

Performance of Bactericides Against Bacterial Blight of Pomegranate

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Received 17 February 2016; Accepted 21 March 2016; Published online 14 April 2016

Abstract Bacterial blight of pomegranate caused by *Xanthomonas axonopodis* pv. *punicae* became a serious threat for pomegranate production resulting in yield loss ranged from 60-100 % in Karnataka. Keeping in view, a field trial was conducted in pomegranate farm which was pruned during May month at Sira taluk, Tumkur district, Karnataka. The treatments consisting of antibiotics/bactericides alone or in combination/alternating with other antibiotics in order to evaluate their performance in controlling the disease. As per the data, it is evident that spraying Streptocycline @ 500 ppm + COC @ 0.3% was very effective in reducing the percent leaf infection (82.33%), mean number of spots per leaf (88.33%), and percent of leaf area infection (87.50%). The reduction in number of infected twigs per plant (91.75%), lesion size on twig (81.33%), fruit infection (72.62%) and number of lesions per fruit (83.50%) compared to control with higher yield level to an extent of 15.25 t/ha followed by Trimethoprim + Sulphamethoxazole @ 500 ppm + COC 0.3%. However, in control

(unsprayed) plants, there was increase in the per cent leaf infection (40.65%), mean number of spots per leaf (33.20) and per cent of leaf area (75.00%), per cent twig infection (41.50%), lesion size on twigs (16.40%), number of lesions per fruit (50.00%) and per cent fruit infection (58.82%) over the same period.

Keywords Pomegranate, Blight, Bactericides, Management.

Introduction

Pomegranate (*Punica granatum* L.) is being grown since ancient times for its fruit and ornamental purposes. It is commonly known as 'Anar' in Hindi and 'Daalimbe' in Kannada and it belong to botanical family Punicaceae. It is indigenous to Iran and cultivated extensively in Spain, Morocco, Egypt, Iran, Afghanistan, Arabia and other Mediterranean countries. In India, pomegranate is commercially cultivated in Maharashtra, Karnataka and small scale plantations are seen in Gujarat, Rajasthan, Tamil Nadu, Andhra Pradesh, Punjab and Haryana [1].

Pomegranate occupies sixth place in the fruit export market of India, where it accounts for 50% of world pomegranate production and earns foreign exchange to the tune of Rs 270 crores. Quantity of fresh pomegranate fruits export from India accounts 3.5% while the value of fresh fruit export is 3.0% Karnataka occupies first position in export, worth of Rs 8.5 crores [2]. The total pomegranate production in the world is 10 lakh tonnes. India produces 5 lakh tonnes but export only 5000 tonnes [3].

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Table 1. Effect of antibiotics/bactericides on leaf disease incidence.

Sl. No.	Treatment details	Per cent leaves infectd			Number of lesions per leaf			Percent leaf area affected		
		Before spray	After 8 th spray	Percent reduction	Before spray	After 8 th spray	Per cent reduction	Before spray	After 8 th spray	Per cent reduction
T ₁	Trimethoprim + Sulplamethoxazole-500 ppm	38.00	14.33 (20.89)	62.15	6.00	1.66	72.33	30.00 (33.00)	15.00 (19.19)	50.00
T ₂	Streptocycline-500 ppm	48.33	11.66 (20.09)	75.50	5.33	1.33	75.00	25.00 (29.93)	10.00 (18.34)	60.00
T ₃	Trimethoprim + Sulphamethoxazole-500 ppm + COC-0.3%	39.00	8.33 (16.61)	79.0	5.33	1.00	81.23	25.00 (29.93)	7.50 (15.75)	70.00
T ₄	Streptocycline-500 ppm + COC-0.3%	44.00	7.66 (16.16)	82.33	5.66	0.66	88.33	20.00 (26.45)	2.50 (9.09)	87.50
T ₅	Tetracycline-500 ppm + COC-0.3%	36.66	21.80 (27.84)	40.50	6.00	3.00	50.00	30.00 (33.16)	17.50 (24.61)	41.66
T ₆	Cephalaxin-500 ppm + COC-0.3%	40.33	21.66 (27.54)	46.67	5.00	2.33	53.40	22.50 (28.17)	10.00 (18.34)	55.55
T ₇	Norflox-500 ppm + COC-0.3%	40.66	22.66 (30.59)	54.0	4.66	2.00	57.08	27.50 (31.58)	12.50 (20.53)	54.54
T ₈	Trimethoprim + Sulphamethoxazole-500 ppm + Garlic- 2%	41.66	12.66 (22.21)	69.30	6.33	1.66	73.77	30.00 (33.00)	12.50 (22.60)	58.33
T ₉	Bactrinol- 500 ppm	35.00	22.00 (27.98)	37.0	6.33	3.33	47.39	30.00 (33.04)	17.50 (24.61)	41.66
T ₁₀	Bleaching powder- 0.5%	40.33	31.00 (34.17)	21.20	5.33	4.66	12.57	25.00 (29.80)	22.50 (25.17)	10.00
T ₁₁	Check	40.66	57.33 (49.15)	+40.65	5.00	6.66	+33.20	20.00 (26.45)	35.00 (37.66)	+75.00
	SEm±		2.458			0.436			2.381	
	CD @ 5%		7.251			1.2855			7.0244	

A plant with wide level of adaptability and benefits may fall sick also, which may be due to a pest or pathogen attack. Such sick plants grow and produce poorly. Pomegranate is affected by many serious diseases. Among them bacterial blight disease has been appearing in a devastating form in Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra, since 2001 in India.

Materials and Methods

A field trial was conducted in the naturally infected farmers' field at Sira taluk, Tumkur district, Karnataka state to study the effect of different antibacterial chemicals and botanical on the suppression of the disease development. The treatments were imposed with three replications. Each replication contained five plants and eight sprays were given at 15-20 days interval. The experiment was laid out as per randomized complete block design (RCBD) technique. Observations on per cent incidence and severity of disease

on leaf, twig and fruits were recorded on 3-4 days after each spray.

Results and Discussion

A field trial was conducted for management of bacterial blight of pomegranate at Sira, Tumkur district. The results were presented in the (Tables 1 to 3) and ethrel was sprayed in the month of May.

Disease severity was calculated on the basis of percentage leaves affected, number of lesions per leaf, per cent leaf area affected, number of twigs affected, lesion size on twigs, number of fruits affected and number of lesions on fruits.

The least per cent leaf infection of 7.66 was recorded in plants sprayed with Streptocycline @ 500 ppm + COC @ 0.3% followed by Trimethoprim + Sulphamethoxazole at 500 ppm + COC @ 0.3%, with 8.33 leaf after 8th spray. Streptocycline @ 500 ppm

Table 2. Effect of antibiotics/bactericides on twig disease incidence.

Sl. No.	Treatment details	Number of twigs infected/plant			Lesion size on twigs in cm		
		Before spray	After 8 th spray	Per cent reduction	Before spray	After 8 th spray	Per cent reduction
T ₁	Trimethoprim + Sulphamethoxazole-500 ppm	5.66	2.00	64.66	4.55	1.50	67.03
T ₂	Streptocycline-500 ppm	4.66	1.33	71.45	3.80	1.16	69.47
T ₃	Trimethoprim + Sulphamethoxazole-500 ppm + COC-0.3%	4.00	0.66	83.50	4.00	0.95	76.25
T ₄	Streptocycline-500 ppm + COC-0.3%	4.00	0.33	91.75	3.75	0.70	81.33
T ₅	Tetracycline-500 ppm + COC-0.3%	5.00	2.66	46.80	3.50	1.90	45.71
T ₆	Cephalaxin-500 ppm + COC-0.3%	4.66	2.33	50.00	3.50	1.50	57.14
T ₇	Norflox-500 ppm + COC-0.3%	4.33	2.00	53.81	3.95	1.60	59.49
T ₈	Trimethoprim + Sulphamethoxazole- 500 ppm + Garlic- 2%	5.00	1.66	66.80	4.50	1.50	66.66
T ₉	Bactrinol- 500 ppm	4.66	2.66	42.91	4.00	2.10	47.50
T ₁₀	Bleaching powder-0.5%	4.00	3.33	16.75	4.00	3.25	18.75
T ₁₁	Check	4.00	5.66	+41.50	3.65	4.25	+16.40
	SEm ±		0.2662			0.1027	
	CD @ 5%		0.7854			0.3031	

alone was found to be the next best treatment which recorded only 11.66% leaf infection. While in Bactrinol @ 500 ppm sprayed plants recorded 22.00 % (Table 1). Bleaching powder was found to be least effective as 31.00% of leaf were found to be infected. While the disease severity increased from 40.66 before spray to 57.33% at the end of 8th spray.

Less than one lesion per leaf (0.66) was found after 8th spray with Streptocycline @ 500 ppm + COC @ 0.3% followed by Trimethoprim + Sulphamethoxazole @ 500 ppm + COC 0.3% which recorded 1.00 lesions per leaf. In plants sprayed with Streptocycline @ 500 ppm and Trimethoprim + Sulphamethoxazole @ 500 ppm + Garlic @ 2% recorded 1.33 and 1.66 lesions per leaf, respectively (Table 1). Whereas, in control 6.66 lesions per leaf were recorded, Bleaching powder @ 0.5% is found to be least effective as 4.66 lesions per leaf were found.

Per cent leaf area affected was found to be least (2.50%) again in Streptocycline @ 500 ppm + COC @ 0.3% sprayed plants. Whereas, 7.5, 10.0, 12.50 and 15.0% leaf area infection was recorded in Trimethoprim + Sulphamethoxazole @ 500 ppm + COC @ 0.3%, Streptocycline @ 500 ppm, Trimethoprim + Sulphamethoxazole @ 500 ppm + Garlic @ 2%, Trimethoprim + Sulphamethoxazole @ 500 ppm sprayed plants, respectively. However, plants sprayed

with Cephalaxin @ 500 ppm + COC @ 0.3% recorded about 10.00% leaf area infection. While 35% of leaf area was affected in unsprayed control plants at the end of 8th spray (Table 1).

With regards to the number of twigs infected per plant (Table 2) a combined spray of Streptocycline @ 500 ppm + COC @ 0.3% were found to be very effective as 0.33 twigs per plant was affected at the end of 8th spray followed by Trimethoprim + Sulphamethoxazole @ 500 ppm + COC 0.3% with 0.66 infected twigs per plant. Streptocycline @ 500 ppm alone sprayed plants recorded 1.33 infected twigs per plant. However, combination of Trimethoprim + Sulphamethoxazole @ 500 ppm + Garlic @ 2% was found to be equally effective as recorded 1.66 infected twigs per plant. While, the unsprayed control plants recorded 5.66 infected twigs per plant.

The lesion size on twigs was found to increase in unsprayed control plants from 3.65 to 4.25 cm. While, in plants sprayed with Streptocycline @ 500 ppm + COC @ 0.3% the lesion size was significantly reduced to 0.70 cm followed by Trimethoprim + Sulphamethoxazole @ 500 ppm + COC 0.3% which measured 0.95 cm at the end of 8th spray (Table 2).

The least number of lesions per fruit (0.33) was recorded in the plants sprayed with Streptocycline @

Table 3. Effect of antibiotics/bactericides on fruit disease incidence and yield.

Sl. No.	Treatment details	Number of lesions per fruit			Number of fruits infected			Number of fruits infected Total				Yield (t/ha)
		Before spray (after 6 th spray)	After 8 th spray	Per cent reduction	Before spray	After 8 th spray	Per cent reduction	No. of fruits infected	no. of fruits/plant	% fruits infected	% reduction	
T ₁	Trimethoprim + Sulphamethoxazole-500ppm	3.00	1.66	44.66	6.00	1.66	72.33	6	50	12.00	54.66	12.50
T ₂	Streptocycline-500 ppm	2.33	1.00	57.08	5.33	1.33	75.00	6	46	13.04	60.08	11.50
T ₃	Trimethoprim + Sulphamethoxazole-500 ppm + COC-0.3%	2.33	0.66	71.67	5.33	1.00	81.23	6	53	11.30	68.92	13.25
T ₄	Streptocycline-500 ppm + COC-0.3%	2.00	0.33	83.50	5.66	0.66	88.33	7	61	11.47	72.62	15.25
T ₅	Tetracycline-500 ppm + COC-0.3%	3.33	2.33	30.03	6.00	3.00	50.00	7	34	20.50	40.54	8.50
T ₆	Cephalaxin-500 ppm + COC-0.3%	3.00	2.00	33.33	5.00	2.33	53.40	7	37	18.91	48.66	9.25
T ₇	Norflax-500 ppm + COC-0.3%	3.33	2.00	39.93	4.66	2.00	57.08	7	31	22.58	50.73	7.75
T ₈	Trimethoprim + Sulphamethoxazole-500 ppm + Garlic-2%	2.66	1.33	50.00	6.33	1.66	73.77	7	37	18.91	55.84	9.25
T ₉	Bactrinol- 500 ppm	3.00	2.33	22.30	6.33	3.33	47.39	8	36	22.22	42.37	9.00
T ₁₀	Bleaching powder- 0.5%	3.33	3.00	9.90	5.33	4.66	12.57	8	29	27.58	11.09	7.25
T ₁₁	Check	2.00	3.00	+50.00	5.00	6.66	+33.20	6	17	58.82	+69.95	4.25
	SEm ±	0.1684	0.1096			0.4357		0.4201	0.2665			
	CD @ 5%	0.4853	0.3232			1.2855		1.2117	0.8123			

500 ppm + COC @ 0.3% followed by Trimethoprim + Sulphamethoxazole @ 500 ppm + COC 0.3% which recorded 0.66 lesions per fruit at the end of 8th spray (Table 3). However, Streptocycline @ 500 ppm and Trimethoprim + Sulphamethoxazole @ 500 ppm + Garlic @ 2% sprayed plants recorded 1.00 and 1.33 spots per fruit respectively. The unsprayed control plants recorded 3.00 spots per fruit.

The least number of fruits per plant was found to be infected in plants sprayed with Streptocycline @ 500 ppm + COC @ 0.3% and Trimethoprim + Sulphamethoxazole @ 500 ppm + COC 0.3% recorded 7.00 out of 61.00 and 6.00 out of 53.00 fruits per plant followed by Streptocycline @ 500 ppm recorded 6.00 out of 46.00 fruits (Table 3). In Bactrinol sprayed plants 29.00 fruits found to be affected out of 65.00 fruits per plant. While in unsprayed control plants 6.00 out of 17.00 fruits found to be affected.

The highest yield of 15.25 t/ha was recorded in

plants sprayed with Streptocycline @ 500 ppm + COC @ 0.3% followed by Trimethoprim + Sulphamethoxazole @ 500 ppm + COC 0.3%, which recorded yield of 13.25 t/ha. Whereas, in unsprayed control plants only 4.25 t/ha of yield was recorded (Table 3).

The effect of antibiotic in reducing the incidence and severity of bacterial disease especially caused by *Xanthomonas* has been very well documented on various host under field conditions [4]. In one of the studies on spraying of antibiotics viz., Paushamycin, Streptocycline and K-cycline @ 500 ppm were very effective in controlling the bacterial blight of pomegranate under field conditions followed by Bactrinol @ 500 ppm [5]. However, our present studies revealed that Bactrinol-500 ppm was moderately effective in reducing the disease.

The application of Paushamycine 500 ppm plus copper oxychloride (0.2%) was most effective in con-

trolling the disease of pomegranate caused by *X. c. pv. punicae* [6]. Similarly, Streptomycin sulfate, Streptocycline, Paushamycine and bacteriomycin spray in combination with copper oxy chloride thrice at an interval of 20 days reduce the bacterial spot of grapes and citrus canker [7] effectively.

Conclusion

Hence it may be concluded that spraying of Streptocycline @ 500 ppm + COC @ 0.3% is very effective in reducing the incidence and severity of bacterial blight of pomegranate followed by Trimethoprim + Sulphamethoxazole @ 500 ppm + COC @ 0.3%.

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