Research Paper :

Evaluation of different chemicals and bioagents against bacterial leaf spot of grapevine and their effect on yield and yield parameters

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SUMMARY

The various chemicals and bioagents were tested against growth of *Xanthomonas campestris* pv. *viticola* causing bacterial leaf spot of grapevine and their effects on yield and yield parameters. The results revealed that application of streptocycline (500 ppm) + Copper oxychloride (2000 ppm) thrice at 20 days interval was found effective, recording minimum PDI (29.86%), maximum yield (26.95 t/ha.), more number of bunches production (20.03/plant), lowest bunches infected (3.40/plant) and maximum single bunch weight (925 g) followed by Streptocycline 500 ppm, PDI (35.35%), yield (23.50t/ha), bunches production (17.13/plant), number of bunches infect (5.05/plant) and single bunch weight (862 g). Among the bio-agents *Bacillus subtilis* 5000 ppm noticed (PDI) (45.48%) yield (14.23t/ha), bunches production (9.35/plant) number of bunches infected (7.10/plant), single bunch weight (413 g), It gave comparatively good result than *Pseudomonas fluorescens* 5000 ppm, PDI (47.09%), yield (11.35 t/ha), bunches production (7.43/plant), bunches infected (7.08/plant) and single bunch weight (318 g).

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Grape (*Vitis. vinifera* L.) is an important temperate fruit of the world. It is one of the important horticultural crops grown in India and also cultivating in both tropical and subtropical regions of the world. It is rich source of vitamin 'A' and good source of biflorohoids known to be usefully in condition as pulpusa, capillary edema, radiation damage etc.

Maharashtra has the largest area followed by Karnataka (Vasantha Kumar, 2007). In Karnataka it spread across Bijapur, Bagalkot, Raichur, Koppal, Belgaum, Kolar, Bangalore districts (Anonymous, 2007).

Baterial leaf spot of grape caused by *Xanthomonas campestris* pv. *viticola* was noticed for the first time on *Vitis vinifera* cv. Anab-e-shahi at Tirupati (Andhra Pradesh) during 1960 (Nayudu, 1972). The disease appeared in epiphytotic form during 1984 in September pruned vineyards in Sangali and Solapur districts of Maharashtra on cv. Thompson seedless (Patil,1998). Yield loss due to bacterial leaf spot was estimated approximately 60 to 70 per cent (Chand and Kishun,1990).

Now a days, the bacterial leaf spot of grape has become a regular problem at early pruned (September) vineyards in the major grape growing areas of Northern Karnataka, even in the states of Maharashtra and Andhra Pradesh also. Therefore, keeping these points in view, the present investigation was carried out to know the field efficacy of different chemicals and bioagents in keeping the disease under economic threshold, hence that to know their effects on yield and yield parameters.

MATERIALS AND METHODS

The field trial was taken up, to know the field efficacy of different chemicals and bioagents against growth of *Xanthomonas campestris* pv. *viticola* causing bacterial leaf spot of grapevine and their effects on yield and yield parameters at Bijapur. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications on ten years old grape vineyards spaced at 1.8 m x

2.4 m. In each replication and for each treatment, randomly five plants were selected for taking observations. Unsprayed plants served as control and three sprays were taken up at 20 days interval. The required quantities of chemicals were weighed and suitably dissolved in a requisite quantity of water to get desired concentrations. Spraying was done using manually operated high volume (Knapsack) sprayer.

The observations were recorded on the severity of the disease on basis of relative percentage of leaf area covered by the disease using 0 to 5 scale and per cent disease index was worked out using Wheeler (1969) formula. The data were statistically analyzed as per Sukhatme and Amble (1985).

Grade	Per cent of leaf area infected	Reaction
0	No visible infection	Immune (I)
1	1 – 5% infection	Resistant (R)
2	6 – 15% infection	Moderately resistant (MR)
3	16 – 30% infection	Moderately susceptible (MS)
4	31 – 50% infection	Susceptible (S)
5	>50% infection	Highly susceptible (HS)

Per cent disease index (PDI) was calculated as below.

$$PDI = \frac{\text{Total sum of numerical rating}}{\text{No. of leaves examined x Maximum grade value}} \times 100$$

Yield and yield parameters:

The data on fruit yield and yield parameters obtained from different treatments was also recorded and analysed statistically (Sukhatme and Amble,1985). The number of bunches produced and number of bunches infected per plant were counted and weight of single bunch was also taken from all the treatments at the end of experiment.

RESULTS AND DISCUSSION

The results obtained on per cent disease index(PDI) are presented in Table 1 and Fig.1.The results obtained at the end of the first spray indicated that spraying with

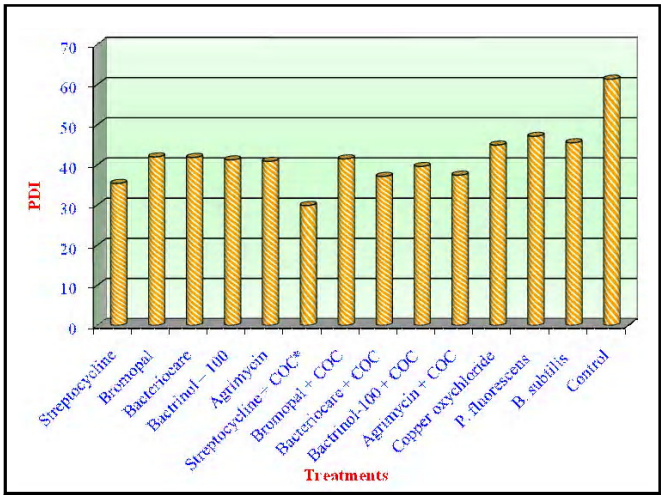

Fig. 1 : Evaluation of different chemicals and bioagents against of *Xanthomonas campestris* pv. *viticola* causing bacterial leaf spot of grapevine

Table 1 : Evaluation of different chemicals and bioagents against *Xanthomonas campestris* pv. *viticola* causing bacterial leaf spot of grapevine

Sr. No.	Treatments	Concentration (ppm)	Percent disease index (PDI)				% control over check
			1st spray	2nd spray	3rd spray	Mean	
1.	Streptocycline	500	40.50 (40.90)*	36.50 (38.93)	28.05 (31.98)	35.35	40.72
2.	Bromopal	500	51.88 (46.07)	38.50 (38.35)	35.50 (36.56)	41.96	31.57
3.	Bacteriocare	500	49.30 (44.59)	44.00 (41.52)	32.45 (34.54)	41.82	31.81
4.	Bactrinol – 100	500	48.05 (43.88)	42.20 (40.48)	33.40 (35.30)	41.22	32.79
5.	Agrimycin	500	45.18 (42.22)	41.10 (39.84)	36.30 (37.04)	40.86	33.37
6.	Streptocycline + COC*	500+2000	36.20 (36.92)	30.95 (35.61)	22.45 (27.97)	29.86	47.85
7.	Bromopal + COC	500+2000	50.20 (45.11)	37.80 (37.93)	36.40 (37.08)	41.47	32.38
8.	Bacteriocare + COC	500+2000	42.10 (40.42)	37.60 (37.81)	31.60 (34.19)	37.10	39.50
9.	Bactrino-100l + COC	500+2000	46.75 (43.13)	39.30 (38.80)	32.70 (34.82)	39.58	35.45
10.	Agrimycin + COC	500+2000	41.50 (39.51)	38.83 (38.35)	33.20 (35.17)	37.41	39.00
11.	Copper oxychloride	3000	48.55 (44.16)	43.95 (41.52)	42.20 (40.51)	44.90	26.78
12.	*P. fluorescens*	5000	51.85 (46.05)	45.04 (41.15)	44.38 (41.76)	47.09	23.21
13.	*B. subtilis*	5000	48.25 (43.09)	44.50 (41.83)	43.70 (41.36)	45.48	25.83
14.	Control	-	58.10 (99.66)	61.06 (51.39)	64.80 (53.61)	61.32	-
	S.E.±		1.80	1.87	1.89		
	C.D. (P=0.05)		5.49	5.72	5.77		

Streptocycline 500 ppm plus Copper oxychloride 2000 ppm was found effective (36.20 PDI) in managing the bacterial canker of grapes followed by Streptocycline 500 ppm (40.50 PDI), which was at par with Agrimycin 500 ppm (45.18 PDI), bacteriocare 500 ppm plus Copper oxychloride 2000 ppm (42.10 PDI), Agrimycin 500 ppm plus Copper oxychloride 2000 ppm (41.50 PDI). Maximum incidence was recorded in untreated check (58.10 PDI).

At the end of second spray it was observed that Streptocycline 500 ppm plus Copper oxychloride 2000 ppm was found effective (30.95 PDI), followed with Streptocycline 500 ppm (36.50 PDI), which was at par with Bacteriocare 500 ppm + Copper oxychloride 2000 ppm (37.60%), Bromopal 500 ppm + Copper oxychloride 2000 ppm (37.80 PDI), Bactrinol 500 ppm + Copper oxychloride 2000 ppm (39.30 PDI), Agrimycin 500 ppm + Copper oxychloride 2000 ppm (38.83 PDI), Bactrinol 500 ppm (42.20 PDI), Bromopal 500 ppm (38.50 PDI) and maximum incidence was recorded in control (61.06 PDI).

Results obtained at the end of third spray revealed that Streptocycline 500 ppm plus Copper oxychloride 2000 ppm was found the best (22.45 PDI) followed by Streptocycline 500 ppm (28.05 PDI) and was at par with Bacteriocare 500 ppm (32.45 PDI), Bacteriocare 500 ppm plus copper oxychloride 2000 ppm (31.60 PDI), Bacterinol 500 ppm plus Copper oxychloride 2000 ppm (32.70 PDI). The maximum disease pressure was recorded in control (64.80 PDI).

The lowest mean per cent disease index was observed in Streptocycline 500 ppm plus Copper oxychloride 2000 ppm (29.86 PDI). This was followed by streptocycline 500 ppm (35.35 PDI). Similar results were enumerated by Ravikumar *et al.*(2002),Thirumurti and Agarwal (1992), Thomber *et al.* (1989) and Gupta (1977).

It was found that highest per cent disease control over check was observed in plants sprayed with Streptocycline 500 ppm plus Copper oxychloride 2000 ppm (47.85%) followed by Streptocycline 500 ppm (40.72 %) and least was *P. fluorescens* 5000 ppm (23.21%). Among the bioagents, *Bacillus subtilis*. 5000 ppm (25.83%) gave comparatively good result than *pseudomonas fluorescens* (23.21%).

Hence, spraying with Streptocycline 500 ppm + Copper oxychloride 2000 ppm at an interval of 10 to 15 days thrice be recommended for the management of bacterial leaf spot of grape in Northern Karnataka.

Yield and yield parameters:

The data on yield and yield parameters are presented in Table 2 and Fig.2 and 3. The results revealed that the highest fruit yield (26.95 t/ha) was observed in Streptocycline 500 ppm plus Copper oxychloride 2000 ppm closely followed by Streptocycline 500 ppm (23.50 t/ha) similar result was found by Raju *et al.*(1980) and were at par with each other. The least yield was obtained in control (9.80 t/ha). *Bacillus subtilis* 5000 ppm gave better yield

Table 2 : Effect of different chemicals and bioagents on yield and yield parameters of grapevine

Sr. No.	Treatments	Concentration (ppm)	Yield (t/ha)	Mean No. of bunches production/ plant	Mean No. of bunches infected/ plant	Mean weight of single bunch (g)
1.	Streptocycline	500	23.50	17.13	5.05	861
2.	Bromopal	500	17.13	12.23	7.07	684
3.	Bacteriocare	500	19.25	14.15	6.40	760
4.	Bactrinol – 100	500	21.30	13.10	8.35	817
5.	Agrimycin	500	21.85	15.05	7.03	835
6.	Streptocycline + COC*	500+2000	26.95	20.03	3.40	925
7.	Bromopal + COC	500+2000	18.33	13.75	6.15	716
8.	Bacteriocare + COC	500+2000	20.18	15.20	5.25	785
9.	Bactrinol-100 + COC	500+2000	22.53	14.48	7.01	844
10.	Agrimycin + COC	500+2000	23.35	16.63	6.05	856
11.	Copper oxychloride	3000	16.73	12.42	9.09	619
12.	*P. fluorescens*	5000	11.35	7.43	7.08	318
13.	*B. subtilis*	5000	14.23	9.35	7.10	413
14.	Control	-	9.80	6.17	6.05	273
	S.E.±		1.53	0.89	0.43	0.05
	C.D. (P=0.05)		4.68	2.73	1.31	0.15

*COC – Copper oxychloride

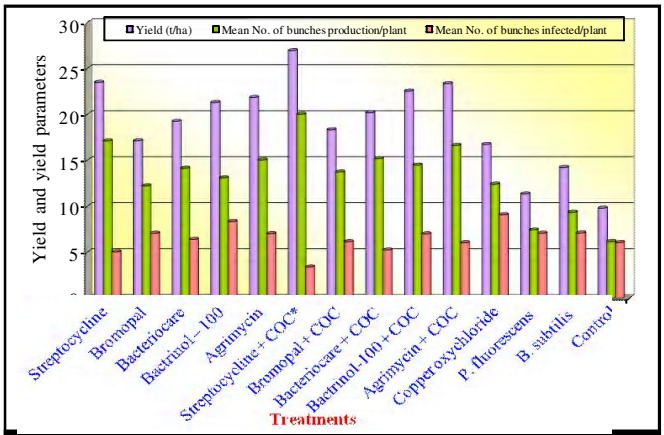

Fig. 2 : Yield and yield parameters

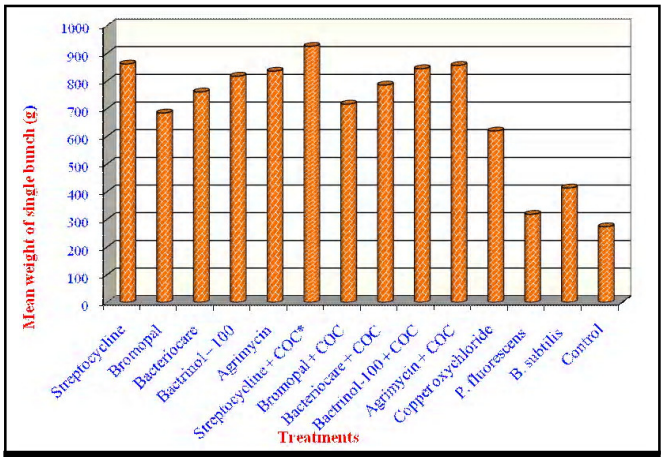

Fig. 3 : Yield and yield parameters

(14.23 t/ha) than *P. fluorescens* 5000 ppm (11.35 t/ha).

The more number of bunches production was observed in plants sprayed with Streptocycline 500 ppm plus Copper oxychloride 2000 ppm(20.03/pt) followed by Streptocycline 500 ppm (17.13/pt). Similar results were enumerated by Ravikumar *et al*.(2002) and were at par with each other. Least number of bunches production was observed in control (6.17/pt) and was at par with *Pseudomonas fluorescens* 5000 ppm (7.43/pt).

The lowest number of bunches infected was observed in plants sprayed with Streptocycline 500 ppm plus Copper oxychloride 2000 ppm (3.40/pt) followed by Streptocycline 500 ppm (5.05/pt) and was at par with bromopal 500 ppm plus Copper oxychloride 2000 ppm (6.15/pt), Agrimycin 500 ppm plus Copper oxychloride 2000 ppm (6.05/pt), Bacteriocare 500 ppm plus Copper oxychloride 2000 ppm (6.05/pt).

The maximum weight (g) of single bunch was observed in Streptocycline 500 ppm plus Copper oxychloride 2000 ppm (925 g) followed by Streptocycline 500 ppm (861 g) and least weight of a bunch was observed in control (273 g).

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