ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 3.4
IJAR 2015; 1(4): 24-29
www.allresearchjournal.com
Received: 13-12-2014
Accepted: 15-01-2015

M. Salahuddin M. Chowdhury
Professor, Department of Plant Pathology, Sher-e-Bangla Agricultural University, Dhaka-1207. Bangladesh.

H. E. M. Khairul Mazed
MS Student, Department of Horticulture, Sher-e-Bangla Agricultural University, Dhaka-1207. Bangladesh.

Israt Jahan Irin
Ph.D. Student, Department of Agronomy, Sher-e-Bangla Agricultural University, Dhaka-1207. Bangladesh.

Md. Hafizur Rahman
MS Student, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka-1207. Bangladesh.

Jannatul Ferdous Moonmoon
MS Student, Department of Agronomy, Sher-e-Bangla Agricultural University, Dhaka-1207. Bangladesh.

Correspondence:
H. E. M. Khairul Mazed
MS Student, Department of Horticulture, Sher-e-Bangla Agricultural University, Dhaka-1207. Bangladesh.

Study on seedling diseases of jackfruit (*Artocarpus heterophyllus* L.) in Bangladesh

M. Salahuddin M. Chowdhury, H. E. M. Khairul Mazed, Israt Jahan Irin, Md. Hafizur Rahman, Jannatul Ferdous Moonmoon

Abstract
The existing health situation of jackfruit seedling of nursery diseases of jackfruit species in the country is in a stage to be upgraded for successful fruit production to meet the national demand. Experiments were carried out during the period of July, 2012-October, 2014 to study the status of seedling diseases of jackfruit in different major growing areas of Bangladesh. Important plant pathogen *Phyllosticta artocarpina* and *Pseudomonas sp*. were detected and identified. The incidence and severity of leaf spot and leaf blight of jackfruit seedling were differed location to location and significant variations were observed. The maximum incidence and severity of the leaf spot disease observed in Dhaka and Gazipur district in month of October. The minimum incidence and severity of the leaf spot disease observed in Barisal district in month of January. Again the maximum incidence and severity of leaf blight disease is observed in Dhaka and Gazipur district in the month of April. Similarly the minimum incidence and severity of leaf blight disease is observed in Khagrachari district in the month of October.

Keywords: Jackfruit, seedling, disease, survey.

1. Introduction
Jackfruit (*Artocarpus heterophyllus* L.) is one of the most important popular delicious fruit crops in Bangladesh (Haque, 2009) [5]. It belongs to the family Moraceae. It stands third position in respect of an area (22814 acres) and second in production (1005 thousand metric tons) of fruits in Bangladesh (BBS, 2010) [3]. It is grown in Bangladesh, Philippines Sri Lanka, Thailand, India, some extent in Brazil and Queensland of Australia. Success of an orchard or homestead gardening depends on the quality of the planting material. Disease of jackfruit has been reviewed by few workers throughout the world. Seedling diseases of jackfruit play a major role in reducing yields of horticultural crops in the tropic. It has been estimated that the production could be increased at least by 28% if the crop could be protected against various seedling diseases (Chowdhury, 2009) [4]. Jackfruit is grown widely in Bangladesh and thus has been selected for this study. Seedling diseases of jackfruit species were not thoroughly investigated by researchers of Bangladesh prior to this study. However, Awasthi *et al.* (2005) [2] observed that jackfruit mainly suffered from leaf spot (*Phyllosticta artocarpina*) and tender fruit rot (*Rhizopus artocarpi* (*Rhizopus stolonifer var. stolonifer*). Morton (1987) [6] stated important diseases that include pink disease, *Pelliculana (Corticium) salmonicolor*, stem rot, fruit rot and male inflorescence rot caused by *Rhizopus artocarpi*; and leafspot due to *Phomopsis artocarpina, Colletotrichum lagenarium, Septoria artocarpi*, and other fungi. Gray blight, *Pestalotia elasticola*, and rust, *Uredo artocarpi* occurred on jackfruit. So, studies on seedling diseases of jackfruit are an urgent need in the country. Therefore, attempt should put forward to study the prevalence of various diseases occurring on jackfruit seedlings in some selected nurseries of Dhaka, Gazipur, Barisal and Khagrachari district in Bangladesh. Keeping in view of the above discussion the present study was undertaken with the following objectives. i) Survey on the seedling diseases of Jackfruit in selected nurseries of Bangladesh. ii) Identification of causal organisms of the seedling diseases of jackfruit. iii) Epidemiological survey on the disease prevalence of seedling diseases of jackfruit.

3. Materials and Methods

3.1 Experimental site and period

The study was carried out at Sher-e-Bangla Agricultural University, Dhaka-1207 with 3 other districts of Bangladesh and it was carried out from July, 2012-October, 2014.

3.2 Preparation of nursery soil and seedlings

The substratum was prepared by mixing soil, sand and well decomposed cow dung and sterilized with 5 ml formalin (40%) diluted with 20 ml water for 4 kg soil. The prepared soil was heaped in a square block. Soil heap was inocula. After 4 days of treatment, earthen pots were filled up with the sterilized soil.

3.4 Location of survey area

Prevalence of diseases occurring on Jackfruit seedlings raised in the selected nurseries was surveyed. The experiment was carried out in eight nurseries of Dhaka, Gazipur, Khagrachari and Barisal. The eight nurseries of four districts are surveyed:

3.5 Age and number of seedlings

Age of the jackfruit seedling and total number of seedling in selected eight nurseries from July, 2012 to April, 2014**.**

Nurseries	Age of the seedling (Years)	Total number of Seedlings (July, 2012-July,2013)	Total number of seedlings (Oct' 12-Oct'13)	Total number of seedlings (Jan'13- Jan'14)	Total number of seedlings (April'13- April'14)
Green orchid nursery Agargaon, Dhaka	1	30	70	80	60
Barisal nursery Savar, Dhaka	1	60	90	90	70
Gazipur nursery Gazipur	1	70	80	90	90
Laxmipur nursery Gazipur	1	70	60	80	70
Hill Research Center Khagrachari	1	50	70	70	50
Ramgarh nursery Ramgarh, Khagrachari	1	50	60	50	50
Sarchina nursery Barisal	1	60	90	80	70
Riyadh nursery Barisal	1	60	60	80	70

3.6 Observation of the symptoms

Symptoms of the diseases were studied by visual observation. Sometimes hand lens were used for critical observation of the disease and sometimes a disease was identified based on matching the observed symptoms in the infected plants with the symptoms published in Ber and other Jackfruit disease compendium.

3.7 Survey period

Altogether eight surveys were made during the period from July, 2012 to April, 2014. Where First, second, third, fourth, fifth, sixth, seventh, and eighth surveys were made in July, 2012; October, 2012; January, 2013; April, 2013; July, 2013; October, 2013; January, 2014; and April, 2014 respectively.

3.8 Collection of diseased specimen

Diseased leaves were collected from the infected plants representing the different areas of the survey. The specimens were preserved in the laboratory following standard procedure of preservation of disease specimens until isolation was made.

3. 9 Data collection during survey

During the survey in the nurseries, total numbers of jackfruit seedling as well as number of diseased seedling in the nurseries were recorded. Then 30 seedlings were randomly selected for counting diseased leaves and disease free leaves. Moreover, five leaves per plant were randomly selected to determine the disease severity.

3.10 Determination of disease incidence and disease severity

For calculation of incidence of disease every seedling was counted in the nursery and also counted the infected seedlings and then expressed in percentage. The disease incidence of Jackfruit seedling was determined by the following formula (Rai and Mamatha, 2005) [7]:

$$\text{Percent plant infection} = \frac{\text{Number of diseased plants}}{\text{Number of total plants observed}} \times 100$$

Percent disease incidence (PDI) of foliar diseases was determined by the following formula (Rai and Mamatha, 2005):

$$\text{Percent Disease Incidence (Leaves)} = \frac{\text{Number of diseased leaves on each plant}}{\text{Number of total leaves on each plant}} \times 100$$

Percent Disease severity (PDI) was determined by the following formula (Rai and Mamatha, 2005):

$$\text{Percent Disease Severity (Leaves)} = \frac{\text{Area of leaf tissue infected by disease}}{\text{Total number of leaf inspected}} \times 100$$

3.11 Meteorological data collection
Meteorological data of the experimental period were collected from Meteorological Department, Agargaon, Dhaka.

3.12 Data analysis
On different parameters were analyzed in two factor randomized block design (RCBD) through computer software MSTAT-C (Anonymous 1989). Duncan' s Multiple Range Test (DMRT) and Least Significant difference (LSD) test were performed to determine the level of significant differences and to separate the means within the parameters.

4. Result and Discussion
4.1 Survey of nursery diseases of Jackfruit
Two different diseases viz. leaf spot and leaf blight of jackfruit were recorded in the survey conducted in eight nurseries of Dhaka, Gazipur, Khagrachari and Barisal.

4.2 Symptoms of diseases and identification of pathogen
4.2.1 Leaf spot of jackfruit
The disease was characterized by dark brown to brick red spot on both the leaf surfaces (Plate 1). These spots were later turned into grayish white centers with dark brown boundaries. Conidia cylindrical, conical, sometimes very slender, straight or curved. Conidia were one celled pyriform or even club shaped (Plate 2).

Plate 1: Symptom of leaf spot on leaf of jackfruit seedling

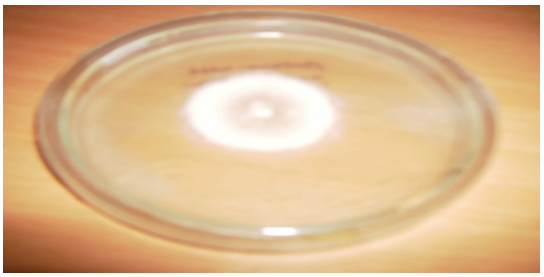

Plate 2: Pure culture of *Phyllosticta artocarpina*.

4.2.2 Leaf blight of jackfruit
The disease was characterized by blighting of leaf (Plate 3). At later stage, the total leaf and the twig also blighted and showed die back symptom (Plate 4).

Plate 3: Symptom of leaf blight on jackfruit seedlings.

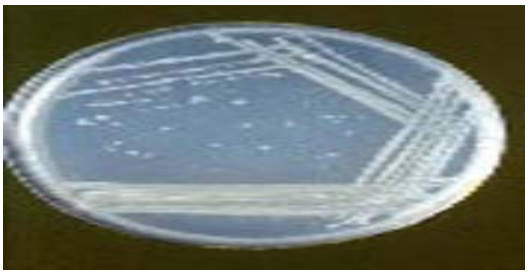

Plate 4: Isolate of *Pseudomonas syringae* pv. *syringae*

4.3 Epidemiology of incidence and severity
4.3.1 Mean incidence and severity of leaf spot of jackfruit at different experimental location of Bangladesh during July, 2012 to April, 2014
Incidence of leaf spot of jackfruit varied from location to location and that ranged from 29.44-50.70% (Table 1). The highest incidence (50.70%) was recorded at Dhaka and the lowest (29.44%) was recorded at Barisal. The severity of leaf pot of jackfruit also varied from location to location and that ranged from 19.26-41.53% (Table 1). The highest severity (41.53%) was recorded at Dhaka and the lowest (19.26%) was recorded at Barisal.

Table1: Mean incidence and severity of leaf spot of jackfruit at different locations of Bangladesh during July, 2012 to April, 2014

Location	Leaf spot of jackfruit	
	% Disease Incidence (July, 2012-April, 2014)	% Disease Severity (July, 2012-April, 2014)
Dhaka	50.70 a	41.53 a
Gazipur	48.90 a	39.38 a
Khagrachari	36.95 b	26.67 b
Barisal	29.44 c	19.26 c
$LSD_{(p\geq0.05)}$	4.370	4.064
CV%	3.49	3.56

Each data represents the mean value of two nurseries of each district for consecutive two years

4.3.2 Mean incidence and severity of leaf spot of jackfruit in different growing seasons of Bangladesh during July, 2012 to April, 2014

The incidence of leaf spot of jackfruit varied significantly from July, 2012 to April, 2014 and ranged from 31.73-51.79% (Table 2). The highest (51.79%) incidence was recorded in October (2012 & 2013) and the lowest (31.73%) was observed in the month of January (2013 & 2014). The severity of leaf spot of jackfruit varied significantly from July, 2012 to April, 2014 and ranged from 22.43-41.18% (Table 2). The highest (41.18%) severity was recorded in the month of October (2012 & 2013) and the lowest (22.43%) was observed in the month of January (2013 & 2014).

Table 2. Mean incidence and severity of leaf spot of jackfruit during July, 2012 to April, 2014 of Bangladesh

Time of data collection	leaf spot of jackfruit	
	% Disease Incidence (July, 2012-April, 2014)	% Disease Severity (July, 2012-April, 2014)
July	36.90 c	27.78 c
October	51.79 a	41.18 a
January	31.73 d	22.43 d
April	45.58 b	35.46 b
$LSD_{(p\geq0.05)}$	4.228	3.297
CV%	4.52	3.56

Each data represents the mean value of two nurseries of each district for consecutive two years

4.3.3 Mean incidence and severity of leaf spot of jackfruit during different growing seasons at different experimental location:

Incidence of leaf spot of jackfruit varied significantly from season to season as well as location to location and that ranged from 17.78-61.11% (Table 3). The highest (61.11%) incidence of leaf spot of jackfruit recorded in the month of October (2012 & 2013) at Dhaka followed by in the month of October (2012 & 2013) at Gazipur (59.44%). The lowest (17.78%) incidence was observed in the month of January (2013 & 2014) at Barisal. The severity of leaf spot of jackfruit 10.50-51.57%. The highest (51.57%) severity of leaf spot observed in the month of October (2012 & 2013) at Dhaka followed by in the month of October (2012 &2013) at Gazipur (59.44%) while the lowest (10.50%) was recorded in the month of January (2013 & 2014) at Barisal.

Table 3. Mean incidence and severity of leaf spot of jackfruit during growing seasons at different experimental locations of Bangladesh.

Location	Time of data collection	Leaf spot of jackfruit	
		% Disease Incidence (July, 2012-April, 2014)	% Disease Severity (July, 2012-April, 2014)
Dhaka.	July	46.66 c	37.43 c
	October	61.11 a	51.57 a
	January	40.03 e	30.83 d
	April	55.00 b	46.29 b
Gazipur	July	44.38 cd	34.84 c
	October	59.44 a	50.15 a
	January	39.10 ef	29.44 d
	April	52.67 b	43.09 b
Khagrachari	July	31.55 gh	23.00 e
	October	46.61 c	34.37 c
	January	30.00 h	18.95 fg
	April	39.66 e	30.38 d
Barisal	July	25.00 i	15.87 g
	October	39.99 de	28.62 d
	January	17.78 j	10.50 h
	April	35.00 fg	22.07 ef
$LSD_{(p\geq0.05)}$		4.228	3.297
CV(%)		3.49	3.56

Each data represents the mean value of two nurseries of each district for consecutive two years

4.3.4 Mean incidence and severity of leaf blight at different experimental locations in Bangladesh during July, 2012 to April, 2014

Incidence of leaf blight of jackfruit varied from location to location and that ranged from 19.71-34.19% (Table 4). The highest (34.19%) incidence was recorded at Dhaka followed by incidence of leaf blight at Gazipur (33.40%) and the lowest (19.71%) was recorded at Khagrachari. The severity of leaf blight of jackfruit varied from location to location and that ranged from 14.57-30.27% (Table 4). The highest (30.27%) severity was recorded at Dhaka followed by severity of leaf blight at Gazipur (29.03%) and the lowest (14.57%) was recorded at Khagrachari.

Table 4. Mean incidence and severity of leaf blight of jackfruit at different locations in Bangladesh during July, 2012 to April, 2014

Location	Leaf blight of jackfruit	
	% Disease Incidence (July, 2012-April, 2014)	% Disease Severity (July, 2012-April, 2014)
Dhaka	34.29 a	30.27 a
Gazipur	33.40 a	29.03 a
Khagrachari	19.71 c	14.57 c
Barisal	26.77 b	21.63 b
$LSD_{(p\geq0.05)}$	4.050	4.194
CV%	5.62	4.72

Each data represents the mean value of two nurseries of each district for consecutive two years

4.3.5 Mean incidence and severity of leaf blight of jackfruit in different growing seasons of Bangladesh during July 2012 to April 2014

The incidence of leaf blight of jackfruit varied significantly from July, 2012 to April, 2014 and ranged from 3.21-44.17% (Table 5). The highest (44.17%) incidence was recorded in April (2013 & 2014) and the lowest (3.21%) was observed in the month of January (2013& 2014). The severity of leaf blight of jackfruit varied significantly from July, 2012 to April, 2014 and ranged from 1.27-38.59 % (Table 5).The highest (38.59%) severity was recorded in the month of April (2013 & 2014) and the lowest (1.27%) was observed in the month of January (2013 & 2014).

Table 5. Incidence and severity of leaf blight of jackfruit during July, 2012 to April, 2014 of Bangladesh.

Time of data collection	Leaf blight of jackfruit	
	% Disease Incidence (July, 2012-April, 2014)	% Disease Severity (July, 2012-April, 2014)
July	37.00 b	31.38 b
October	29.80 c	24.27 c
January	3.21 d	1.27 d
April	44.17 a	38.59 a
$LSD_{(p\geq0.05)}$	4.681	3.287
CV%	5.62	4.72

Each data represents the mean value of two nurseries of each district for consecutive two years

4.3.6 Mean incidence and severity of leaf blight of jackfruit during different growing seasons at different experimental locations of Bangladesh

Incidence of leaf blight of jackfruit varied significantly from season to season as well as location to location and that ranged from 0.00-53.28% (Table 6). The highest (53.28%) incidence of leaf blight of jackfruit recorded in the month of April (2013 & 2014) at Dhaka followed by in the month of April (2013 & 2014) at Gazipur (51.73%). There is no incidence was observed in the month of January (2013 & 2014) at Dhaka and in the month of January (2013 & 2014) at Gazipur. The lowest incidence was found in the month of January (2013 & 2014) at Khagrachari and Barisal. The severity of leaf blight of jackfruit also varied significantly from season to season as well as location to location and that ranged from 0.00-48.13 %. The highest (48.13 %) severity of leaf blight of jackfruit observed in the month of April (2013 & 2014) at Dhaka followed by in the month of April (2013 & 2014) at Gazipur (46.45%).The disease severity was absent during the month of January (2013 & 2014) at Dhaka and Gazipur.

Table 6. Incidence and severity of leaf blight of jackfruit seedlings during growing seasons at different experimental locations of Bangladesh.

Location	Time of data collection	leaf blight of jackfruit	
		% Disease Incidence (July, 2012-April, 2014)	% Disease Severity (July, 2012-April, 2014)
Dhaka.	July	44.44 b	39.08 b
	October	39.48 b-d	33.89 c
	January	o.oo i	0.00 h
	April	53.28 a	48.13 a
Gazipur	July	43.56 b	38.03 b
	October	38.33 cd	31.66 cd
	January	0.00 i	0.00 h
	April	51.73 a	46.45 a
Khagrachari	July	25.00 f	19.09 f
	October	17.56 g	11.97 g
	January	5.157 h	1.74 h
	April	31.11 e	25.46 e
Barisal	July	35.00 de	29.36 d
	October	23.80 f	19.56 f
	January	7.66 h	3.340 h
	April	40.55 bc	34.30 c
$LSD_{(p\geq0.05)}$		4.681	3.287
CV (%)		5.62	4.72

Each data represents the mean value of two nurseries of each district for consecutive two years

5. Conclusion

Two different diseases were recorded in jackfruit seedlings during the survey period under four different geographical location viz. Dhaka, Gazipur, Barisal and Khagrachari. Incidence and severity of leaf spot and leaf blight varied from location to location and time to time. The highest incidence and severity of leaf spot were recorded in the month of October (2012 & 2013) at Dhaka. The lowest incidence and severity of leaf spot were observed in January (2013 & 2014) at Barisal. The highest incidence and severity of leaf blight were recorded in the month of April (2012 & 2013) at Dhaka. The lowest incidence and severity of leaf blight were observed in October (2013 & 2014) at Khagrachari.

6. References

1. Anonymous. MSTAT-C, a micro computer program for the design, management and analysis of agronomic research experiments. Michigan State Univ., East Lansing, MI. 1989.
2. Awasthi DP, Sarkar S, Mishra NK and Kaisar SAKM. Disease situation of some major fruit crops in new alluvial plains of west Bengal. Environment and Ecology. 2005; 235 (Special-3): 497-499.
3. BBS. Statistical Year Book of Bangladesh. Statistics Division, Ministry of Planning, Government of the Peoples Republic of Bangladesh. Dhaka, 2010, 64-79.
4. Chowdhury MSM. Seed and seedling diseases of some selected fruits of Bangladesh. Ph. D. Thesis. Department of Plant pathology, Bangladesh Agricultural University, Mymensingh, 2009, 97-124.
5. Haque MA. Scenario of fruit production in Bangladesh. In: International conference on quality seed and food security, 17-19 February (2009). Bangladesh Agricultural University, Mymensigh, Bangladesh, 2009, 82-83.
6. Morton, Julia F. Fruits of Warm Climates. Creative Resources Systems, Inc, 1987, 383-836.
7. Rai VR and Mamatha T. Seedling diseases of some important forest tree species and their management. In. Working papers of the Finnish Forest Research Institue. 2005, 11.