Leaf Blight of Litchi in Nurseries of Northern Region of Bangladesh and its Management

Farzana Yasmin[#1] and Ismail Hossain[*2]

[1&2]*Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh*

***Abstract*—** Bacterial leaf blight of litchi (*Litchi chinensis* Sonn.) considered as a serious disease in the nurseries especially in Northern region of Bangladesh. Survey was conducted on leaf blight of litchi in 7 cultivating litchi varieties in the country. Leaf blight was common in all 7 varieties *viz.* Bedana, Bombai, Haria Bombai, Madrajie, China-2, China-3 and Kathali lichu. The incidence and severity of leaf blight of litchi ranged from 13.5 to 41% and 11.5 to 33.5%, respectively. *In vitro* test revealed that all isolates of *Pseudomonas syringae* pv. *syringae* did not show resistance to Gentamicin. In the net house, six different treatments *viz*. Gentamicin (0.05%), Erythromycin (0.05%), Doxycycline (0.05%), Copper sulphate (0.05%), BAU-Biofungicide (2%) and Control were used in controlling bacterial leaf blight of litchi (Variety: Chaina-3). BAU-Biofungicide @ 2% was found superior for controlling leaf blight that increased 14.48% sapling height, 38.83% branch and reduced 72.96% disease incidence as well as 51.38% disease severity followed by Gentamycin @ 0.05% over control.

***Keywords*—** Bacterial leaf blight, incidence, severity, Pseudomonas syringae pv. syringae, antibiotic sensitivity, Antibiotics, Copper sulphate, BAU-Biofungicide.

I. INTRODUCTION

Litchi is one of the popular, delicious, highly priced and major table fruit of Bangladesh. Litchi (*Litchi chinensis Sonn.*) belongs to the family Sapindaceae and sub-family Nepheleae. It is one of the most important sub-tropical evergreen fruit trees. It is believed that litchi came from Burma to Bangladesh sometime in the early 19th century [1]. Litchi grown almost all over the country but its production is mostly concentrated in the northern and eastern region [2]. The expansion of the litchi area in these districts is relatively slow due to high mortality rate of young litchi plants [1]. Bangladesh produced 56687 metric ton of litchi in 5596 ha of land during the period of 2011-2012 [3]. Although a huge number of nurseries are engaged in producing seedlings, but they fail to produce quality seedlings due to lack of their knowledge about diseases and their management [4]. Litchi subjected to attack by a number of diseases at all stage of its growth and development but bacterial leaf blight resulting significant loss in case of nursery seedlings. For the first time in Bangladesh bacterial leaf blight disease has been reported by Hossain [5] and it has been found to be caused by *Pseudomonas syringae* pv. *syringae* [6]. Bacterial diseases are explosive; by the time symptoms are recognized, the pathogen often is entrenched and well on its way to destroying the crop and lead to devastating financial losses to farmers [7]. Antibiotics are effective against most gram-positive and some gram negative bacteria, and its mode of action is through blocking elongation of peptide chains, which inhibits protein synthesis [8]. Antibiotics show effectiveness during the growth phase of the pathogen on the surface of flowers before infection [7]. In recent years, antibiotic use on plants has been fiercely debated in several countries, although, antibiotic use on plants is minor relative to total use. Therefore, it is necessary to survey the nurseries of major litchi growing areas of Bangladesh for determining the leaf blight disease of litchi and management of the disease through sound and economic way. Moreover, no chemicals were screened to control this dangerous disease in the country, while in developed countries antibiotics are used in limited extent. Therefore, the present research work was undertaken to meet the following objectives:

i) To survey the bacterial leaf blight disease of litchi in nurseries of the Northern region of Bangladesh.
ii) To evaluate the sensitivity of *P. syringae* pv. *syringae* against some antibiotics.
iii) To evaluate some antibiotics, Copper sulphate and BAU-Biofungicide for the management of bacterial leaf blight of litchi.

II. MATERIALS AND METHODS

A. Survey of leaf blight of litchi in Northern region of Bangladesh Survey was conducted from 13 October 2013 to 10 April, 2014 in the Northern region of Bangladesh. Altogether seven varieties of litchi *viz*., Bedana, Bombai, Haria Bombai, Madrajie, China-2, Chaina-3 and Kathali Lichu were surveyed. During the survey 30 saplings of litchi for each variety were selected randomly in each location. Number of saplings and number of healthy and diseased saplings were recorded from the selected nurseries. Each of the selected saplings was observed carefully and symptoms of leaf blight disease were recorded following the descriptions of [9], [10], [11] and [12]. The disease incidence and severity were evaluated

following the formula of Rai and Mamatha [13], and Johnston [14], respectively.

B. Antibiotic sensitivity test of Pseudomonas syringae pv. syringae Diseased leaves were collected from the nurseries as shown in Fig. 1 and kept in sterile polythene bag and transported to the laboratory. Tissue planting (leaf cutting) method was used for collection of bacteria as shown in fig. 2. The cut infected portions of the leaf were washed and cleaned in sterile distilled water, and plated on nutrient agar (NA). Plates were incubated at 28 ˚C for 2 days. Cream or off white colored colony of bacteria was appeared after incubation on NA medium. The cream color on the NA media was the colony of *P. syringae* pv. *syringae* [15]. After isolation bacterial isolates were purified by streaking a single colony of each isolate by sub-culturing on nutrient agar medium as described by [16] as shown in Fig. 3. The isolates of bacteria were preserved in 10% skim milk, kept at -20 ˚C in refrigerator for antibiotic sensitivity test.

Fig. 1 Leaf blight disease in litchi leaf Caused by *P. syringae* pv. *syringae*

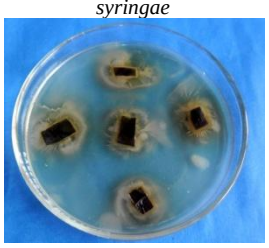

Fig. 2 Isolation of *P. syringae* pv. *syringae* by leaf cutting method on NA medium

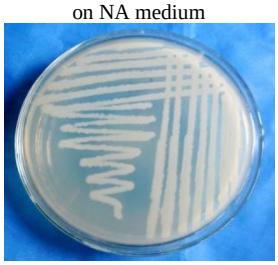

Fig. 3 Pure culture of *P. syringae* pv. *syringae*

Sensitivity of *P. syringae* pv. *syringae* isolates to different antibiotics was determined *in-vitro* by employing Kirby-Bauer disc diffusion method [17]. The procedure involved measuring the diameter of the zone of inhibition that results from diffusion of the agent into the medium surrounding the disc. Antimicrobial discs of 0.05% were used for the test. The used antibiotics were Gentamicin, Erythromycin and Doxycycline.

With a sterile pipette a drop of test culture of bacteria was poured on NA plate. Sterile glass spreader was used to spread the culture homogenously on the medium. The plate was allowed to sit at room temperature at least 3 to 5 minutes, but no more than 15 minutes, for the surface of the agar plate to dry before proceeding to the next step. Three antibiotic discs were placed aseptically onto the surface of the inoculated plates applying appropriate special arrangement with the help of a sterile forceps. The plates were incubated at 35 ˚C ± 2 ˚C in the incubator. Following incubation, after 24 hrs the zone sizes were measured to the nearest millimeter using a ruler, include the diameter of the disc in the measurement. The plates were examined and the diameter of each zone of complete inhibition was measured in mm. At the time of measuring zone diameters, always rounded up to the next millimeter. All measurements were made with the unaided eye while viewing the back of illuminated with reflected light. The plate was viewed using a direct, vertical line of sight to avoid any parallax that may result in misreading. The zone size was recorded on the recording sheet. Growth up to the edge of the disc was reported as a zone of 0 mm. Distinct, discrete colonies within an obvious zone of inhibition were not considered. Data that were recorded depending on the areas of zone diameter were arranged according to maximum to minimum diameter in mm. For each antibiotic indicating on the recording sheet the zone size was reported as sensitive (S), intermediate (I), or resistant (R).

C. Management of bacterial leaf blight of litchi

The experiment was carried out from July 2013 to June 2014 in the net house, Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh, Bangladesh. Under this program, the saplings of three years old grown in pots were used for management of leaf blight of litchi. For the control of Bacterial Leaf Blight (BLB) disease of litchi (Variety: China-3) six different treatments were employed on litchi saplings. The treatments were: (i) T_1 = Gentamicin applied as foliar spray @ 0.05%, (ii) T_2 = Erithromycin applied as foliar spray @ 0.05%, (iii) T_3 = Doxycycline applied as foliar spray @ 0.05%, (iv) T_4 = Copper sulphate applied as foliar spray @ 0.05%, (v) T_5 = BAU-Biofungicide applied as foliar spray @ 2% and (vi) T_6 = Untreated control. The experiment was laid out in Completely Randomized Design (CRD) with three replications. The data were recorded on a) Height of the saplings (cm), b) Total number of branch/sapling, c) Total number of leaves/sapling, d) Number of diseased leaves/sapling and e) Percent leaf area diseased/sapling. The incidence and severity of bacterial leaf blight of litchi was assayed following the formula of Rai and Mamatha [13] (2005), and Johnston [14] (2000), respectively.

III. RESULTS AND DISCUSSION

A. Incidence and severity of bacterial leaf blight of litchi Leaf blight was found in all the litchi varieties *viz*., Bedana, Bombai, Haria Bombai, Madrajie, China-2, Chaina-3 and Kathali Lichu, where the % plant infection, % incidence and % severity were from 12 to 34%, 13.5 to 41% and 11.5 to 33.5%, respectively as shown in Fig. 4. The highest leaf blight incidence (41%) was found in Kathali Litchu and severity (33.5%) in China-2. Leaf blight of litchi has also been reported by [4], [5], [18], [15] and [19] in different litchi growing areas of Bangladesh.

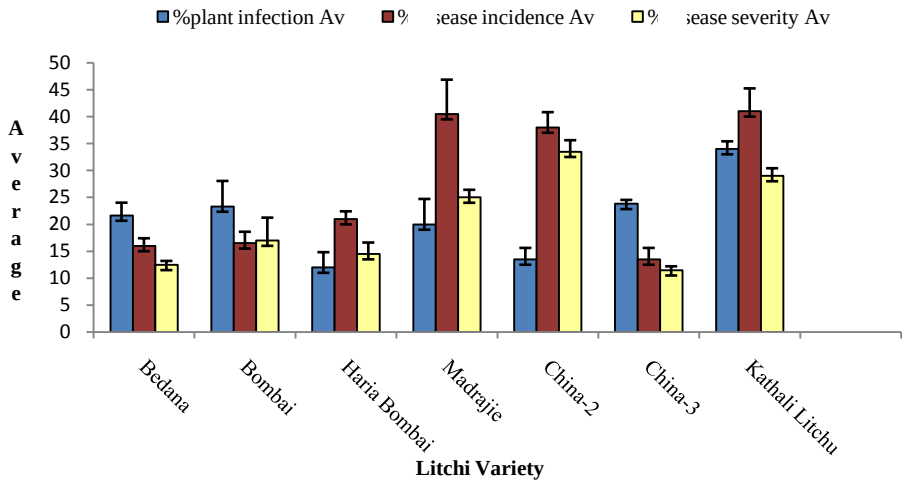

Fig. 4 Incidence and severity of leaf blight in different varieties of litchi in Northern region of Bangladesh

B. Antibiotics sensitivity test of Pseudomonas syringae pv. syringae collected from blighted leaf of litchi of Rajshahi, Chapai Nawabgonj and Dinajpur Twelve isolates of *P. syringae* pv. *syringae* collected from Rajshahi, Chapai Nawabgonj and Dinajpur were tested for antibiotic susceptibility against three different antibiotics *viz*. Gentamicin, Erythromycin and Doxycycline. The isolates were recorded as resistant (R), intermediate (I) and sensitive (S) to the antibiotics as shown in TABLE I and Fig. 5. None of the isolates collected from blighted leaf of litchi of Rajshahi were found to show resistance to Gentamycin (GEN-0.05). But in case of Erythromycin (E-0.05) only isolate LR4 showed resistant reaction. On the other hand all the isolates were showed resistant reaction against Doxycycline (DO-0.05). Isolate LR3 was found intermediate to Gentamycin but except isolate LR4 all the isolates graded as intermediate to Erythromycin. Any isolates were not found to show intermediate reaction against Doxycycline. Again isolates LR1, LR2 and LR4 were found sensitive to Gentamycin but none of the isolates showed sensitive reaction to both Erythromycin and Doxycycline. All the isolates of *P. syringae* pv. *syringae* collected from Chapai Nawabganj did not show resistant reaction against Gentamycin (GEN-0.05). Isolates LC1 and LC3 were resistance to Erythromycin (E-0.05). On the other hand, all the isolates recorded as resistant to Doxycycline (DO-0.05). In case of Gentamycin, isolate LC2 showed intermediate reaction but none of the isolates showed intermediate reaction to Erythromycin and Doxycycline. Except isolate LC2, isolates LC1, LC3 and LC4 were graded as sensitive to Gentamycin. In case of Erythromycin isolates LC2 and LC4 showed sensitive reaction. But none of the isolates were found sensitive to Doxycycline.Isolates collected from Dinajpur did not show resistant reaction against Gentamycin (GEN-0.05) and Erythromycin (E-0.05). On the other hand, rest of the three isolates except isolate LD4 were found resistant against Doxycycline (DO-0.05). Isolate LD3 and LD1 showed intermediate reaction to Gentamycin and Erythromycin, respectively. But isolate LD4 was recorded as intermediate to both Erythromycin and Doxycycline. Isolates LD1, LD2 and LD4 were graded as sensitive to Gentamycin and isolates LD2 and LD3 showed sensitive reaction to Erythromycin. In case of Doxycycline none of the isolates showed sensitive reaction. Orlans *et al.* [20] reported that out of 189 isolates of *P. spp*, 188 isolates were susceptible to Gentamycin. Akinbowale *et al.* [21] also observed *P. spp* were sensitive to Gentamycin. The findings also supported by Hossain *et al.* [22]. They reported that isolates of *P. syringae* pv *syringae* collected from different locations were sensitive to Gentamycin, Kanamycin, Erythromycin and Chloramphenicol.

TABLE I
Antibiotics sensitivity test of *Pseudomonas syringae* pv. *syringae* collected from litchi leaf blight of Rajshahi, Chapai Nawabgonj and Dinajpur

Location	Antibiotics	Reaction of isolates		
		Resistant (R) mm	**Intermediate (I) mm**	**Sensitive (S) mm**
Rajshahi	GEN- 0.05	-	LR3 (14.00)	LR1 (17.00), LR2 (16.50), LR4 (17.50)
	E- 0.05	LR4 (13.50)	LR1 (16.50), LR2 (17.00), LR3 (17.00)	-
	DO- 0.05	LR1 (11.00), LR2 (10.00), LR3 (0.00), LR4 (8.00)	-	-
Chapai Nawabgonj	GEN- 0.05	-	LC2 (14.00)	LC1 (17.00), LC3 (15.00), LC4 (17.00)
	E- 0.05	LC1 (0.00), LC3 (7.00)	-	LC2 (40.00), LC4 (35.00)
	DO- 0.05	LC1 (0.00), LC2 (12.00), LC3 (0.00), LC4 (0.00)	-	-
Dinajpur	GEN- 0.05	-	LD3 (14.00)	LD1 (15.00), LD2 (15.00), LD4 (16.00)
	E- 0.05	-	LD1 (16.00), LD4 (18.00)	LD2 (28.00), LD3 (35.00)
	DO- 0.05	LD1 (11.00), LD2 (10.00), LD3 (9.00)	LD4 (16.00)	-

Legend: GEN= Gentamycin, E= Erythromycin, DO= Doxycycline

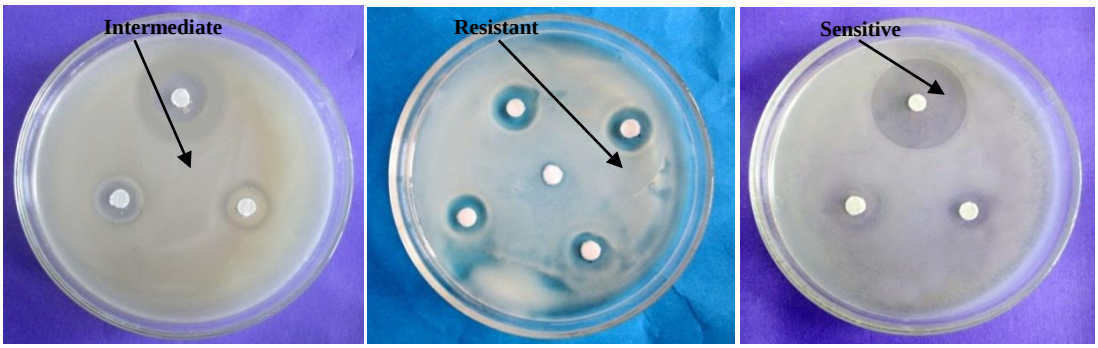

Fig. 5 Antibiotic sensitivity pattern of *Pseudomonas syringae* pv. *syringae*

C. Management of bacterial leaf blight of litchi

In the present study the management of bacterial leaf blight of litchi (variety: China-3) was done by using antibiotics *viz.,* Gentamycin, Erythromycin, Doxycycline; Copper sulphate and BAU-Biofungicide including an untreated control to evaluate their comparative efficacy. The effect of different treatments on sapling height of litchi were determined and presented in TABLE II. Significant variation of sapling height was observed under different management practices. All the treatments increase the sapling height of litchi over control. Considering the mean sapling height, the highest (108.61 cm) sapling height was observed in T_2 (Erythromycin) which was 36.36% over control followed by T_1 (Gentamycin). In T_5 (BAU-Biofungicide) increase sapling height over control by 14.84%. On the other hand, the lowest increase (8.80%) over control was observed in T_4 (Copper sulphate). But Basak *et al.* [23] reported that increase of sapling height was highest in Gentamycin treated plants. The effect of different treatments on number of branch/ sapling of litchi were determined and presented in TABLE III. In case of application of different management practices significant variation in the number of branch/ sapling was observed. Considering the mean of branch/ sapling the highest (10.17) number of branch/ sapling was observed in T_1 (Gentamycin) that was 48.47% higher over control followed by T_2 (Erythromycin). T_5 (BAU-Biofungicide), T_3 (Doxycycline) and T_4 (Copper sulphate) also showed increase number of branch/ sapling over control by 38.83%, 29.64% and 20.73%, respectively. Erythromycin (41.31%) and BAU-Biofungicide (38.83) showed statistically similar effect in increasing number of branch/ sapling. Basak *et al.* [23] found highest number of branch/plant of mango and litchi in Erythromycin and BAU-Biofungicide treated plants. The effect of different treatments on leaf blight incidence of litchi was determined and presented in TABLE IV. All the treatments significantly reduce incidence of bacterial leaf blight of litchi over control. The mean leaf blight incidence of litchi was lowest (7.40%) in T_5 (BAU-Biofungicide) resulting 72.96% reduction over control followed by T_1 (Gentamycin). It had been recorded that the percent disease incidence of bacterial leaf blight of litchi ranged from 7.40% to 27.37%. The findings of the present study corroborate with the findings of Basak *et al.* [23] and Hossain *et al.* [18]. They also found BAU-Biofungicide an effective control measure against bacterial leaf blight disease of litchi. The effect of different treatments on severity of leaf blight of litchi were determined and presented in TABLE V. All the treatments significantly reduce severity of bacterial leaf blight of litchi over control. It had been observed that BAU-Biofungicide was superior to control the severity of bacterial leaf blight of litchi, as the mean leaf blight severity of litchi was lowest (4.77%) in T_5 (BAU-Biofungicide) that reduced 51.38% disease severity over control treatment followed by Gentamycin (31.19%), Erythromycin (26.61%) and Doxycycline (20.29%). Basak *et al.* [23] also reported that application of BAU-Biofungicide resulted maximum reduction (63.03%) of leaf blight over control followed by Copper sulphate. Hossain *et al.* [18] also found BAU-Biofungicide as an effective control measure against bacterial leaf blight disease of litchi under nursery condition.

The mean temperature in 2013-2014 ranged from 17.3 to 29.6 ˚C and rainfall ranged from 0.0 to 338.8 mm, where relative humidity ranged from 64.5 to 86.6% (Fig. 6). Under the above condition, leaf blight incidence and severity ranged from 5.0 to 50.5% and 6.87 to 17.0%, respectively. It has been found that leaf blight incidence was higher under high humid and relatively higher temperature. These findings are also accordance with the findings of Khan [19]. Giladdi *et al.* [24] reported that high humid condition was favoured for infection of Tomato plant causing leaf spot by *P. syringae* pv. *syringae*.

TABLE II

Effect of antibiotics, Copper sulphate and BAU-Biofungicide on height of litchi saplings

Treatments	Sapling height (cm)												Mean sapling height (cm)	% Increase over control
	July 2013	Aug 2013	Sep 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	June 2014		
T_1	96.53a	99.39a	101.93a	104.67a	106.17a	108.67a	109.33a	109.67a	111.56a	112.33a	115.00a	117.17a	107.70	35.22
T_2	100.00a	102.50a	104.27a	106.33a	108.67a	108.93a	109.66a	109.97a	110.33a	112.00a	114.00a	116.67a	108.61	36.36
T_3	77.83b	80.00b	81.67c	84.17c	85.67c	86.27c	87.60c	88.10c	89.10c	91.00c	93.00c	95.50c	86.66	8.80
T_4	78.83b	81.83b	83.27bc	85.00bc	86.67bc	88.43bc	88.60c	89.00c	91.33c	92.50c	94.17c	96.00c	87.97	10.45
T_5	81.67b	83.50b	85.33b	87.87b	89.00b	91.10b	92.57b	93.27b	95.33b	97.33b	99.33b	101.33b	91.47	14.84
T_6	68.67c	71.33c	73.67d	75.67d	77.33d	79.17d	81.00d	82.23d	84.23d	85.50d	87.33d	89.67d	79.65	_
$LSD_{0.05}$	3.88	3.64	3.66	3.60	3.11	3.41	3.45	3.50	3.94	3.79	4.35	2.79		
CV (%)	2.61	2.37	2.33	2.24	1.89	2.05	2.04	2.06	2.29	2.16	2.42	1.54		

TABLE III

Effect of antibiotics, Copper sulphate and BAU-Biofungicide on number of branch per sapling of litchi

Treatments	Number of branch/sapling												Mean number of branch / sapling	% Increase over control
	July 2013	Aug 2013	Sep 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	June 2014		
T_1	9.00a	9.00a	9.00a	9.00a	10.00a	10.00a	10.50a	10.50a	10.50a	10.50ab	12.00a	12.00a	10.17	48.47
T_2	8.60ab	8.60a	8.77a	8.77a	8.77ab	9.00ab	9.00abc	10.00ab	11.00a	11.00a	11.00ab	11.67ab	9.68	41.31
T_3	8.00ab	8.00a	8.00a	8.30a	8.30ab	8.30b	8.30bc	9.00ab	10.00ab	10.00ab	10.00bc	10.33bcd	8.88	29.64
T_4	7.40b	7.40a	8.00a	8.00a	8.00b	8.00b	8.00c	8.50b	8.50b	9.00b	9.00cd	9.50cd	8.27	20.73
T_5	7.73ab	8.50a	8.50a	8.80a	9.00ab	9.00ab	10.00ab	10.00ab	10.00ab	10.50ab	11.00ab	11.00abc	9.51	38.83
T_6	5.00c	5.00b	6.00b	6.50b	6.50c	7.00c	7.00d	7.00c	7.00c	8.00c	8.00d	9.17d	6.85	-
$LSD_{0.05}$	1.59	1.68	1.75	1.58	1.74	1.68	1.80	1.77	1.77	1.98	1.77	1.52		
CV (%)	11.71	12.14	12.50	11.01	11.78	11.29	11.69	11.11	10.71	11.57	9.83	8.00		

Data represents the mean values of three replications

$T_{1=}$ Gentamycin applied as foliar spray @ 0.05%, $T_{2=}$ Erithromycin applied as foliar spray @ 0.05%, $T_{3=}$ Doxycycline applied as foliar spray @ 0.05%, $T_{4=}$Copper sulphate applied as foliar spray @ 0.05%, $T_{5=}$ BAU-Biofungicide applied as foliar spray @ 2% and $T_{6=}$ Untreated control

TABLE IV

Effect of antibiotics, Copper sulphate and BAU-Biofungicide on leaf blight incidence (%) of litchi

Treatments	Disease incidence (%)												Mean	% Reduction over control
	July 2013	Aug 2013	Sep 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	June 2014		
T_1	20.67c	24.21d	26.17d	17.00d	6.53d	3.11e	3.67d	14.99cd	3.64e	3.00c	3.00c	3.17cd	10.76	60.67
T_2	11.70d	7.67f	38.67c	21.00c	10.10c	8.00cd	7.66c	13.98d	5.00d	3.00c	2.50d	2.50d	10.98	59.88
T_3	28.00ab	36.21c	36.00c	22.67c	15.17b	9.00c	8.96c	16.67bc	6.68c	3.22c	3.00c	3.33bc	15.74	43.48
T_4	30.20a	43.00b	43.67b	36.00b	35.13a	17.87b	19.17b	18.67b	10.00b	7.70b	5.33b	4.00b	22.54	17.65
T_5	12.93d	14.82e	16.67e	10.83e	8.37cd	7.33d	4.36d	3.77e	3.00e	2.21d	2.00e	2.50	7.40	72.96
T_6	27.60b	49.67a	50.50a	39.11a	36.25a	26.47 a	29.48a	25.80a	20.97a	10.10a	7.44a	5.00a	27.37	-
$LSD_{0.05}$	2.23	2.88	2.95	2.34	3.28	1.52	1.62	2.13	1.25	0.73	0.41	0.72		
CV (%)	5.71	5.52	4.69	5.38	9.95	7.10	7.41	7.69	8.61	8.51	6.08	11.95		

TABLE V

Effect of antibiotics, Copper sulphate and BAU-Biofungicide on leaf blight severity (%) of litchi

Treatments	Disease severity (%)												Mean	% Reduction over control
	July 2013	Aug 2013	Sep 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	June 2014		
T_1	14.00c	10.00bc	11.17cd	7.00d	5.00d	5.00d	4.00d	7.00c	5.80a	6.86b	5.19c	5.00c	6.75	31.19
T_2	9.00d	12.00ab	13.00bc	7.50cd	6.00c	7.10b	6.40b	6.00d	5.00b	6.00c	4.00d	4.50d	7.20	26.61
T_3	15.00bc	9.17c	12.17bc	8.00c	6.50bc	6.00c	5.50c	7.90b	4.20c	7.50ab	6.00b	6.00b	7.82	20.29
T_4	18.00a	13.00a	14.00ab	10.00b	7.00b	6.70bc	5.00c	4.00e	3.43d	5.16d	5.67bc	5.17c	8.09	17.53
T_5	11.00d	8.17c	9.17d	5.00e	4.00e	4.00e	3.00e	3.00f	2.80d	2.67e	2.00e	2.50e	4.77	51.38
T_6	17.00ab	14.00a	15.17a	11.00a	8.00a	8.20a	7.70a	9.00a	6.00a	8.00a	6.80a	6.87a	9.81	-
$LSD_{0.05}$	2.51	2.42	2.04	0.72	0.72	0.73	0.72	0.73	0.72	0.72	0.72	0.36		
CV (%)	10.11	12.34	9.19	5.05	6.72	6.72	7.76	6.73	9.00	6.76	8.26	4.07		

Data represents the mean values of three replications

T_1 = Gentamycin applied as foliar spray @ 0.05%, T_2= Erithromycin applied as foliar spray @ 0.05%, T_3= Doxycycline applied as foliar spray @ 0.05%, T_4=Copper sulphate applied as foliar spray @ 0.05%, T_5= BAU-Biofungicide applied as foliar spray @ 2% and T_6= Untreated control

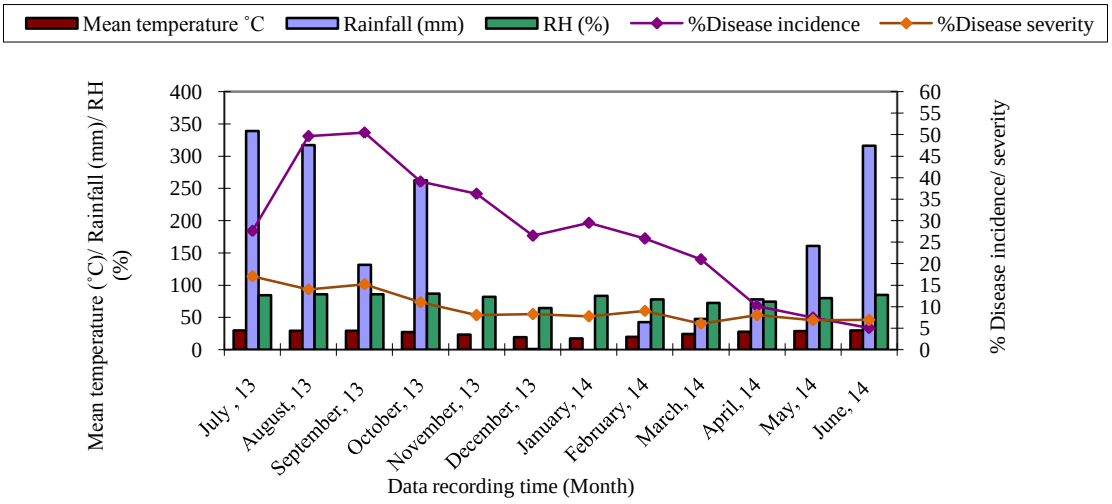

Fig. 6 Effect of weather factors on the incidence and severity of bacterial leaf blight disease of litchi in 2013-2014

IV. CONCLUSION

From the findings of the study it may be concluded that leaf blight of litchi is one of the serious problems in Bangladesh which is caused by *P. syringae* pv *syringae*, an emerging disease as well as threat for production of healthy litchi saplings in different nurseries especially in Northern region of Bangladesh In *in-vitro* test of antibiotic sensitivity it is found that *P. syringae* pv *syringae* was sensitive to Gentamycin and Erythromycin. But BAU-Biofungicide was found to be most effective than antibiotics among all the treatments used in controlling bacterial leaf blight disease of litchi under nursery condition. BAU-Biofungicide could be used an alternative means of leaf blight disease control of litchi.

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