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Estimation of avoidable seed cotton yield losses caused by bacterial blight and chemical management of cotton

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ABSTRACT : A field experiment was conducted to estimate the avoidable seed cotton yield loss due to bacterial blight (*Xanthomonas axonopodis* pv. *malvacearum*) during 2009-2010 to 2011-2012. The minimum per cent disease intensity (11.30%) was recorded in treatment of copper oxychloride(0.3%) + streptocycline (100 ppm) of maximum 5 sprays at 35, 50, 65, 80 and 95 days after sowing (DAS) were effective in reduction of 50.80 percent disease. Maximum seed yield cotton (1017 kg/ha) was also recorded in same treatment with 5 sprays. Lowest seed cotton yield was obtained (784 kg/ha) in control. The seed cotton yield loss due to bacterial blight disease was maximum (22.91%) in the control. Minimum 3 sprays of copper oxychloride(0.3%) + streptocycline (100 ppm) at 65, 80 and 95 DAS and 4 sprays of same treatment at 50, 65, 80 and 95 DAS recorded highest monitory return *i.e.* 1:1.81 and 1:1.52 respectively, were found effective and economically viable in management of bacterial blight disease. One per cent disease could reduce 21.1 kg/ha yield could be avoided by adoption of plant protection schedule *i.e.*lower down the intensity from 22.73 per cent to 11.30 per cent for monitory return and avoiding the losses.

Key words : Avoidable losses, bacterial blight, cotton, estimation, infection levels

Cotton (*Gossypium* sp) is a major cash crop of India and continued to maintain the second largest producer next to China with 22 per cent of world production (Anonymous, 2011). The crop is affected by several diseases caused by fungi, bacteria, viruses, nematodes and abiotic factors. Bacterial blight caused by *Xanthomonas oxanopodis* pv. *malvacearum* is serious disease, which appear almost every year and have seriously threatened cotton production in certain areas and reduce the yield. The annual yield loss due to the disease varies from 5 to 25 per cent (Verma, 1995). Mishra and Krishna (2001) reported that 1 to 27 per cent losses due to bacterial blight of cotton depending upon variety and stage of crop infection. Chattannavar *et al.,* (2001) reported yield loss up to 26.99 per cent due to foliar disease in LRA 5166.

MATERIALS AND METHODS

The field experiment was conducted during 2009-2010 to 2011-2012 at Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The cotton variety LRA 5166 was sown in a randomized block design with 3 replications, 10 treatments and a plot size of 6.0 x 4.20 m^2 adopting 60 x 60 cm spacing. The recommended package of practices was followed to raise the crop. The treatment details are as below *viz.*, the doses of copper oxychloride @ 0.3 per cent plus streptocycline 100 ppm were the constant concentration in all the treatments, initial spray at 35 DAS; 2 spraysat 35 and 50 DAS; 3 sprays at 35, 50 and 65 DAS; 4 sprays at 35, 50, 65 and 80 DAS; 5 sprays at 35, 50, 65, 80 and 95 DAS; 4 sprays at 50, 65, 80 and 95 DAS; 3 sprays at 65, 80 and 95 DAS; 2 sprays at 80 and 95 DAS; last spray at 95 DAS and control (water spray).

The observation on disease intensity of bacterial blight was recorded 15 days after last spray on 06.10.2009, 04.10.2010 and 08.10.2011, respectively of the treatments. Ten plants were tagged randomly in each net plot. Six leaves/ plant *i.e.* 2 lower, 2 middle and 2 upper leaves were scored on the basis of grading scale *i.e.* 0-4 points grade scale described by Sheoraj (1988). The per cent disease intensity was worked out by using fallowing formulae.

$$PDI = \frac{\text{Sum of all numerical grades}}{\text{No. of leaves scored x maximum grade}} \times 100$$

The yield data were recorded from net plot of each treatment. Per cent avoidable losses in seed cotton yield were calculated yearwise and 3 years data on per cent disease intensity and seed cotton yield were pooled and subjected to statistical analysis and yield loss was estimated by using the following formulae.

$$\text{Avoidable loss (\%)} = \frac{\text{Yield in protected plot} - \text{Yield in unprotected plot}}{\text{Yield in protected plot}} \times 100$$

RESULTS AND DISCUSSION

Disease intensity : The disease intensity ranged between 20.97 to 25.56 per cent with an average of 22.73 per cent for 3 seasons. However, the maximum disease pressure was during 2009-2010 *i.e.* 25.56 per cent.

The pooled data for 3 *kharif* seasons are recorded (Table 1). Minimum per cent disease intensity (PDI) of bacterial blight was recorded (11.30%) with 5 sprays of copper oxychloride + streptocycline initiated at 35 DAS with an interval of 15 days *i.e.* 35, 50, 65,80 and 95 DAS. This treatment was statistically *at par* with 4 foliar sprays at 50, 65, 80 and 95 DAS (11.57%) and 35, 50, 65 and 80 DAS (11.85%) and 3 foliar sprays at 65, 80 and 95 DAS (12.18%). Maximum per cent disease intensity was recorded in control (22.73%).

The yearwise results also indicated similar trend in reduction of disease intensity. The results revealed that, increased number of sprays reduced the intensity of bacterial blight *i.e.* 5 sprays of copper oxychloride + streptocycline. The results are in accordance with Patil *et al.,* (2006) and Ingole *et al.*, (2011,a).

Yield of seed cotton : The 3 years pooled results (Table 1) revealed the significant differences. Maximum seed cotton yield (1017 kg/ha) was recorded in 5 sprays at 35, 50, 65, 80 and 95 DAS of copper oxychloride + streptocycline *i.e.* 15 days interval. Yield levels are *at par* with 4 sprays of same treatment at 50, 65, 80 and 95 DAS (1016 kg/ha) and 3 sprays at 65, 80 and 95 DAS (985 kg/ha). The lowest seed cotton yield was obtained in control (784 kg/ha). The averages of seed cotton yield loss due to bacterial blight was maximum (22.91%) in control. The yield losses were based on the treatment in which maximum disease reduction was achieved *i.e.* 50.28 per cent with disease intensity of 11.30 per cent. These findings are in conformity with disease severity and losses reported by Mishra and Krishna (2001) and Patil *et al.* (2003).

As regards incremental cost benefit ratio (Table 1), the minimum sprays of copper oxychloride + streptocycline at 65, 80 and 95 DAS and maximum 4 sprays at 50, 65, 80 and 95 DAS recorded more monitoring return *i.e.* 1:1.81 and 1:1.52 ICBR respectively, and economical viable. The present findings are on similar line of results of Govindappa *et al.,* (2008) and Ingole *et al.* (2011, b).

Five sprays of recommended chemicals resulted in 50.28 per cent disease reduction with 11.30 per cent intensity, while 22.73 per cent intensity was in control with an increase seed cotton yield of 233 kg/ha, resulted that 1per cent intensity could reduces 21.1 kg/ha seed cotton yield. It could be influenced that by adoption of plant protection measures *i.e.* reduction of disease from 22.73 per cent to 11.30 per cent can avoid the losses of 233kg/ha.

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Table 1. Effect of different schedules of treatment on per cent disease intensity, seed cotton yield and estimation of yield losses caused by bacterial blight disease (Pooled data of three years, 2009-2010, 2010-2011 and 2011-2012)

Sr. No.	Per cent disease intensity (PDI)			**Pooled mean**	Disease control (%)	Yield of seed cotton(kg/ha)			**Pooled mean**	Increase over control (kg/ha)	Yield loss (%)	ICBR
	2009-2010	2010-2011	2011-2012			2009-2010	2010-2011	2011-2012				
T_1	24.03 (29.35)	20.14 (26.67)	20.00 (26.56)	**21.39 (27.53)**	5.89	717	898	745	**787**	03	22.62	1:0.08
T_2	19.86 (26.45)	17.08 (24.39)	16.11 (23.68)	**17.68 (24.84)**	22.21	743	927	780	**816**	325	19.76	1:0.42
T_3	18.47 (25.47)	13.61 (21.63)	14.86 (22.59)	**15.65 (23.23)**	31.14	795	972	807	**858**	74	15.63	1:0.65
T_4	13.75 (21.78)	11.11 (19.41)	10.69 (19.09)	**11.85 (20.09)**	47.86	927	1098	908	**977**	193	3.93	1:1.27
T_5	13.47 (21.45)	10.70 (19.08)	9.72 (18.19)	**11.30 (19.58)**	50.28	944	1158	951	**1017**	233	0.00	1:1.23
T_6	13.61 (21.67)	10.97 (19.34)	10.14 (18.58)	**11.57 (19.86)**	49.09	948	1153	949	**1016**	232	0.09	1:1.52
T_7	14.17 (22.09)	11.39 (19.67)	10.97 (19.33)	**12.18 (20.36)**	46.41	922	1117	916	**985**	207	3.15	1:1.81
T_8	17.08 (24.42)	16.67 (24.09)	14.58 (22.43)	**16.11 (23.64)**	29.21	826	1003	814	**881**	97	13.37	1:1.28
T_9	23.61 (29.06)	19.58 (26.25)	19.17 (25.95)	**20.79 (27.08)**	8.53	728	915	760	**801**	17	21.24	1:0.45
T_{10}	25.56 (30.37)	21.67 (27.74)	20.97 (27.27)	**22.73 (28.46)**	-	715	894	744	**784**	-	22.91	-
SE (m)+	0.63	0.73	0.71	**0.42**	-	35	28	41	**19**	-	-	-
CD (p = 0.05)	1.88	2.17	2.1	**1.27**	-	105	86	123	**56**	-	-	-

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