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RESEARCH ARTICLE

INTEGRATED MANAGEMENT OF CHILLI LEAF SPOT CAUSED BY *ALTERNARIA ALTERNATA* AND *CERCOSPORA CAPSICI* UNDER FIELD CONDITIONS.

DEVAPPA V AND THEJAKUMAR M.B.**
Professor & Head, Dept. of Plant Pathology, College of Horticulture, UHS Campus, GKVK, Bengaluru -560 065.

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Corresponding Author
DEVAPPA V.

Abstract

With regards to management of *Alternaria* and *Cercospora* leaf spot diseases of chilli, lowest per cent disease index was observed in combination spray of Tilt 25% EC @ 0.05% + *Eucalyptus* spp. @ 10% + *Pseudomonas fluorescens* @ 5g/ lt which was followed by spray with Tilt 25% EC @ 0.05% + *P. fluorescens*@ 5g/ lt. Plant height was maximum (at 75 and 105 day after transplanting) in treatment with combination spray of Tilt 25% EC @ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens* @ 5g/ lt which was followed by spray with Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt. Number of fruits infected per plant was found less in treatment with combination spray of Tilt 25% EC @ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens* @ 5g/ lt which was followed by spray with Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt. The maximum yield (286.67 g/plant) was recorded in treatment Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt. which was on par with treatment Tilt 25% EC@ 0.05% + *P. fluorescens*@ 5g/ lt. (273.33 g/plant).

Introduction:-

Chilli (*Capsicum annuum* L.) is one of the important cash earning crop, mainly cultivated for its vegetable green chilli and dry chilli as a spice of commerce. India is the largest chilli producer and contributes to about 25 per cent to total world production followed by China and Pakistan (Anon., 2010 a).Within our country Andhra Pradesh is the major producer of chilli and contributes to about 51% to Indian chilli production followed by Karnataka (9%), Madhya Pradesh (11%), Rajasthan (5%) and West Bengal (4%) *etc*. (Anon., 2010 b). In Karnataka, Haveri district leads both in area and production of green chilli followed by Belgaum, Raichur and Gulburga. In dry chilli, Dharwad leads followed by Haveri, Bellary and Raichur (Anon., 2009). The crop having many uses and at the same time it is surrounded by many threats, for this disease is not an exceptional factor. Fungi, bacteria, viruses, nematodes and abiotic stress are the causal entities for this. Among fungal diseases, leaf spot caused by *Alternaria alternate* (Fr.) Keissler and *Cercospora capsici* Heald and Wolf causing damage from seed to seed stage in chilli. As foliar pathogen they are more severe compared to their seed borne nature in many regions around the world. These pathogens will cause damage to crop from early stage itself. In later stages pathogens cause damage to fruits also, ultimately less yield and reduction in quality of the produce. Li *et al.* (2011) reported that 70-80 per cent chilli fields are affected with *Alternaria* spp. in Shouguang district. In Karnataka, crop losses due to *Cercospora* have been reported up to 45 per cent in groundnut (Siddaramaiah *et al.*, 1983).

Material and methods:-

A field experiment was conducted during *rabi* 2011-12 at KRC College of Horticulture, Arabhavi in order to estimate the disease severity due to leaf spot disease on chilli and to find out a suitable management strategy in managing the disease at field level. Cultivar *Byadagi Dabbi* was transplanted with spacing of 60 x 45 cm and crop was grown according to package of practice. Spray schedule was initiated when disease was started in 30 days intervals. Three spray of individual treatment and two spray of combination treatment were given.

Field experiment was divided into Randomized Complete Block Design (RCBD), includes eight treatments with three replications. Five plants in each sub plot were scored for disease in four intervals by using 0-5 scale and data were converted into Per cent Disease Index (PDI). The growth and yield parameters were recorded.

The details of the treatments used in experimental plot are given here under.

Treatment No.	Treatments details
T_1	Tilt 25% EC @ 0.05%
T_2	*Eucalyptus* spp. @10 %
T_3	*Pseudomonas fluorescens* @ 5 g/ lt. (commercial formulations)
T_4	Tilt 25% EC @ 0.05% + *Eucalyptus* spp. @10 %
T_5	Tilt 25% EC @ 0.05% + *Pseudomonas fluorescens*@ 5 g/lt.
T_6	*Eucalyptus* spp. @10 % + *Pseudomonas fluorescens* @ 5 g/lt.
T_7	Tilt 25% EC @ 0.05% + *Eucalyptus* spp. @10 % + *Pseudomonas fluorescens* @ 5 g/lt.
T_8	Control

Results:-

This study was under taken to evaluate the relative efficacy of best performing fungicide, plant leaf extract and best bio- agent from *in- vitro* study *viz*., Tilt 25% EC @ 0.05% (Propiconazole 25% EC), *Eucalyptus* spp. @ 10% and *Pseudomonas fluorescens* at 5 g/lt respectively are taken up for foliar spray against *Alternaria* and *Cercospora* leaf spot of chilli. The experiment was conducted during *rabi* season of 2011-12 with eight treatments *viz*. **T_1**- Tilt 25% EC @ 0.05%, **T_2**- *Eucalyptus* spp. @ 10%, **T_3**- *Pseudomonas fluorescens* @ 5g/ lt., **T_4**- Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10%, **T_5**- Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt., **T_6**- *Eucalyptus* spp. @ 10% + *P. fluorescens* @ 5g/ lt., **T_7**- Tilt 25% @ EC 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens* @ 5g/ lt. and **T_8**- Control (without spray). Totally three set of sprays were given at 30 days interval starting from the initiation of the disease (45 days after planting). The observations on *Alternaria* and *Cercospora* leaf spot were recorded at 45, 60, 75 and 120 days (>50% fruits are in red stage) after transplanting. Further, these observations were recorded by following 0-5 disease scale and converted into per cent disease index (PDI) using the formula given by wheeler (1969).

Per cent disease index (PDI):-

The data on per cent disease index (PDI) of *Alternaria* leaf spot is presented in Table 1 and from the data it is observed that in 45, 60, 75 DAP and >50% fruits ripening stage, all the treatments differ significantly over unprotected control. The PDI is increasing as the number of days increasing from the day after transplanting (DAT). In 45 DAT least PDI was observed in T_7- Tilt 25% @ EC 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens* @ 5g/ lt (4.00) which was on par with T_4- Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10% (5.33), T5-Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt (6.67) and T_1-Tilt 25% EC @ 0.05% maximum PDI (14.67) was noticed in untreated control.

In 60 DAT least PDI was observed in T_7- Tilt 25% @ EC 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens* @ 5g/ lt (10.67) which was on par with T_5- Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt. (14.67) maximum PDI (33.33) was noticed in untreated control. They are superior compared to untreated control. The same trend was continued in whole cropping season. At the stage of more than 50% fruits are at ripened least PDI was observed in T_7- Tilt 25% @ EC 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens* @ 5g/ lt (28.00) which was on par with T_5- Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt. (30.67), they were significantly superior over all the treatment and maximum PDI (57.33) was noticed in untreated control.

The data on PDI of *Cercospora* leaf spot is presented in Table 2 and from the data it is observed that in 45, 60, 75 DAP and >50% fruits ripening stage, all the treatments differ significantly over unprotected control. The PDI is increasing as the number of days increasing from the DAT. In 45 DAT least PDI was noticed in T_7- Tilt 25% EC @ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens* @ 5g/ lt.(8.00) which was on par with T_5- Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt.(10.67) and T_4- Tilt 25% EC @ 0.05% + *Eucalyptus* spp. @ 10% (12.00), maximum PDI (21.33) was noticed in unprotected control. The same trend was continued up to 75 DAT. In 60 DAT, PDI in T_1- Tilt 25% EC @ 0.05% was (20.00), which were also on par with above treatment.

At the stage of >50% fruits are at ripened least PDI was observed in T_7- Tilt 25% @ EC 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens* @ 5g/ lt (21.33) which was on par with T_5- Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt. (25.33), they were significantly superior over all the treatment and maximum PDI (45.33) was noticed in untreated control.

Growth parameters:-

Plant height:-

The Growth parameter was recorded at 45, 75 and 105 DAT. In 45 DAT highest plant height was observed in treatment T_7- Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt. However there was no significant difference among the treatments. In 75 DAT and 105 DAT all the treatments showed significant differences, highest plant height (73.20cm and 82.70 cm respectively) was observed in T_7- Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt. which was on par (64.73 cm and 70.87 cm respectively) with T_5- Tilt 25% EC@ 0.05% + *P. fluorescens*@ 5g/ lt.. Lowest (50.60 cm and 57.07 cm respectively) was in control (Table 3).

Fruit length:-

Results revealed that maximum fruit length (10.73) was recorded in treatment T_6- *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt. and minimum (10.05) was recorded in T_3- *Pseudomonas fluorescens*@ 5g/ lt.. However, there was no significant difference among the treatments.

Number of fruits infected per plant:-

All the treatments in number of fruits infected per plant of chilli were differing significantly. Results revealed that minimum (0.53) number of fruits infected per plant observed in treatment T_7- Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt. which was on par (0.67) with T_5- Tilt 25% EC@ 0.05% + *P. fluorescens*@ 5g/ lt.. Maximum (3.93) infection was observed on unprotected control.

Days for first harvest per plot:-

Result revealed that minimum (96.67) days taken for first harvest per plot was recorded in treatment T_1- Tilt 25% @ EC 0.05% and maximum (102) was in T_2- *Eucalyptus* spp. @ 10%. However, there was no significant difference among the treatments.

Fruit yield per plant (g):-

All the treatments in chillifruit yield per plant were differs significantly. The maximum yield (286.67 g) was recorded in treatment T_7- Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt. which was on par with treatment T_5- Tilt 25% EC@ 0.05% + *P. fluorescens*@ 5g/ lt. (273.33 g). Least (165.00) yield was in unprotected control.

Discussion:-

The field experiment was carried out in the farmer's field at Arabhavimata, Gokak during *rabi* 2011-12. The best fungicide and botanicals from *in- vitro* studies *viz*., propiconazole 0.05% and *Eucalyptus* spp. 10 per cent respectively and efficient bacterial bio-agent *Pseudomonas fluorescens* were selected for spray in field conditions for both individual treatments and its combination.

The present result reveals that, per cent disease index (PDI) of *A. alternata* was recorded at four intervals *viz.*, 45, 60, 75 DAT and > 50% fruits were in ripened stage. The treatment T_7- Tilt 25% @ EC 0.05% + Eucalyptus @ 10% + *P. fluorescens* @ 5g/ lt. was effectively managed the *Alternaria* leaf spot disease with PDI ranged from 4.00 to 28.00 which was on par with treatment T_5- Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ litre with a PDI range of 6.67 to 30.67 compared to T_8- control. Maximum PDI was recorded in unprotected T_8- Control with PDI range of 14.67 to 57.33. The data's are statistically significant.

Per cent disease index (PDI) of *C. capsici* was recorded at four intervals. The treatment T_7- Tilt 25% @ EC 0.05% + Eucalyptus @ 10% + *P. fluorescens* @ 5g/ litre was effectively managed the *Cercospora* leaf spot disease with PDI range from 8.00 to 21.33 which was on par with treatment T_5- Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ litre with a PDI range of 10.67 to 25.33 compared to T_8- Control. Maximum PDI was recorded in unprotected T_8- Control with PDI range of 21.33 to 45.33. The data's are statistically significant.

Hence, comparison of two leaf spot in control reveals that, the *Alternaria* leaf spot was recorded least PDI (14.67) in initial stage *i.e.*, 45 DAT. The disease gradually progress and it reaches maximum (57.33) but the *Cercospora* leaf spot was recorded less PDI (21.33) in initial stage of 45 DAT gradually the disease increases in moderate level when compared to *Alternaria* leaf spot and reaches maximum PDI (45.33). This may be due to influence of temperature and relative humidity for both the diseases. The treatment T_7 showed effective management of both the disease which was on par with treatment T_5 compared to control. This may be due to combination of fungitoxic activity of propiconazole (Tilt) and production of sidrophores, antibiotics, competition and antagonistic activity of *P. fluorescens* and fungicidal activity of *Eucalyptus* spp. at the time of application.

The similar results were found with Mesta *et al.* (2003) reported that propiconazole 0.1% was effective against *Alternaria* blight of sunflower. Nagraj and Naik (2003) reported that tilt 0.1 per cent recorded significantly less PDI of *A. solani* by 12.11 to 9.72 compared to control. Propiconazole @ 0.1 per cent found effective against early blight of tomato caused by *A. solani* with a minimum PDI of 28.50, minimum fruit infection (1.1%) and recorded maximum (62.35 t/ ha) fruit yield. (Arunkumara, 2006). Datar (1994) reported that maximum reduction of onion purple blotch caused by *A. porri* was observed with a leaf extract of *Polyanthia longifolia* followed by *Eucalyptus citriodora*. This may be due to fungicidal activity of leaf extracts. Joshi and Gupta (2009) reported that maximum mycelia growth inhibition and significantly the highest yield was recorded in *Datura stramonium* (20.55 q/ha) followed by *Eucalyptus globules* (19.86 q/ha) against leaf spot of chickpea. Babu *et al.* (2000) reported that spraying tomato cv. PKM-1, plants with suspension of the *P. fluorescens* strains 48 hours after inoculation with *A. solani* reduced leaf blight disease by 15-38 per cent compared to control. Indira *et al.* (2006) reported that per cent incidence and severity of *A. alternata* were lowest (19.44 and 13.50 %, respectively) with the treatment (seed harvested at physiological maturity + propiconazole @ 0.02% + *P. fluorescens* @ 1x 108 cfu/ ml) and treatment (seeds harvested at physiological maturity + *P. fluorescens*).

Hundekar *et al.* (2005) reported that spraying propiconazole (0.1%) found to be better in managing the frog eye leaf spot disease of bidi tobacco. Pairashi *et al.* (2007) reported that spraying of carbendazim 50% WP (0.05%) immediately after appearance of the disease followed by another spray at 10-12 days interval recorded minimum disease incidence of frogeye lead spot of tobacco followed by propiconazole 25% EC (0.1%). Pairashi *et al.* (2007) reported that field evaluation of *P. fluroscens* (2 g/lit) to the control of frog eye leaf spot of tobacco recorded minimum disease incidence. Singh *et al.* (2012) reported that pooled data of three years revealed that less per cent disease control (PDC) due to the use of *P. fluorescens* against *Cercospora* leaf spots of cotton ranged from 34.7 to 47.7 per cent.

The present study reveals that plant height was maximum in treatment T_7- Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt. which was on par with T_5- Tilt 25% EC@ 0.05% + *P. fluorescens*@ 5g/ litre. Lowest was recorded in treatment unprotected T_8- Control. However, the data was non-significant at 45 day after transplanting (DAT) while data are statistically significant at 75 and 105 DAT. Trivedi and Pandey (2007) reported that isolates exhibited plant growth promotion abilities such as production of sidrophores, indole acetic acid and antagonized to test fungus *Alternaria alternata*.

The highest number of branches was recorded in treatment T_7- Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt and lowest was recorded in unprotected treatment T_8- Control at three intervals *viz*., 45, 75 and 105 DAT. The data was not statistically significant. However, there is no influence of treatment on number of branches.

The fruit length was recorded maximum (10.73 cm) in treatment T_6- *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt. minimum (10.05 cm) in treatment T_3- *Pseudomonas fluorescens*. The data was not statistically significant. However, there is no influence of treatment on number of branches.

The number of fruits infected per plant was recorded minimum (0.53) in treatment T_7- Tilt 25% EC@ 0.05% + *Eucalyptus* spp. @ 10% + *P. fluorescens*@ 5g/ lt. which was on par (0.67) with T_5- Tilt 25% EC@ 0.05% + *P. fluorescens*@ 5g/ lt.. Maximum (3.93) infection was observed on unprotected control. This may be due to the fungitoxic activity of tilt and antifungal activity of *P. fluorescens*. The similar results were found with Anand *et al.* (2007) reported that *P. fluorescens* isolate 1 (Pfl) was found to protect the chilli fruit against rot fungi *A. alternata*. Chilli fruits treated with Pfl, showed an increase in the total phenols, the activities of the enzymes by inducing the production of defence proteins *viz.* Phenylalanine Ammonia Lyase, Peroxidase and Polyphenol oxidase and catalase as compared with untreated control fruits.

Data in days for first harvest was not statistically significant. However, the treatments were no relationship with this parameter.

Fruits yield per plant was recorded highest (286.67 g) in treatment T_7- Tilt 25% EC@ 0.05% + Eucalyptus @ 10% + *P. fluorescens*@ 5g/ lt. which was on par with treatment T_5- Tilt 25% EC@ 0.05% + *P. fluorescens*@ 5g/ lt. (273.33 g). Least (165.00) yield was in unprotected control. The data was statistically significant. However, the effect of treatment T_7 and T_5 on fruit yield influencing more. The similar results was found with Indira *et al.* (2006) reported that treatment with seeds harvested at physiological maturity + propiconazole @ 0.02%+ *Pseudomonas fluorescens* @ 1x108 cfu ml^{-1} recorded maximum seed weight (2.905 g), followed by 2.871 g in treatment seeds harvested at physiological maturity + *P. fluorescens* (Table 4).

Table 1 Effect of different treatment on per cent disease index (PDI) of *Alternaria alternata*.

Treatment	Per cent disease index (PDI)				Mean
	45 DAT*	60 DAT	75DAT	>50% of fruits are in red stage	
T_1- Tilt 25% EC @ 0.05%	8.00 (16.09)	20.00 (26.51)	29.33 (32.76)	33.33 (35.27)	22.67 (27.66)
T_2- Eucalyptus @ 10%	10.67 (19.00)	28.00 (31.96)	40.00 (39.25)	48.00 (43.87)	31.67 (33.52)
T_3- *Pseudomonas fluorescens*@ 5g/ lt.	12.00 (20.10)	25.33 (30.13)	34.67 (36.08)	40.00 (39.25)	28.00 (31.39)
T_4- Tilt 25% EC@ 0.05% + Eucalyptus @ 10%	5.33 (13.17)	18.67 (25.58)	24.00 (29.30)	33.33 (35.27)	20.33 (25.83)
T_5- Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt.	6.67 (14.81)	14.67 (22.38)	22.67 (28.30)	30.67 (33.63)	18.67 (24.78)
T_6- Eucalyptus @ 10% + *P. fluorescens* @ 5g/ lt.	9.33 (17.72)	24.00 (29.30)	30.67 (33.63)	37.33 (37.68)	25.33 (29.58)
T_7- Tilt 25% @ EC 0.05% + Eucalyptus @ 10% + *P. fluorescens* @ 5g/ lt.	4.00 (11.54)	10.67 (19.00)	17.33 (24.59)	28.00 (31.96)	15.00 (21.77))
T_8- Control	14.67 (22.49)	33.33 (35.27)	45.33 (42.34)	57.33 (49.25)	37.67 (37.34)
SEm±	1.65	1.51	1.42	0.97	
CD @ 5%	5.00	4.59	4.31	2.95	

*DAT- Day after transplanting.

Table 2 Effect of different treatment on per cent disease index (PDI) of *Cercospora capsici.*

Treatment	Per cent disease index (PDI)				Mean
	45 DAT*	60 DAT	75 DAT	>50% of fruits are in red stage	
T_1- Tilt 25% EC @ 0.05%	13.33 (21.38)	20.00 (26.51)	21.33 (27.50)	34.67 (36.08)	22.33 (27.87)
T_2- Eucalyptus @ 10%	17.33 (24.59)	24.00 (29.30)	30.67 (33.63)	40.00 (39.21)	28.00 (31.68)
T_3- *Pseudomonas fluorescens* @ 5g/ lt.	18.67 (25.58)	25.33 (30.22)	29.33 (32.80)	37.33 (37.66)	27.67 (31.56)
T_4- Tilt 25% EC @ 0.05% + Eucalyptus @ 10%	12.00 (20.10)	17.33 (24.59)	17.33 (24.59)	30.67 (33.63)	19.33 (25.73)
T_5- Tilt 25% EC @ 0.05% + *P. fluorescens* @ 5g/ lt.	10.67 (19.00)	14.67 (22.20)	20.00 (26.51)	25.33 (30.22)	17.67 (24.48)
T_6- Eucalyptus @ 10% + *P. fluorescens* @ 5g/ lt.	14.67 (22.49)	22.67 (28.37)	29.33 (32.80)	36.00 (36.87)	25.67 (30.13)
T_7- Tilt 25% EC @ 0.05% + Eucalyptus @ 10% + *P. fluorescens* @ 5g/ lt.	8.00 (16.44)	13.33 (21.10)	16.00 (23.48)	21.33 (27.43)	14.67 (22.11)
T_8- Control	21.33 (27.50)	29.33 (32.80)	38.67 (38.43)	45.33 (42.34)	33.67 (35.27)
SEm±	1.18	1.95	1.26	1.53	
CD @ 5%	3.59	5.90	3.83	4.64	

*DAT- Day after transplanting.

Table 3.Effect of fungicide, plant extract and bio-agent on growth of chilli.

Treatment	Plant height (cm)			Number of branches per plant		
	45 DAT	75 DAT	105 DAT	45 DAT	75 DAT	105 DAT
T_1- Tilt 25% EC @ 0.05%	49.93	61.67	69.80	9.33	14.00	18.73
T_2- Eucalyptus @ 10%	49.60	57.40	63.40	10.33	13.87	17.33
T_3- *Pseudomonas fluorescens*@ 5g/ lt.	45.60	59.60	66.87	10.27	14.00	16.53
T_4- Tilt 25% EC@ 0.05% + Eucalyptus @ 10%	47.33	59.93	64.20	9.73	13.80	17.73
T_5- Tilt 25% EC@ 0.05% + *P. fluorescens*@ 5g/ lt.	49.67	64.73	70.87	10.27	16.67	20.40
T_6- Eucalyptus @ 10% + *P. fluorescens*@ 5g/ lt.	49.47	62.13	69.33	8.67	13.73	18.33
T_7- Tilt 25% EC@ 0.05% + Eucalyptus @ 10% + *P. fluorescens*@ 5g/ lt.	54.27	73.20	82.70	11.33	15.67	20.47
T_8- Control	40.20	50.60	57.07	7.93	11.87	14.73
SEm±	3.08	3.54	4.07	1.12	1.19	1.38
CD @ 5%	NS	10.73	12.33	NS	NS	NS

*DAT- Day after transplanting.

Table 4. Effect of fungicide, plant extract and bio-agent on yield parameters of chilli

Treatment details	Fruit length (cm)	Number of fruits infected per plant	Days for first harvest per plot	Fruit yield per plant (g)
T_1- Tilt 25% @ EC 0.05%	10.55	1.07	96.67	266.67
T_2- Eucalyptus @ 10%	10.65	1.53	102.00	195.00
T_3- *Pseudomonas fluorescens*@ 5g/ lt.	10.05	1.47	100.67	240.00
T_4- Tilt 25% EC@ 0.05% + Eucalyptus @ 10%	10.54	1.00	98.00	268.33
T_5- Tilt 25% EC@ 0.05% + *P. fluorescens*@ 5g/ lt.	10.31	0.67	101.00	273.33
T_6- Eucalyptus @ 10% + *P. fluorescens*@ 5g/ lt.	10.73	1.33	99.67	246.67
T_7- Tilt 25% EC@ 0.05% + Eucalyptus @ 10% + *P. fluorescens*@ 5g/ lt.	10.38	0.53	99.00	286.67
T_8- Control	10.31	3.93	101.00	165.00
S.Em±	0.36	0.13	3.79	5.60
CD @ 5%	NS	0.40	NS	17.00

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