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TIME OF APPLICATION OF FUNGICIDE FOR CONTROL OF ANTHRACNOSE DISEASE OF PEPPER *(FUNGAL POLLU)*

The anthracnose disease in pepper is commonly termed as "fungal pollu" because the disease causes the production of light and hollow berries (Ayyar *et al.*, 19?.1). The causal organism of the disease has been identified as *Colletotrichum gloeosporioides* (Penz) Sacc. The extent of damage caused by the disease has been estimated by different workers from 0 5 to 13.0 per cent (Rao, 1926, Sundararaman 1928, Thomas and Menon 1 939 and Menon, 1949). The detailed symptomatology of the disease was first described by Thomas and Menon (1939) and Vinukantananda and Celino (1940) gave a detailed description of the disease in Philippines. Sebastin (1982) studied the etiology and ecology of the disease. Earlier studies to control the disease at the station showed that one per cent bordeaux mixture and 0.1% Bavistin are effective in controlling the disease (Anonymous, 1979). However, the time of application of fungicides seemed to be critical in deciding the efficacy of the chemicals. So, an experiment was conducted to determine the correct time and optimum frequency of application of one per cent bordeaux mixture against the disease, the results of which are reported here.

The experiment was conducted at the Pepper Research Station, Panniyur from 1980-81 to 1983-84 on Panniyur 1 variety of pepper of uniform age and growth. A randomised block design with four replications and three vines per plot was adopted. One per cent bordeaux mixture was applied at different times as shown in the Table 1. At the time of harvest, 25 spikes were selected at random from each vine and the number of early infected and late infected berries was recorded. From this, percentages of early and late infected berries were separately computed and the data for each year and the pooled data were analysed using the analysis of variance technique.

The mean values for the percentage of early and late infections by the pathogen for various treatments and their ranks (in parenthesis) are presented in Table 1 and 2 respectively.

The treatment effects were significant in 1981-82 and 1983-84 for early infection and in 1981-82 and 1982-83 for late infection. Analysis of pooled data showed significant treatment differences in early and late infections. All the combinations of fungicidal applications were effective in reducing the disease, but treatment 10 followed by treatment 16 gave overall maximum control of early and late infections. Analysis of pooled data has also shown that effectiveness of the treatments varied quite significantly from year to year, suggesting the great relevance of seasonal fluctuations in deciding the efficacy of fungicidal application at any particular time. However, it is to be assumed that effect of season on treatment efficacy is rather indirect, i. e., through its influence on the stage of the crop. Climatic variations, especially the pattern and quantity of rainfall decide the time

Table 1

Effect of various treatments on the intensity of early berry infection in pepper

Treatment No.	Treatment notation	Mean percentage of early infection during 1980-81	1981-82	1982-83	1983-84	Pooled mean
T_1	1+2	0.77 (14)	0.30 (13;	1.48 (16)	1.13 (4)	0.92 (8)
T,	1+3	1.02 (16)	0.22 (8)	0.87 (1)	2.05 (18)	1.04 (14)
T_3	1+4	0.74 (13)	0.26 (9)	1.02 (19)	1.01 (2)	0.76 (5)
T_4	1+5	0.56 (3)	0.78 (19)	0.81 (5)	1.56 (8)	0.93 (10)
T_5	2+3	0.62 (6)	0.18 (5)	1.04 (11)	2.45 (20)	1.07 (15)
T,	2+4	0.72 (10)	0.31 (14)	1.77 (18)	1.70 (13)	1.13 (17)
T_7	2+5	0.57 (5)	0.49 (17)	2.08 (20)	1.57 (9)	1.18 (18)
T,	3+4	1.11 (18)	0.19 (6)	0.66 (2)	1.85 (17)	0.95 (12)
T_9	3+5	1.09 (17)	0.43 (16)	1.16 (14)	2 25 (19)	1.23 (19)
T_{10}	1+2+3	0.77 (15)	0.15 (2)	0.85 (6)	0.90 (1)	0.67 (1)
T_{11}	1+2+4	0.72 (11)	0.17 (4)	1.60 (17)	1.64 (12)	1.03 (13)
T_{12}	1+2+5	0.51 (2)	0.26 (10)	1.08 (12)	1.03 (3)	0.72 (4)
T_{13}	2+3+4	0.33 (1)	0.10 (1)	0.78 (4)	1.58 (10)	0.69 (3)
T_{14}	2+3+5	0.66 (9)	0 26 (11)	0.99 (9)	1 82 (15)	0.93 (9)
T_{15}	2+4+5	0.73 (12)	0.21 (7)	1.08 (13)	1.60 (11)	0.91 (7)
T_{16}	1+3+4	0.64 (8)	0.15 (3)	0 47 (1)	1.47 (7)	0.68 (2)
T_{17}	1+3+5	1.65 (20)	0.70 (18)	0.73 (3)	1.43 (6)	1.13 (16)
T_{18}	1+4+5	0.57 (4)	0.29 (12)	1.37 (15)	1.31 (5)	0 89 (6)
T_{19}	3+4+5	0.63 (7)	0.43 (15)	0.87 (8)	1.80 (14)	0.93 (11)
T_{20}	Control (no fungicide)	1.50 (19)	1.05 (20)	1.86 (19)	1.82 (16)	1.56 (20)
	CD (0.05)	NS	0.340*	NS	0.830	0.535*

* Significant at 5% level

(Figures in parenthesis show the ranks of the treatments)

Treatment notation 1 indicates spraying of 1% bordeaux mixture during the 1st week of June
" 2 " " 1 st week of July
" 3 " " last week of July
" 4 " " last week of August
" 5 " " third week of September

Table 2

Effect of various treatments on the intensity of late berry infection in pepper

Treatment No.	Treatment notation	Mean percentage of late infection during 1980–81		1981–82		1982–83		1983-84		Pooled mean	
T_1	1+2	0.68	(4)	0.80	(12)	3.14	(15)	3.37	(9)	2.00	(11)
T_2	1+3	1.33	(17)	0.97	(13)	1.38	(1)	3.67	(13)	1.84	(7)
T_3	1+4	1.03	(12)	1.35	(16)	3.04	(13)	2.17	(1)	1.90	(9)
T_4	1+5	0.83	(9)	1.51	(19)	2.20	(6)	3.65	(12)	2.05	(13)
T_5	2+3	0.81	(8)	0.52	(5)	2.68	(11)	4.09	(16)	2.03	(12)
T_6	2+4	0.80	(7)	1.21	(14)	4.61	(20)	3.99	(15)	2.65	(19)
T_7	2+5	1.17	(15)	1.48	(18)	4.57	(19)	3.55	(8)	2.64	(18)
T_8	3+4	1.28	(16)	0.67	(10)	2.33	(9)	4.51	(18)	2.20	(15)
T_9	3+5	1.10	(13)	1.34	(15)	2.75	(12)	5.00	(19)	2.55	(16)
T_{10}	1+2+3	0.74	(5)	0.35	(3)	1.50	(2)	2.73	(4)	1.30	(1)
T_{11}	1+2+4	2.30	(20)	0.42	(4)	4.10	(18)	3.47	(10)	2.57	(17)
T_{12}	1+2+5	0.61	(2)	0.56	(6)	3.69	(16)	2.50	(3)	1.84	(8)
T_{13}	2+3+4	0.95	(10)	0.31	(2)	2.02	(4)	3.65	(11)	1.73	(4)
T_{14}	2+3+5	0.77	(6)	0.64	(8)	2.59	(10)	3.84	(14)	1.96	(10)
T_{15}	2+4+5	1.45	(18)	0.59	(7)	2.21	(7)	4.13	(7)	2.10	(14)
T_{16}	1+3+4	0.98	(11)	0.24	(1)	1.74	(3)	2.96	(5)	1.48	(2)
T_{17}	1+3+5	1.13	(14)	0.77	(11)	2.24	(8)	3.16	(7)	1.83	(6)
T_{18}	1+4+5	0.53	(1)	0.64	(9)	3.04	(14)	2.43	(2)	1.66	(3)
T_{19}	3+4+5	0.63	(3)	1.39	(17)	2.03	(5)	2.96	(6)	1.75	(5)
T_{20}	Control (No fungicide)	1.51	(19)	2.16	(20)	3.90	(17)	5.10	(20)	3.17	(20)
	CD (0.05)	NS		0.79*		1.48*		NS		NS	

* Significant at 5% level

(Figures in parenthesis show the rank of the treatments)

(For treatment notations, see Table 1)

of flowering and resultantly fruit formation in pepper. So, if the flowering season is advanced or delayed due to early or late receipt of sufficient rains, the effectiveness of fungicidal treatment at any particular time may also vary. So a calendar based timing of fungicidal application is prone to failure and therefore, the stage of the crop is to be given primary consideration in deciding the timing.

If the present data are examined in the light of the above situation, it can be reasonably deduced that three fungicidal applications, two of them before the flowering process is completed (June and July) and another at the time of fruit formation (August-September) will effectively control berry infections; as is evidenced by the superiority of treatment numbers 10, 1 6 and 13.

If the cost benefit factor is taken into consideration, two sprayings, one just before flowering and another at berry formation stage (Treatment 3) can be considered sufficient under normal situations. However, where factors favouring the disease incidence such as susceptible variety, heavy shade and long spell of heavy rains prevail, it is advisable to go in for three fungicidal applications as described earlier.

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