
Economics and chemical control of Phomopsis twig blight and fruit rot of brinjal

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The effectiveness of six different fungicides such as Carbendazim 0.1 %, Mancozeb FP 0.3 %, Propineb 0.25 %, Tebucanazole 0.05 %, Copper oxychloride 0.3 %, and Copper hydroxide 0.3 % were studied on the management of Phomopsis blight and fruit rot diseases in brinjal. Field trials were conducted for three consecutive seasons during *kharif*, 2001, 2002 and 2003 in the experimental field of All India Coordinated Vegetable Improvement Project, OUAT, Bhubaneswar with the variety Utkal Tarini. The trial was laid out in randomized block design with three replications at the fertilizer dose of 125:50: 75 kg N:P₂O₅:K₂O/ha. Four sprays of Carbendazim 0.1 % at 10 days intervals at the initiation of the disease significantly recorded least incidence of twig blight (PDI-7.86 %) and fruit-rot (PDI-6.42 %) contributing 74.33 % and 78.10 % disease control respectively over check plots. The same treatment also resulted in maximum fruit yield (227.25 q/ha) registering 71.12 % increase in yield over control with maximum cost benefit ratio of 1:12.85 and a net return of Rs. 31,329/ha. Tebucanazole was found to be the next best in respect of disease control (PDI of twig blight 8.50 % and fruit-rot 10.94 % and fruit yield 210.62 q/ha) giving rise to 72.24 % control of twig blight, 62.67 % control of fruit rot and 59.52 % increase in yield over control. The check plots recorded maximum disease incidence of twig-blight of 30.62 %, fruit-rot 29.31 % with lowest fruit yield of 132.03 q/ha.

INTRODUCTION

Brinjal (*Solanum melongena*, L.) also known as subergine or eggplant, garden egg and guine squash belonging to the family Solanaceae is considered to be the native of India (Thompson and Kelly, 1957) from where it spreads to other parts of the world (Chaudhury and Kalda, 1968). While China is considered as the secondary centre, it is commercially cultivated in China, Egypt, India, Japan, Pakistan, Srilanka and U.S.A.. In India of the total 5.33 million ha of land under different vegetables brinjal alone occupies an area of 8.14 %. It is mainly grown in Indian states like Orissa, Bihar, Punjab, West Bengal, Karnataka, Maharashtra, Andhra Pradesh and Uttar Pradesh (Akhtar *et al.*, 2007). In Orissa, brinjal is cultivated in 1.276 million ha with an yield of 18.50 million tonnes. The productivity of brinjal in Orissa is however, only 14.50 tonnes/ha. This low productivity is due to the various biotic and abiotic stresses, which cause immense loss to the crop. Among the biotic stresses, insect pests and

diseases play an important role in reducing the yield throughout the world.

The diseases make serious loss into brinjal production in terms of fruit yield by affecting seed germination, seedling mortality, killing the plants rotting of fruits and spoiling the fruit quality.

The Phomopsis blight and fruit rot diseases of brinjal caused by *Phomopsis vexans* (Sacc. and Syd.) Harter [Tel : *Diaporthe vexans* (Cratz)] is a destructive fungal disease which has gained national importance and is considered to be the major constraint for limited production and productivity of this crop. In Orissa, the disease has been found to be most serious and wide spread throughout the state. It causes damping off, seedling blight, twig blight with premature defoliation and fruit rot, adversely affecting the seed quality and viability. If the infection enters into the fruit through calyx, the whole fruit is mummified due to dry rot (Kumar *et al.*, 1986). Realizing the great economic importance of the crop and the disease,

the study has been undertaken by inclusion of some new chemicals in field trials to evaluate and find out the most efficacious fungicides for successful management of the pathogen.

MATERIALS AND METHODS

In order to study the efficacy of six chemical on the management of *Phomopsis* blight and fruit rot disease, the field trials were conducted for three consecutive years during kharif 2001-02, 2002-03 and 2003-04 in the experimental field of All India Coordinated Vegetable Improvement Project, OUAT, Bhubaneswar. The trial was laid out in randomized block design with three replications. The following chemical treatments were included in the study. T₁ – Carbendazim (Bavistin 50 % WP) 0.1 % ; T₂ – Mancozeb FP 0.3 % ; T₃ – Propineb (Antracol 70% WP) 0.25 % ; T₄ – Tebuconazole (Folicur 25 % EC) 0.05 % ; T₅ – Copper oxychloride (Blitox-50 WP) 0.3 % ; T₆ – Copper hydroxide (Kocide, 77% WP) 0.3 % and T₇ – Untreated control.

The crop was planted in a plot size of 8.1 sq.m (3.0 m x 2.7 m) with row to row spacing of 50 cm and plant to plant spacing of 45 cm with the variety Utkal Tarini on 19.9.2001, 25.9.2002 and 16.9.2003. All the agronomical practices as generally recommended were followed with the fertilizer dose of 125:50:75 kg N : P₂O₅ : K₂O / ha. Four sprayings were given at an interval of 10 days after appearance of the disease in the field. Observations were recorded two days after each sprayings and final observation was recorded after 7 days of last spraying. The per cent disease incidence (PDI) and per cent disease control (PDC) were calculated. The brinjal fruits were harvested at proper maturity and the cumulative fruit yields were estimated.

RESULTS AND DISCUSSION

It may be seen from Tables 1 to 4 and Fig. 1 that,

all the chemicals were found to be significantly superior over control in reducing the *Phomopsis* incidence. Among the chemicals, lowest incidence of twig-blight and fruit rot was recorded from plots where Carbendazim (T₁) spraying was taken up resulting in 74.33 % disease control in respect of twig blight, 78.10 % reduction in respect of fruit rot and 71.12 % increase in fruit yield over control. The same treatment also recorded maximum cost : benefit ratio of 1:12.85 accounting for a net return of Rs. 31,329/-.

Tebuconazole (T₄) was found to be the second best chemical with respect to control of *Phomopsis* blight and fruit rot and brinjal fruit yield which recorded 72.24 % control of twig blight, 62.67 % control of fruit rot and 59.52 % increase in fruit yield over the check plot with corresponding cost : benefit ratio of 1:9.45 and with net return of Rs. 21593.

The efficacy of Carbendazim for the control of *Phomopsis* disease in brinjal was successfully demonstrated by Meah *et al.* (1998), who reported Bavistin to be the most effective fungicide for control of brinjal *Phomopsis*. Singh and Agrawal (1999) also reported the efficacy of Carbendazim which resulted in lowest disease incidence (4.3 %) and highest fruit yield of 222.83 q/ha against *Phomopsis* which also corroborated the results of the present investigation. Superiority of Carbendazim for controlling *Phomopsis vexans* was demonstrated by some other workers (Islam and Pan, 1993 ; Kausal, 1992 ; Sinha, 1989).

There is, however, no agreement between the workers on the number of sprays. Islam and Pan (1993) in West Bengal found Carbendazim 0.1 % effective with three sprays at 15 days intervals. Kausal (1992) also reported three sprays of Carbendazim alone or in combination with Mancozeb or Copper oxychloride to be superior for controlling leaf blight and fruit rot of brinjal in the

Table 1 : Incidence of twig-blight of brinjal as influenced by different treatments

Treatments	Dosage (%)	Per cent twig- blight				Per cent control
		2001-02	2002-03	2003-04	Pooled mean	
T ₁ Carbendazim	0.1	10.86(19.22)	6.51(14.77)	6.2(7.97)	7.86(13.99)	74.33
T ₂ Mancozeb FP	0.3	15.36(233.06)	9.21(17.66)	9.5(17.95)	11.36(19.56)	62.90
T ₃ Propineb	0.25	18.30(25.32)	10.98(19.28)	11.8(20.09)	13.69(21.56)	55.29
T ₄ Tebuconazole	0.05	11.50(19.82)	6.9(15.23)	7.1(15.49)	8.50(16.85)	72.24
T ₅ Copper oxychloride	0.3	20.83(27.14)	12.49(20.62)	12.3(20.52)	15.21(22.76)	50.33
T ₆ Copper hydroxide	0.3	20.83(27.14)	13.00(21.13)	11.4(21.50)	14.41(23.26)	59.47
T ₇ Control (water spray)	-	38.86(38.86)	23.31(28.86)	29.7(33.02)	30.62(33.58)	
CD at 5 %	-	1.18	3.76	4.29	3.24	

Table 2 : Incidence of fruit rot of brinjal as influenced by different treatments

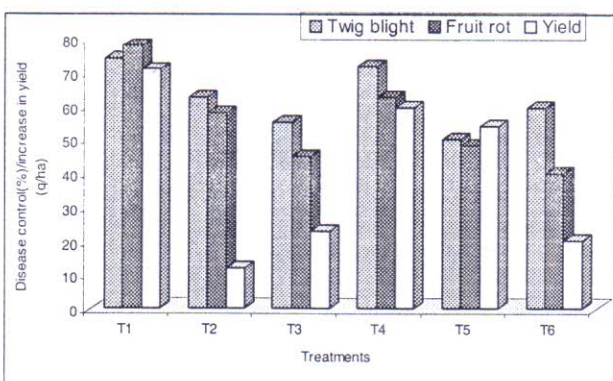
Treatments	Dosage (%)	Per cent Fruit-rot				Per cent control
		2001-02	2002-03	2003-04	Pooled mean	
T ₁ Carbendazim	0.1	7.50(15.84)	6.87(15.12)	4.9(12.79)	6.42(14.58)	78.10
T ₂ Mancozeb FP	0.3	13.93(21.90)	12.99(21.05)	10.0(18.40)	12.31(20.45)	58.00
T ₃ Propineb	0.25	18.40(25.37)	14.10(22.06)	15.4(23.08)	16.00(23.50)	45.41
T ₄ Tebuconazole	0.05	11.66(19.94)	10.87(19.19)	10.3(18.74)	10.94(19.29)	62.67
T ₅ Copper oxychloride	0.3	18.93(25.78)	13.47(21.47)	13.1(21.24)	15.17(22.83)	48.24
T ₆ Copper hydroxide	0.3	20.36(26.81)	16.02(23.58)	16.3(23.83)	17.56(24.74)	40.10
T ₇ Control (water spray)	-	31.83(34.34)	25.50(30.33)	30.6(33.60)	29.31(32.76)	-
CD at 5 %	-	2.43	3.29	1.41	2.68	-

Table 3 : Average fruit yield of brinjal due to different treatments

Treatments	Dosage (%)	Average fruit yield (q/ha)				Per cent yield increase over control
		2001-02	2002-03	2003-04	Pooled mean	
T ₁ Carbendazim	0.1	232.85	229.40	219.5	227.25	71.12
T ₂ Mancozeb FP	0.3	210.47	177.77	164.6	184.28	12.31
T ₃ Propineb	0.25	184.75	154.30	149.1	162.72	23.24
T ₄ Tebuconazole	0.05	215.23	216.52	200.1	210.62	59.52
T ₅ Copper oxychloride	0.3	210.47	206.25	194.3	203.67	54.26
T ₆ Copper hydroxide	0.3	193.33	138.87	144.6	158.93	20.37
T ₇ Control (water spray)	-	159.04	131.15	105.9	132.03	-
CD at 5 %	-	23.91	10.56	15.67	15.80	-

Table 4 : Economics of chemical control of *Phomopsis* blight of brinjal

Treatments	Dosage	Excess produce over control (kg/ha)	Expenditure over control (Rs./ha)	Return over control		Mean cost benefit ratio
				Gross	Net	
T ₁ Carbendazim	0.1	95.22	2438.00	33766.00	31329.00	12.85
T ₂ Mancozeb FP	0.3	52.25	1844.00	14457.00	12613.00	6.84
T ₃ Propineb	0.25	30.69	1487.00	6573.00	5086.00	3.42
T ₄ Tebuconazole	0.05	78.59	2285.00	23878.00	21593.00	9.45
T ₅ Copper oxychloride	0.5	71.64	2550.00	23588.00	21038.00	8.25
T ₆ Copper hydroxide	0.3	26.9	2336.00	7662.00	5326.00	2.28
T ₇ Control (water spray)	-	-	-	-	-	-

**Fig. 1** : Per cent disease control and per cent increase in yield of brinjal against *Phomopsis* blight and fruit rot as influenced by different treatments.

field under Himachal Pradesh condition. On the contrary, Sinha (1989) obtained excellent control of *Phomopsis* blight and fruit rot by seed treatment

followed by four sprays of Carbendazim under Bihar agro-climatic condition. Our observations are in total agreement with that of Sinha (1989) with regard to the number of sprays in the field for control of *Phomopsis* blight and fruit rot of brinjal.

Mancozeb FP (T₂) ranked third with respect to control of twig blight and fruit rot but was surpassed by Copper oxychloride (T₅) in yield (Tables 1, 2 and 3). Propineb (T₃) and Copper hydroxide (T₆) were at par with regard to disease control and yield and were found least effective.

As evident from the present investigation the twig blight and fruit rot of brinjal incited by *Phomopsis vexans* can be successfully managed by four sprays of Carbendazim (0.1 %) after appearance of the disease in the field under Orissa conditions with

a net profit of Rs. 31,329/- due to Carbendazim treatment followed by Rs. 21,593/- due to Tebuconazole spray over check plots.

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