorded	:	i) Growth, flowering and fruit characteristics ii) Yield/plant (by number and weight) iii) Incidence of pests and diseases
14.	Investigator(s)	:	J. C. Sarker, S. M. L. Rahman, M. H. M. B. Bhuyan, F. Ahmed, and M. M. Rahman
15.	Season	:	-
16.	Date of initiation	:	2021
17.	Date of completion	:	Will be continued
18.	Exp. Output/benefit	:	It will help to produce and distribute quality plant materials of improved citrus varieties
19.	Locations	:	Jaintapur
20.	Status	:	On-going
21.	Estimated cost	:	Tk. 40,000/-
22.	Sources of fund	:	Production of safe fruits and vegetables and promotion of their exports scheme, BARI
23.	Priority	:	1st

ACTIVITY # 3: Breeder's Propagule Production

Breeder's Propagule Production of BARI Released Fruit Varieties 2021-2022

Sl. #	Name of Fruit	Variety	Amount (No.)
3	Banana	BARI Banana-3 (Sapling)	200
5	Guava	BARI Guava-2 (Sapling)	1000
7	Mandarin	BARI Mandarin-1 (Sapling)	600
		BARI Mandarin-3 (Sapling)	2500
8	Sweet orange	BARI Malta-1 (Sapling)	2000
9	Lemon	BARI Lebu-2 (Sapling)	300
10	Lime	BARI Kagji lebu-1 (Sapling)	200
12	Pummelo	BARI Pummelo-1 (Sapling)	100
		BARI Pummelo -5 (Sapling)	1500
13	Satkara	BARI Satkara-1 (Sapling)	1100
19	Wax apple	BARI Wax jambu-1 (Sapling)	200
20	Toikar	BARI Toikar-1 (Sapling)	1100
	Total		**10800**

Breeder's Propagule Production of BARI Released Spices Varieties 2021-2022

Sl. #	Name of Spices	Variety	Amount
1	Ginger	BARI Ada-1 (Seed)	50 Kg
2	Eryngium	BARI Bilati dhonia-1 (Seed)	1 Kg
3	Onion	BARI Piaz-5 (Seedling)	10000
4	Chilli	BARI Morich-2 (Seedling)	2000
5	Black pepper	BARI Golmorich-1 (Seedling)	10000
6	Cinamon	BARI Daruchini-1 (Seedling)	200
	Total		**10800**

SUGGESTIONS/COMMENTS MADE IN THE REGIONAL RESEARCH REVIEW AND PROGRAM PLANNING WORKSHOP AT SYLHET (2021-22)

Sl. No.	Comments/suggestions	Action/Remarks
1.	CRS, Jaintipur should be collected Komala germplasms (Shoileshori and Sajek) from different sources of Bangladesh for releasing a good variety.	Action will be taken
2.	It is high time to demand of lime doses for pit application during fruit cultivation in Sylhet region, so researchers should take research trial with lime on major fruit crops, for recommending crop specific lime doses.	Action has been taken
3.	Rresearch to be needed on graft compatibility of BARI Malta-1.	Action has been taken
4.	Seed dealers of BADC should be included in the field day, training and workshop.	Action will be taken
5.	Khasia pan is one of the important commercial crops in Sylhet region, but growers facing problems with pest and diseases. So entomology and pathological researcher work should be done for better suggestions.	Action will be taken
6.	At present the cultivation area of pineapple are increasing. Researchers should take initiative to develop a pineapple variety.	Action has been taken
7.	CRS, Jaintapur should formulate research programs with addressing the naga chilli, pineapple and summer tomato production practice without poly shed system.	Action will be taken
8.	The local mandarin loosing sweetness, so scientists should take research program for increasing sweetness of mandarin orange.	Action will be taken
9.	Bay leaf is very good commercial crop in Sylhet, growers facing many problems with pest and diseases. So farmers could not produce quality bay leaf. Researchers should take systematic research on bay leaf for a complete production technology.	Action will be taken
10.	CRS of BARI has been requested by the house to take over the research programs with addressing the collection of seedless lemon, black pepper, khasia pan, cashew nut, and coffee. But in case of cashew nut and coffee researchers should have to discuss with relevant project directors.	Action has been taken
11.	Before finalized the program under the title effect of rootstock on growth, yield and quality of Navel orange, concern scientist should discussed with OFRD Rangpur station.	Action has been taken

SUGGESTIONS/COMMENTS MADE IN THE INTERNAL RESEARCH REVIEW AND PROGRAM PLANNING WORKSHOP AT BARI (2021-22)

Sl. No.	Comments/suggestions	Action/Remarks
1.	Soil pH should be checked before liming and lime will be incorporated to the soil based on area (hectare) in place of per tree/plant basis. So liming treatment should be taken per area basis properly.	Action will be taken
2.	Programs should be taken in consideration of rapporteurs reports sent by different regional stations to research director	Action has been taken
3.	Top-down programs should be conducted properly by the scientists of ARSs and RARSs.	Action has been taken
4.	During evaluation of the germplasm/genotypes which have already been established after collection or during evaluation of germplasm/genotypes under in-situ condition, the title of the experiment should be begun with the word 'Evaluation' instead of writting collection and evaluation ..	Action will be taken
5.	Programs should be formulated and updated according to Delta Plan, SDG and safe food production and nutrition security policy.	Action has been taken
6.	Adaptation trials of cashew nut should be taken and conducted in all the regions of Bangladesh..	Action has been taken
7.	Data regarding disease and pest reaction should be taken in each fruit program.	Action will be taken
8.	Organoleptic test has to be written in place of eating quality.	Action has be taken
9.	References should be cited in both text and reference list. In Result and Discussion section, discussion should be be made according to the the results of review of literature (reference).	Action as well as improvement is being continued
10.	Orchards of different fruit varieties released by BARI should be established through different Regional Stations by supplying saplings of those varieties to the selected farmers.	Action has been taken
11.	BARI itself should collect germplasm from abroad maintaining quarantine procedure strictly.	Action will be taken

SUGGESTIONS/COMMENTS MADE IN THE NARS INSTITUTES' RESEARCH REVIEW WORKSHOP AT BARC (2021-22)

Sl. No.	Comments/suggestions	Action/Remarks
1.	Floral biology should be studied before undertaking new hybridization program on fruit for improvement.	Action will be taken
2.	Strengthen pummelo, sweet orange and bullock heart improvement programs.	Action has already been taken
3.	Research program should be strengthened for minor fruits.	Action has already been taken
4.	Hybridization program should be reinforced in major fruits.	Action has already been taken
5.	Hybridization program should be undertaken in the selected research stations for better research outcomes and best resource use.	Action has already been taken
6.	Rainforce seed/sapling production program at farm level.	Action will be taken

SUGGESTIONS/COMMENTS MADE IN THE Central RESEARCH REVIEW AND PROGRAM PLANNING WORKSHOP AT BARI (2021-22)

Sl. No.	Comments /suggestions	Action/Remarks
1.	The reason of smaller sized malta and the problem associated with malta cultivation, its area coverage and possibility of grafting for propagation should be investigated with due priority.	Action will be taken
2.	Research program should be developed estimating and considering the demand of BARI mandated high value crops putting due emphasis on SDG, Perspective Plan, Delta plan, Vision 2041, 8 FYP and yearly target of APA.	Action will be taken