International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(10): 669-674
www.biochemjournal.com
Received: 22-07-2025
Accepted: 27-08-2025

Nataraja KD
Department OF Plant Pathology, University of Horticulture Sciences Bagalkot, Karnataka, India

Ambika DS
Assistant Professor, Department OF Plant Pathology, College of Horticulture, University of Horticulture Sciences Bagalkot, Karnataka, India

Kiran Kumar KC
Associate Professor, College of Horticulture, Mysore, Department of Plant Pathology, University of Horticulture Sciences Bagalkot, Karnataka, India

Corresponding Author:
Nataraja KD
Department OF Plant Pathology, University of Horticulture Sciences Bagalkot, Karnataka, India

Integrated disease management of onion leaf rot under field condition

Nataraja KD, Ambika DS and Kiran Kumar KC

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i10Sh.5905

Abstract
The leaf rot of onion is caused by *Enterobacter cloacae*, which is recently found disease of onion in Karnataka. It is causing considerable damages in the Onion growing areas of Karnataka. Hence the field management to overcome this disease has become more important. In present investigation leaf rot disease of onion was managed by using integrated approaches lby using bactericides, botanicals and bio agents under the field condition. The highest reduction was recorded by treatment T_1 (streptocycline at 500 ppm + copper oxy chloride at 0.3%) followed by treatment T_3 (2-bromo-2 nitropropane-1, 3-diol (Bactinash-200) at 500 ppm + Copper hydroxide at 0.2%). However, the least reduction was found in case of treatment T_8 (*Bravibacillus* spp. 10^8 cfu/ml).

Keywords: Onion, leaf rot, *Enterobacter cloacae*, management

Introduction
The onion (*Allium cepa* L.) belongs to the family Amaryllidaceae. The onion crop is originated in Central Asia. There are five important species of Allium of which the onion (*Allium cepa*) is the major cultivated species grown all over the world. As a vegetable and spice, it is used both as tender and mature bulb. Onion contains Vitamin A, thiamine, riboflavin, niacin, ascorbic acid, beta-carotene and lachrymatic compounds having antioxidant activity that helps to fight against cancer and chronic diseases (Jorjandi *et al*., 2009) [5]. The pungency of the onion bulbs is due to the presence of a volatile oil that is allylpropyl disulfide. The crop suffers from various diseases caused by virus, bacteria, fungus, and nematodes. Among these diseases onion leaf rot caused by *Enterobacter cloacae*, a bacterial pathogen is causing more losses in Onion growing areas of Karnataka.

Materials and Methods
Field evaluation of effective bactericides/botanicals/bioagents against disease
The study was conducted in the farmer's field at Mamatageri village (Badami taluk) from June to September 2018. The investigation was done to study the effectiveness of different chemicals against leaf rot disease of onion. The treatments were fixed based on the effectiveness under *in vitro* studies. Spraying method was carried out after every 15 days intervals. There were three diseased plants tagged per treatment from which the readings were taken.

Multiplication of bio agents
The purified mother culture was taken from the Petri plate on which the bio agent was grown. The bacterial colony was taken in a loop and inoculated into the nutrient broth in a sterilized conical flask and incubated in the orbital shaker at 28±2 °C at 200 rpm for 48 hours. After incubation the turbid medium was taken and it was used in the field for application after diluting with the sterile water at 10 lit of water/100 ml of broth, such that it should be reached to a population of 10^8 cfu/ml (Vijayan *et al*., 2013) [7].

Extraction of plant extracts
About 200 g of *Prosopis juliflora* was taken and washed in tap water, later rinsed in distilled water then added to the mixer jar and ground in the ratio of 1:1. This mixture is kept overnight for the release of metabolites in to the solution.

Next day, this grinded mixture was filtered using muslin cloth. About 5 times the dilution *i.e*. 1litre of water is added to the obtained solution to make volume of 1:5 and this diluted solution was sprayed on the plants in field.

3.8.3 Details of the experimental plots in farmer's fields

Location: Mamatageri
Design: Randomized Block Design (RBD)
Crop: Onion
Number of treatments: 09
Number of Replications: 03
Plot size: 5 × 5 m
Number of sprays: Need based

R1	R2	R3
T_1	T_4	T_5
T_2	T_8	T_9
T_3	T_1	T_6
T_4	T_7	T_4
T_5	T_9	T_7
T_6	T_2	T_1
T_7	T_5	T_3
T_8	T_6	T_8
T_9	T_3	T_2

Observations to be recorded

- Per cent disease incidence
- Number of lesions per leaf

The following observations were recorded and analysed with standard methods.

Percent disease incidence

About 100 plants were checked for the disease incidence per treatment; the observations were recorded based on total no. of plant over number of plants infected. The observations of individual plants per treatment were taken and then average was taken by calculating all other plots of different replications.

Number of lesions per leaf

About three infected plants were tagged randomly per treatment; the observation on total no. of infected lesions per leaf has been taken from individual plants.

Statistical analysis

Experimental data obtained were subjected to statistical analysis by adopting Fisher's method of analysis of variance at 5 percent level of significance in 'F' test. Critical difference values were calculated for each observation using table't' values at 5% level of significance. Then, the differences between treatment mean were compared with the critical difference values to know their significance.

Benefit: Cost ratio

Economics of the experiment was worked out taking into consideration the cost of individual treatments and income got in return from each of the treatments.

Results

The antibiotics/botanicals/bio agents which were found effective under *in vitro* were evaluated under field condition against disease and effectiveness of these against the disease was recorded.

The experiment was conducted in farmer's field at Mamatageri village, Bagalkote, Karnataka. The details of the experimental treatments were mentioned in materials and methods and the results were presented in Plate 1 and 2.

Per cent disease incidence

The data on percent disease incidence were presented in Table 1 revealed that the treatments like T_1 and T_2, T_3 and T_4, T_7 and T_8, were on par with each other. The percent disease incidence was 33.55% before spray in T_1 (streptocycline at 500 ppm + copper oxy chloride at 0.3%), which was subsequently reduced to 24.88 and11.40 percent after first and second sprays respectively. It was followed by T_3 (2-bromo-2-nitro propane-1, 3, diol (Bactinash-200) at 500 ppm + copper hydroxide at 0.2%) with 34.59% beforespray and reduced to 25.37 and 12.45 percent after each sprays. Similarly in case of treatment T_2 (2-bromo-2 nitropropane-1, 3-diol (Bactinash-200) at 500 ppm + copper oxy chloride at 0.3%) the percent disease incidence recorde before spray was, 34.48% and gradually decreased to 26.17% and 17.35% after each sprays respectively.

Among the different treatments, the highest reduction (77.83%) of percent disease incidence was recorded by treatment T_1 (streptocycline at 500 ppm + Copper oxy chloride at 0.3%), followed by treatment T_3 (2-bromo-2 nitropropane-1, 3-diol (Bactinash-200) at 500 ppm + copper hydroxide at 0.2%) and T_2 (2-bromo-2 nitropropane-1, 3-diol (Bactinash-200) at 500 ppm + copper oxy chloride at 0.3%) with 75.79 and 71.76 percent respectively. However, the least reduction (47.73%) of percent disease incidence was found in case of treatment T_8 (*Bravibacillus spp*. 10^8 cfu/ml). Whereas in the water control recorded 34.87% before spray and gradually increased to 39.64 and 51.43% after each spray.

Number of lesions per leaf

The data on number of lesions per leaf were presented in the Table 2 and it revealed that the treatments T_4 and T_7 were on par with each other.

The number of lesions per leaf in treatment T_1 (streptocycline at 500 ppm + copper oxy chloride at 0.3%) before spray was 3.0 and decreased to 2.13 and 1.10 after subsequent sprays. This was followed by treatment T_3 (2-bromo-2 nitropropane-1, 3-diol (Bactinash-200) at 500 ppm + copper hydroxide 0.2%) recoded 3.20 before spray and decreased to 2.23 and 1.17 number of lesions per leaf. While treatment T_2 (2-bromo-2 nitropropane-1, 3-diol (Bactinash-200) at 500 ppm + copper oxy chloride at 0.3%) recorded 3.30 number of lesions per leaf before spray and reduced to 2.35 and 1.45 after 1st and 2nd sprays respectively (Table 2).

The highest reduction (76.24%) of no. of lesions per leaf was recorded by treatment T_1 (streptocycline at 500 ppm + copper oxy chloride at 0.3%) followed by treatment T_3 (2-bromo-2 nitropropane-1, 3-diol (Bactinash-200) at 500 ppm + Copper hydroxide at 0.2%) and T_2 (2-bromo-2 niropropane-1, 3-diol + copper oxy chloride at 0.3%) with 74.73 and 68.68 percent respectively. However, the least reduction (46.65%) of no. of lesions per leaf was found in case of treatment T_8 (*Bravibacillus* spp. 10^8 cfu/ml). In the water control there was increase in number of lesions per leaf before spray was 2.72 and increased to 3.35 and 4.63 at first and second sprays respectively.

Results also showed that the highest 39.75 ton/ha found in the treatment treatment T_1 *i. e*. streptocycline at 500 ppm +

copper oxy chloride at 0.3%. Followed by 2-bromo-2 nitropropane-1, 3-diol (Bactinash-200) at 500 ppm + Copper hydroxide at 0.2% (36.95 t/ha), 2-bromo-2-nitropropane-1, 3-diol-at 500 ppm (Bactinash-200) + copper oxy chloride at 0.3% (33.58 t/ha), 2-bromo-2-nitropropane-1, 3-diol- @ 500 ppm (31.38 t/ha), copper hydroxide @ 0. 2% (29.33 t/ha), copper oxy chloride @ 0. 3% (27.2 t/ha), *Prosophis juliflora* @ 5% (27.5 t/ha), *Bravibacillus spp*.-10^8 cfu/ml (25.58 t/ha) and in water control treatment (14.27 t/ha).

The highest B:C (1:5.18) was recorded in treatment T_1 (streptocycline at 500 ppm (K-cycline) + copper oxy chloride at 0.3%). This was followed by treatment T_3 (2-bromo-2-nitropropane-1, 3-diol-at 500 ppm (Bactinash-200) + copper oxy chloride at 0.3% (1: 4.79). The least B:C ratio (1: 3.40) was recorded in case of treatment T_8 *i. e. Bravibacillus* spp. 10^8 cfu/ml. Water control shown the B:C ratio of 1:3.01.

However, the highest incremental cost benefit ratio of 27.87 found in treatment streptocycline @ 500 ppm + copper oxy Chloride @ 0.3%, followed by 2-bromo-2-nitropropane-1, 3-diol- @ 500 ppm (24.46), 2-bromo-2-nitropropane-1, 3-diol- @ 500 ppm + copper hydroxide @ 0.2% (22.15). The least incremental cost benefit ratio was observed in *Bravibacillus spp*.-10^8 cfu/ml (8.36) (Table 19)

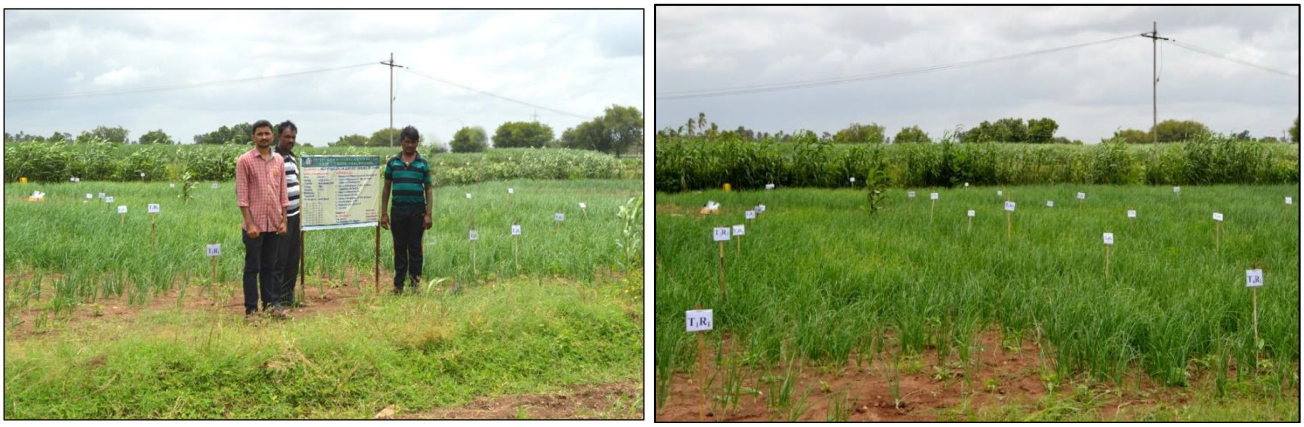

Plate 1: General view of field experiment

a) Effect of Streptocyclin at 500 ppm (K-cyclin) + copper oxychloride at 0.3%

b) Effect of 2-bromo-2 nitro 1,3-diol at 500 ppm (K-cyclin) + copper hydroxide at 0.2%

c) Control

Plate 2: Effect of antibiotics, botanicals and bioagents against leaf rot disease of onion under field condition

Table 1: Effect of Antibiotics, botanicals and bio-agents on percent disease incidence of leaf rot disease of Onion

Sl. No.	Treatments	Before spray	Percent disease incidence after each spray			
			After First spray	% reduction	After Second spray	% reduction
T_1	Streptocyclin @ 500 ppm + Copper oxy chloride @ 0. 3%	33.55 (33.96)	24.88 (29.90)	37.23	11.40 (19.72)	77.83
T_2	2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm + Copper oxy chloride @ 0.3%	34.48 (37.97)	26.17 (30.75)	33.99	17.35 (24.60)	71.76
T_3	2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm + Copper hydroxide @ 0.2%	34.59 (34.81)	25.37 (30.23)	35.99	12.45 (20.63)	75.79
T_4	Copper oxy chloride @ 0. 3%	34.10 (33.91)	29.78 (33.05)	24.87	23.81 (29.19)	53.70
T_5	Copper hydroxide @ 0. 2%	32.17 (36.51)	28.75 (32.39)	27.47	22.44 (28.26)	56.36
T_6	2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm	34.59 (32.24)	27.28 (31.45)	31.19	15.66 (23.29)	62.20
T_7	*Prosophis juliflora*- @ 5%	36.28 (32.89)	32.39 (34.66)	18.29	25.47 (30.29)	50.48
T_8	*Bravibacillus spp*.-10^8 cfu/ml	38.14 (33.40)	34.33 (35.85)	13.39	26.88 (31.20)	47.73
T_9	Water control	34.87 (32.25)	39.64 (39.00)	0	51.43 (45.80)	0
	CD	NA	4.28		2.92	
	SEm±	4.68	1.42		0.97	

*Figures in the parenthesis are Arc transformed

Table 2: Effect of Antibiotics, bio agents and bio-agents on No. of lesions per leaves of leaf rot disease of Onion

Sl. No.	Treatments	No. of lesions per leaf after each spray				
		Before spray	After first spray	% reduction	After second spray	% reduction
T_1	Streptocyclin @ 500 ppm + Copper oxy Chloride @ 0. 3%	3.0 (9.41)	2.13 (8.34)	36.42	1.10 (6.00)	76.24
T_2	2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm + Copper oxy Chloride @ 0.3%	3.30 (12.79)	2.35 (8.81)	29.85	1.45 (6.91)	68.68
T_3	2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm + Copper hydroxide @ 0.2%	3.20 (12.45)	2.23 (8.57)	33.43	1.17 (6.20)	74.73
T_4	Copper oxy Chloride @ 0. 3%	3.06 (12.04)	2.61 (9.29)	22.09	2.37 (8.84)	48.81
T_5	Copper hydroxide @ 0. 2%	2.9 (11.86)	2.53 (9.15)	24.48	2.23 (8.52)	51.84
T_6	2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm	3.1 (11.9)	2.42 (8.93)	27.76	1.63 (7.31)	64.79
T_7	*Prosophis juliflora*- @ 5%	3.22 (11.67)	2.76 (9.54)	17.61	2.40 (8.92)	48.16
T_8	*Bravibacillus spp*.-10^8 cfu/ml	3.47 (14.78)	2.83 (9.66)	15.52	2.47 (9.00)	46.65
T_9	Water control	2.72 (9.45)	3.35 (10.55)	0	4.63 (12.42)	0
	CD	NA	1.064		0.916	
	SEm±	0.05	0.310		0.083	

*Figures in the parenthesis are Arc transformed

Table 3: Benefit cost ratio and incremental cost benefit ratio of the experimeriment conducted at farmer's field.

Treatments	Yield (Ton/ha)	Incremental yield over control (t/ha)	Returns per hectare (Rs)	Incremental return over control (Rs)	Incremental cost (Rs)	Cost of cultivation (Rs)	Total cost/ha (Rs)	B:C	ICBR	Net returns (Rs)
T_1 (Streptocyclin @ 500 ppm + Copper oxy Chloride @ 0. 3%)	39.75	18.35	3,97,500	1,83,500	6585	70,130	76,715	5.18	27.87	3,20,785
T_2 (2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm + Copper oxy Chloride @ 0.3%)	33.58	33.58	3,35,800	1,21,800	6330	70,130	76,460	4.39	19.24	2,59,340
T_3 (2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm + Copper hydroxide @ 0.2%)	36.95	36.95	3,69,500	1,55,500	7020	70,130	77,150	4.79	22.15	2,92,350
T_4 (Copper oxy Chloride @ 0. 3%)	27.2	27.2	2,72,000	58,000	3250	70,130	73,380	3.71	17.85	1,98,620
T_5 (Copper hydroxide @ 0. 2%)	29.33	29.33	2,93,300	79,300	3740	70,130	73,870	3.97	21.20	2,19,430
T_6 (2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm)	31.33	31.38	3,13,800	99,800	4080	70,130	74,210	4.23	24.46	2,39,590
T_7 (*Prosophis juliflora*- @ 5%)	27.5	27.5	2,75,000	61,000	3000	70,130	73,130	3.76	20.33	2,01,870
T_8 (*Bravibacillus spp*.-10^8 cfu/ml)	25.58	25.58	2,55,800	41,800	5000	70,130	75,130	3.40	8.36	1,80,670
T_9 (Water control)	21.4	00	2,14,000	0	1000	70,130	71,130	3.01	0.00	1,42,870

Discussion

The highest reduction in percent disease incidence of leaf rot disease was shown by treatment T_1 (streptomycine (K-cycline) 500 ppm + copper oxy chloride at 0.3%) with reduction of 77.83 (%). It was followed by treatment T_3 (2-bromo-2-nitropropane-1, 3-diol-at 500 ppm (Bactinash-200) + copper hydoxide at 0.2%) with reduction in percent disease incidence of 75.79 (%). The least reduction of percent disease incidence was shown by treatment T_8 (*Bravibacillus* spp. 10^8 cfu/ml) with 47.73 (%) reduction.

The highest reduction in no. of lesions on leaf was shown by treatment T_1 (streptomycin (K-cyclin) 500 ppm + copper oxy chloride (0.3%) with 76.24(%) reduction. This was followed by treatment T_3 (2 bromo-2-nitropropane-1, 3-diol-at 500 ppm (Bactinash-200) + copper hydoxide at (0.2%) with 74.73(%) reduction in no. of lesions on leaf. The least reduction (46.65%) in no. of lesions on leaf was shown by treatment T_8 (*Bravibacillus* spp. 10^8 cfu/ml). The results were depicted in Plate 1 and 2.

The results were found in close proximity with earlier investigations of Nagarale *et al*. (2013) who were carried out an experiment on efficacy of antibiotics and bactericides on the management of "tip-over" disease of banana under field condition. They were used the antibiotics and bactericides *viz*., K-cycline (500 ppm), Strerptocyclin (500 ppm), Norflox (400 ppm), sterptocyclin + $CuSO_4$ (500 + 3000 ppm), K-cycline + $CuSO_4$ (500 + 3000 ppm), Norflox + $CuSO_4$ (400 + 3000 ppm), bleaching powder-8 kg/ha, K-cycline + Carbendazim (500 + 1000 ppm), Emisan-6(500 ppm). Rhizosphere soil was drenched thrice with streptocycline either alone or in combination with copper sulphate or k-cycline + copper sulphate was completely suppressed the disease (100%).

Nagaraj *et al*. (2012) [6] were conducted experiment on management of tip-over disease of banana by using biological agents and botanicals under field condition. They were tested various bioagents *viz*., *Bacillus subtilis*, *Pseudomonas fluorescence*, *Glomus fasciculatum* and the botanicals *viz*., citronella, closcimum and an organic formulation the modified Panchagavya [MPG-3]. The data of study revealed that, among the bio agents *Bacillus subtilis* totally suppressed the disease (100%). This was followed by *Pseudomonas fluorescens* and VAM fungi (*Glomus fasciculatum*) in which (87.5%) control was observed over control. The organic amendment *i.e*., modified panchagavya controlled the disease incidence by (75%), while plant extracts of both the botanicals were giving (62.5%) control each.

Botanical management of *Xanthomonas citri sub sp*. *citri* under the field condition was conducted by Chetankumar during 2016. They found that among the different combinations of botanicals *viz*., *Garcinia indica* @ 5 percent with streptocycline and *Prosopis juliflora* @ 5% along with streptocycline were found effective against citrus canker causing bacteria, *Xanthomonas citri* subsp *citri* under field condition.

Aysana *et al*. (2003) [1] were conducted research on biological control of bacterial stem rot caused by *Erwinia chrysanthemi* on tomato. Eight out of 13 selected isolates reduced the disease development between 89% and 33%. One of the antagonists provided a good level (74% protection) on tomato plants against *E*. *chrysanthemi* in field condition.

Xianling *et al*. (2008) [8] were conducted an experiment on bio control management of mulberry by using different strains of *Bacillus subtilis* against bacterial wilt (*Ralstonia solanacearum*). Among 4 (L_1, L_2. L_3, L_4) strains *Bacillus subtilis* has controlled maximum percentage of disease.

The highest yield of 39.75 ton/ha found in the treatment treatment streptocycline at 500 ppm + copper oxy chloride at 0.3%. It was followed by 2-bromo-2 nitropropane-1, 3-diol (Bactinash-200) at 500 ppm + copper hydroxide at 0.2% (36.95 t/ha). The least yield was observed in *Bravibacillus* spp.-10^8 cfu/ml (25.58 t/ha) and in water controlled treatment (14.27 t/ha).

The highest B:C ratio was (1:5.18) was recorded in treatment T_1 (streptocycline at 500 ppm (K-cycline) + copper oxy chloride at 0.3%). This was followed by treatment T_3 (2 bromo-2-nitropropane-1, 3-diol-at 500 ppm (Bactinash-200) + copper oxy chloride at 0.3% (1: 4.79). The least B:C ratio (1: 3.40) was recorded in case of treatment T_8 *i. e. Bravibacillus* spp. 10^8 cfu/ml. Water control showed the B:C ratio of 1:3.01.

However, the highest incremental cost benefit ratio of 27.87 found in treatment streptocycline @ 500 ppm + copper oxy Chloride @ 0. 3%, followed by 2 Bromo-2-nitropropane-1, 3-diol- @ 500 ppm (24.46). The least incremental cost benefit ratio was observed in *Bravibacillus* spp.-10^8 cfu/ml (8.36).

Conclusion

The results on evaluation of chemicals, botanicals and bio agents against leaf rot disease revealed that, among the treatments, T_1 (Streptocycline at 500 ppm + Copper oxy chloride (0.3%) was found most effective. In which the percent reduction of disease in terms of percent disease incidence (77.83%) and number of lesions per branch (76.24%).

It was followed by treatment, 2 bromo-2-nitropropane-1, 3-diol-at 500 ppm + copper hydroxide at 0.3 (%), which was reduced the number of lesions on leaf (75.79%) and percent disease incidence (74.73%). The *Bravibacillus spp*.-10^8 cfu/ml of the disease was recorded least reduction in disease incidence and number of lesions per leaf (47.73%, 46.65%), respectively.

The highest yield of 39.75 ton/ha found in the T_1 *i. e.* streptocycline at 500 ppm + copper oxy chloride at 0.3 percent. The least yield was observed in *Bravibacillus spp*.-10^8 cfu/ml (25.58 t/ha) and in water control treatment have shown 14.27 t/ha yield.

The highest B:C (1:5.18) was recorded in treatment, streptocycline at 500 ppm + copper oxy chloride at 0.3 (%). The least B:C ratio (1: 3.40) was recorded in case of treatment T_8 *i. e. Bravibacillus* spp. 10^8 cfu/ml. Water control shown the B:C ratio of 1:3.01.

However, the highest incremental cost benefit ratio of 27.87 found in treatment streptocycline @ 500 ppm + copper oxy chloride @ 0. 3% and least incremental cost benefit ratio was observed in *Bravibacillus spp*.-10^8 cfu/ml (8.36).

Acknowledgments

The authors gratefully acknowledge the Dept. Plant Pathology for providing guidance during my research period and helping in publishing the research paper.

References

1. Aysana Y, Karatasb A, Cinara O. Biological control of bacterial stem rot caused by *Erwinia chrysanthemi* on tomato. Crop Prot. 2003;22:807-811.
2. Baloch MA, Baloch AF, Baloch G, Ansari AH, Qayyum SM. Growth and yield response of onion to different nitrogen and potassium fertilizer combination levels. Sarhad J Agric. 1991;4(4):63-67.
3. Chethankumar K, Kirankumar KC, Patil HB, Mushrif SK, Babu AG. In-vitro evaluation of different chemicals, bioagents and botanicals against *Xanthomonas citri* subsp *citri*. J Pure Appl Microbiol. 2017;11(1):615-622.
4. Fritschen RM, Friesen N. Evolution, domestication and taxonomy. In: Rabinowitch D, Currah L, editors. *Allium*. Crop Sci Rec Adv. 2002:5-30.
5. Jorjandi MS, Bonjar GHS, Baghizadeh A, Sirchi GRS, Massumi H, Baniasadi F, *et al*. Biocontrol of *Botrytis alli* Munn, the causal agent of neck rot, the post-harvest disease in onion, by use of a new Iranian isolate of *Streptomyces*. J Agri Biol Sci. 2009;4(2):72-78.
6. Nagaraj MS, Umashankar N, Palanna KB, Khan ANA. Etiology and management of tip-over disease of banana by using biological agents. Int J Agri Biol Res. 2012;2(3):483-486.
7. Vijayan M, James E, Reghu R, Roshini PR. A study on morbidities associated with psoriasis. Int Res J Pharm. 2013;4(2):[pages not provided].
8. Xianling Lu J, Guobing G, Yingping Z, Chengchao M, Zhimei. Biological control against bacterial wilt and colonization of mulberry by an endophytic *Bacillus subtilis* strain. Microb Ecol. 2008;65(3):565-573.