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Evaluation of Pre-mix Fungicide, Fluopyram and Trifloxystrobin 250SC against Purple Blotch Disease of Onion in Karnataka

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Authors' contributions

This work was carried out in collaboration among all authors. Author MRR designed the study and conducted experimental work. Authors DKH and BHK managed analyses of the study and literature searches. Author AK performed the statistical analysis and wrote the draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Onion (*Allium cepa* L.) also known as the bulb onion or is rightly called as Queen of kitchen. It is one of the oldest important vegetable crops grown in India. Among the various fungal diseases, purple blotch caused by *Alternaria porri* is one of the most serious disease of onion which causes extensive damage to bulbs as well as seed crop. Field experiment was carried out to know the effect of combi-fungicide Luna sensation 500SC (Fluopyram250SC and Trifloxystrobin 250SC) at 400, 500 and 600 ml /ha along with recommended fungicides against purple blotch disease of onion during *kharif* seasons 2017-18 and 2018-19. A total of eight treatments were taken and among them Luna sensation 500SC (Fluopyram250SC and Trifloxystrobin 250SC) 600 ml / ha proved to be best for management of purple blotch 22.03% diseases index (PDI), which was superior over all other treatments with maximum bulb yield of 24.77 t/ha.

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1. INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important vegetable as well as condiment crop grown throughout the world. India occupies second rank in productivity after China with an area of 12.04 lakh ha with an annual total production of 194.02 lakh tons and an average productivity of 16.1 mt/ha. The major onion producing states are Maharashtra, Madhya Pradesh, Karnataka, Bihar, Rajasthan, Andhra Pradesh, Haryana, West Bengal, Gujarat and Uttar Pradesh in the country. These States account for almost 90% of the total onion production of the country. The estimated production of onion during the year 2017-18 was 3.72% higher as compared to the previous year *i.e.* 2016-17 Monthly Report [1]. Purple blotch disease is the main destructive foliar disease of genus Allium, widespread in many parts of the world, causing significant losses in bulb and seed yield of the crops Abo Elyousr et al. [2]. On onion, the disease causes severe damage on onion seed crop more than the bulb crop resulting more than 80% Thind and Jhooty, [3]. Under favorable condition, the pathogen develops brownish-purple necrotic lesions in the leaf tissues which breaks the stimulus for bulb initiation, thereby delaying bulb formation and maturation Black et al. [4]. Proper disease control measures can improve the quality of onion bulbs and significantly increase the yield. Limited attempts have been made to find out the suitable control measures of this disease for bulb and seed production. Though many researchers have worked on this pathogen and its management the disease still remains a major bottleneck in onion cultivation. In view of this, an investigation was undertaken by carrying out in vitro evaluation of different fungicides for their efficacy against *A. porri* Priya [5]. The present investigation on purple blotch (*Alternaria porri*) of onion was undertaken effect of chemicals in minimizing the disease under *in vitro* condition with an objectives of the efficacy of Luna sensation (Fluopyram 50+Trifloxystrobin250 SC) and the phytotoxic effect of Luna sensation (Fluopyram 50+Trifloxystrobin250 SC) on Onion.

2. MATERIALS AND METHODS

The field experiments were conducted during *kharif* seasons 2017-18 and 2018-19 to evaluate the efficacy of different chemicals for the management of purple blotch disease of Onion. The field trials were conducted in a randomized block design (RBD) with three replications along with the unsprayed check. The details of the chemicals and their concentrations are follows:

Purple blotch of onion severity was recorded in 10 plants in each plot at 30 and 45 DAS on 0-5 standard rating scale. Disease severity was assessed by using 0-5 scale as given by Sharma (1986).

Table 1. Details of chemicals and their concentrations used in the management of purple blotch of onion

Tr. No.	Treatment Details	Dosage per ha		
		g a.i.	Formulation (ml or g)	Water volume (L)
T1	Luna sensation (Fluopyram 250+ Trifloxystrobin 250 SC)	100+100	400 ml	500
T2	Luna sensation (Fluopyram 250+ Trifloxystrobin 250 SC)	125+125	500 ml	500
T3	Luna sensation (Fluopyram 250+ Trifloxystrobin 250 SC)	150+150	600 ml	500
T4	Luna sensation (Fluopyram 250+ Trifloxystrobin 250 SC)	150	300 ml	500
T5	Fluopyram 500 SC	150	300 g	500
T6	Trifloxystrobin 50% WG	125	500 ml	500
T7	Difenoconazole 25% EC	300+300	1200 ml	500
T8	Control	-	-	-

Table 2. Description of disease symptoms

Score	Disease description
0	No diseases symptoms
1	A few spots towards tip covering 10 per cent leaf area.
2	Several dark purplish brown patch covering upto 20 per cent leaf area
3	Several patches with paler outer zone covering upto 40 per cent leaf area
4	Leaf steaks covering upto 75 per cent leaf area or breaking of the leaves from center
5	Complete drying of the leaves or breaking of the leaves from center.

Table 3. Treatment dosage

Tr. No.	Treatment Details	Dosage per ha		
		g a.i.	Formulation (ml or g)	Water volume (L)
T1	Luna sensation (Fluopyram 250+Trifloxystrobin 250 SC)	150+150	600	500
T2	Luna sensation (Fluopyram 250+Trifloxystrobin 250 SC)	300+300	1200	500
T3	Control	-	-	-

Table 4. Phytotoxicity rank

Score	Phytotoxicity (percent)
0	No Phytotoxicity
1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81-90
10	91-100

The disease index was calculated by using the following the score 0-5. The scale was converted into severity (Per cent Disease Index i.e. PDI) using the formula given by wheeler [6].

$$\text{Percent Disease Index} = \frac{\text{Sum of all disease rating}}{\text{Total no. of leaves/bra nches assessed} \times \text{Maximum Disease grade}} \times 100$$

Phytotoxicity: Phytotoxicty observation on 0-10 scale for leaf tips and surface injury, wilting, necrosis, epinasty and hyponasty. For phytotoxicity, three treatments including check were taken with four replications. Ten plants were selected at random from each treatment and the total number of leaves and those showing phytotoxicty were counted.

2.1 Phytotoxicity Treatment Details

The data collected were converted in to percentage. The extent of phyto-toxicty is recorded based on following score.

3. RESULTS AND DISCUSSION

The result presented in Table 5 revealed that, all the fungicidal treatments were found effective in reducing the disease index of Purple blotch over control. Luna sensation (Fluopyram 250+Trifloxystrobin250 SC) @ 600 ml / ha provided superior (PDI) control followed by Luna sensation (Fluopyram 250+Trifloxystrobin250 SC) @500 ml per ha 24% mean PDI and the next most effective treatment was Difenoconazole 25%EC @500 ml per ha 25.35% mean PDI. Mean Maximum purple blotch disease severity (PDI) was recorded in untreated control 70.35% mean PDI (Table 5). Adaskaveg [7] found that the new SDHI products, fluopyram and fluxapyroxad are highly effective against powdery mildew but will only be sold as pre-mixtures. Overall, data revealed that the efficacy of Luna sensation (Fluopyram 250+Trifloxystrobin250 SC)@ 600ml per ha and @ 500 ml per ha against purple blotch of onion

Table 5. Evaluation of Luna sensation (Fluopyram 250+Trifloxystrobin250 SC) against Purple Blotch of Onion 2017-18

Tr. No	Treatment Details	g a,i	Dosage/ha Formulation (g or ml)	Water volume (L)	% diseases PDI						Yields (t/ha)		
					Before spray		I spray		II spray		2017-18	2018-19	Mean
					2017-18	2018-19	2017-18	2018-19	2017-18	2018-19			
T1	Luna sensation (Fluopyram 250+Trifloxystrobin 250 SC)	100+100	400 ml	500	42.14 (40.47)	37.93 (38.03)	28.70 (32.39)	26.78 (31.16)	25.08 (30.05)	28.37 (32.16)	22.87	23.63	23.25
T2	Luna sensation (Fluopyram 250+Trifloxystrobin 250 SC)	125+125	500 ml	500	41.26 (39.96)	38.07 (38.09)	23.41 (28.93)	24.03 (29.36)	24.50 (25.91)	20.80 (27.13)	24.00	24.63	24.32
T3	Luna sensation (Fluopyram 250+Trifloxystrobin 250 SC)	150+150	600 ml	500	42.55 (40.71)	38.13 (38.15)	25.17 (30.11)	23.80 (29.20)	21.10 (27.34)	20.27 (26.73)	24.60	24.77	24.69
T4	Luna sensation (Fluopyram 250+Trifloxystrobin 250 SC)	150	300 ml	500	42.92 (40.92)	38.03 (38.06)	35.33 (36.47)	28.94 (32.53)	33.79 (35.54)	26.77 (31.16)	18.37	18.73	18.55
T5	Fluopyram 500 SC	150	300 g	500	43.24 (41.11)	38.15 (38.15)	34.77 (36.13)	28.27 (32.13)	34.42 (35.92)	26.23 (30.79)	17.80	17.90	17.85
T6	Trifloxystrobin 50% WG	125	500 ml	500	43.39 (41.19)	38.27 (38.20)	36.13 (36.94)	25.03 (30.01)	31.27 (33.99)	23.00 (28.66)	19.27	22.53	20.90
T7	Difenoconazole 25% EC	300+300	1200 ml	500	42.99 (40.96)	38.23 (38.20)	26.69 (31.10)	30.00 (33.21)	24.01 (29.33)	28.37 (32.14)	23.10	19.45	21.28
T8	Control	-			42.81 (40.86)	38.57 (38.39)	68.96 (56.14)	61.45 51.03)	71.73 (57.87)	63.18 (52.59)	13.50	13.60	13.55
	SEm±				0.31	1.05	1.93	1.81	1.91	1.71	1.18	1.43	
	CD(0.05)				0.93	4.10	5.84	5.49	5.79	5.20	3.58	4.32	

Figures in parenthesis indicate arcsine values

Table 6. Phytotoxicity report of different fungicides combinations against Purple Blotch of onion

Day of observation after spray	Sl. No.	Treatments	Phytotoxicity symptoms				
			Leaf tips and surface injury	Wilting	Vein clearing	Necrosis	Epinasty and hyponasty
1st Day	1.	Luna sensation (Fluopyram	0	0	0	0	0
	2.	250+Trifloxystrobin250 SC)g/l 500 SC	0	0	0	0	0
		2X	0	0	0	0	0
	3.	Untreated control	0	0	0	0	0
3rd Day	1.	Luna sensation (Fluopyram	0	0	0	0	0
	2.	250+Trifloxystrobin250 SC)g/l 500 SC	0	0	0	0	0
		2X	0	0	0	0	0
	3.	Untreated control	0	0	0	0	0
5th Day	1.	Luna sensation (Fluopyram	0	0	0	0	0
	2.	250+Trifloxystrobin250 SC)g/l 500 SC	0	0	0	0	0
		2X	0	0	0	0	0
	3.	Untreated control	0	0	0	0	0
7th Day	1.	Luna sensation (Fluopyram	0	0	0	0	0
	2.	250+Trifloxystrobin250 SC)g/l 500 SC	0	0	0	0	0
		2X	0	0	0	0	0
	3.	Untreated control	0	0	0	0	0
10th Day	1.	Luna sensation (Fluopyram	0	0	0	0	0
	2.	250+Trifloxystrobin250 SC)g/l 500 SC	0	0	0	0	0
		2X	0	0	0	0	0
	3.	Untreated control	0	0	0	0	0

disease was found effective and superior comparable to Difenconozole 25% EC.

3.1 Phyto-Toxicty

The result of phyto-toxicty studies of Luna sensation (Fluopyram 250+Trifloxystrobin250 SC) is presented in Table 6, there were no visual symptoms of phyto-toxicty noticed in terms of leaf tips and surface injury, wilting, necrosis, epinasty and hyponasty on cucumber crops in all the treatment. Thaware et al. [8] reported that different fungicides against the fungus Alternaria under in vitro condition. Karaoglanidisa and Karadimosb [9] reported that efficacy of strobilurins increased when mixed with other broad spectrum or contact fungicides in controlling powdery mildew in field-grown sugar beet.

Yield data is presented in Table 5. It reveals that the maximum highest yield wasrecorded Luna sensation (Fluopyram 250+Trifloxystrobin250 SC) @ 600 ml per ha(24.69 t / ha) followed by Luna sensation (Fluopyram 250+Trifloxystrobin 250 SC)@500 ml per ha (24.32 t/ha) and the next best treatment was Difenoconazole 25% EC @500 ml/L of water /ha (23.25 t/ha). The least yields were recorded in untreated control (T8) (13.55 t/ha). Mishra and Gupta [10] evaluated eight fungicides against Alternariaporri under in vitro condition. Ponnappa [11] studied in vitro efficacy of fungicides against leaf blight on onion caused by A. cepulaeand reported that mancozeb (Dithane M-45), Aureofungin and Duter showed complete inhibition at 0.2% concentration. Gupta et al. [12] reported that mancozeb (Dithane M-45) was the most effective in inhibiting the growth of *Alternariaporri*under in vitro conditions.

4. CONCLUSION

The application of Luna sensation (Fluopyram 250+Trifloxystrobin250 SC) @500 ml/ha has significantly decreased the purple blotch of onion disease. Luna sensation (Fluopyram 250+Trifloxystrobin 250 SC)@500 ml/ha is safer to onion crop without causing any type of Phyto-toxicty effect.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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