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Research Article

EFFECT OF SOME FUNGICIDES ON ANTHRACNOSE DISEASE OF GRAPES UNDER FIELD CONDITION

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Abstract: Anthracnose of grapes (*Vitis vinifera* L.) caused by *Elsinoe ampelina* (de Bary) Shear, is widespread and the most destructive disease in the vineyards which causes considerable yield loss in grapes production. In the absence of resistant cultivars, management of Anthracnose disease has relied principally on application of synthetic fungicides. The present study evaluated the effects of fungicides on Anthracnose disease of grapes and investigated the efficacy on the yield components and yield of grapes. The field experiment was laid in a randomized block design with five treatments and four replications in subtropical climatic condition of West Bengal at Regional Research Sub-Station (R & L Zone), Bidhan Chandra Krishi Viswavidyalaya, Sekhampur, Birbhum, West Bengal, India during 2018 and 2019. The highest disease control was in Picoxystrobin 22.52% SC @ 400 ml/ha (75.89 %, 69.58 % and 72.97 %) followed by Azoxytrobin 23 % SC @ 500 ml/ha (71.93 %, 63.83 % and 66.54 %), Kresoxim-methyl 44.3% SC @ 700 ml/ha (60.50 %, 52.70 % and 53.89 %) and Hexaconazole 5% EC @ 1000 ml/ha (46.71 %, 32.28 % and 37.58 %) on leaves, shoots and bunches respectively at 15 days after 2nd spray. Highest marketable grapes yield was obtained by the spray of Picoxystrobin 22.52% SC @ 400 ml/ha as compared to other treatments.

Keywords: *Anthracnose disease, Fungicides, Grapes*

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Introduction

Grapevine (*Vitis vinifera* L.) is an important commercial fruit crop and widely cultivated crop in different regions of the world. According to Mullins *et al.* (1992) the origin of the grape was southern Caucasia, now occupied by north-west Turkey, northern Iraq, Azerbaijan and Georgia [1]. The grape is used for a numerous of products, ranging from fresh fruit, preserves, juice, wine and raisins. In India grape is the one of the major cash crops. Grape is attacked by many diseases which cause severe yield loss. Anthracnose disease caused by *Elsinoe ampelina* (de Bary) Shear, is common and important disease in grapes cultivation. The disease appears from the early stages and continues upto harvesting. Yield potential will be decreased if proper management is not done. In India the disease has become a major problem in grape cultivation. In most of the grape growing areas of the world, the several fungicides are used to control anthracnose disease successfully [2]. In the lack of resistant varieties chemical fungicides play an important role against the disease [3]. Farmers apply chemical fungicides to protect their crops from the fungal pathogen. The fungal pathogens have started resistance development against the conventional fungicides. But second-generation fungicides are the new hope in diseases management under field conditions. In the present study aimed to test the effectiveness of new molecules of fungicides for the control of grapes anthracnose in West Bengal condition.

Materials and methods

The investigation was carried in a randomized block design with five treatments and four replications in subtropical climatic condition of West Bengal at Regional Research Sub-Station (R & L Zone), Bidhan Chandra Krishi Viswavidyalaya, Sekhampur, Birbhum, West Bengal, India. The experiment was conducted on variety Arka Neelamani during January, 2018 to June, 2018 and January, 2019 to June, 2019 and the age of crop is 6th and 7th years variety, respectively. Vines on this site were moderately vigor, trained in/trellis, planted on a spacing of 3m x 3m. Number of plants/treatment was 5 and row to row orientation was in north south direction. Standard agronomic practices were followed. The treatments were imposed as per details of spray schedules given in [Table-1]. Observations were recorded 15 days after spraying by randomly selecting 20 leaves, shoots and fruit bunches per replication were randomly observed for disease severity. Grape leaves, shoots and fruit bunch having typical symptoms of anthracnose collected from the grape vineyard. The disease severity of anthracnose of grape was recorded by following 0-9 scale of visual rating [4]. Percent disease intensity reaction was classified as 0 = no disease or immune, 1 = 1 to 5% infection, 3 = 6-10% Infection, 5 = 11-25% infection, 7 = 26-50% infection, 9 = >50% infection. Percentage Disease Index was worked out using the formula, PDI = [Sum of all numerical rating/total number of observations taken x maximum disease score] x 100 [5]. The PDI values were transformed by angular transformation and analyzed statistically. The yield data was also analyzed statistically. Harvesting of grapes was done manually at full maturity during last week of May to first week of June under West Bengal condition. Marketable yield (kg /vine) and marketable yield (t /ha) were recorded. Finally, the disease severity percent and yield over the control were also calculated.

Table-1 *Treatments details of fungicides*

Treatments	Fungicides	Dosage (ml/ha)
T_1	Azoxystrobin 23% SC	500 ml
T_2	Picoxystrobin 22.52% SC	400 ml
T_3	Kresoxim-methyl 44.3% SC	700 ml
T_4	Hexaconazole 5% EC	1000 ml
T_5	Control (Water only)	--

Results and discussion

Results presented in [Table-2] and [Fig-1] from the experimental trials revealed that all the treatments reduced the disease severity of anthracnose disease over (T_5) control.

Table-2 *Effect of fungicides for control of anthracnose disease of grapes during 2018 and 2019 under natural condition*

Treatments	Fungicides	Dose (ml/ha)	Pooled analysis of 2018 and 2019								
			PDI on leaves			PDI on shoots			PDI on berries		
			before spray	15 days after 2nd spray	Percent reduction over control	Before spray	15 days after 2nd spray	Percent reduction over control	Before spray	15 days after 2nd spray	Percent reduction over control
T_1	Azoxystrobin 23% SC	500 ml	3.24(10.37)	9.14(17.60)	71.93	1.38(6.75)	3.15(10.22)	63.83	1.28(6.50)	7.65(16.06)	66.54
T_2	Picoxystrobin 22.52% SC	400 ml	2.45(9.01)	7.85(16.27)	75.89	1.45(6.92)	2.65(9.37)	69.58	2.14(8.41)	6.18(14.39)	72.97
T_3	Kresoxim-methyl 44.3% SC	700 ml	3.15(10.22)	12.86(21.01)	60.50	1.58(7.22)	4.12(11.71)	52.70	1.65(7.38)	10.54(18.94)	53.89
T_4	Hexaconazole 5% EC	1000 ml	3.52(10.81)	17.35(24.62)	46.71	2.05(8.23)	5.89(14.05)	32.38	1.53(7.11)	14.27(22.19)	37.58
T_5	Control (Water only)	--	2.86(9.74)	32.56(34.79)	0.00	1.76(7.62)	8.71(17.17)	0.00	1.48(6.99)	22.86(28.56)	0.00
	S Em (±)		1.018	0.373		1.096	0.679		1.123	0.520	
	CD 5%		NS	1.15		NS	2.09		NS	1.60	

Values are mean of 4 replications, Figures in parentheses arc sine transformed values, NS-Non significant

Table-3 *Effect of fungicidal management on yield of grapes during 2018 and 2019*

Pooled analysis of 2018 and 2019					
Treatments	Fungicides	Dose (ml /ha)	Marketable Yield (kg/vine)	Marketable Yield (t/ ha)	Yield increases over control (%)
T_1	Azoxystrobin 23% SC	300 ml	5.53	6.15	61.42
T_2	Picoxystrobin 22.52% SC	400 ml	5.85	6.54	71.65
T_3	Kresoxim-methyl 44.3% SC	500 ml	5.26	5.87	54.07
T_4	Hexaconazole 5% EC	400 ml	4.42	4.96	30.18
T_5	Control (Water only)	700 ml	3.38	3.81	0.00
SEm (±)			0.39	0.41	
CD 5%			1.20	1.28	

Values are mean of 4 replications

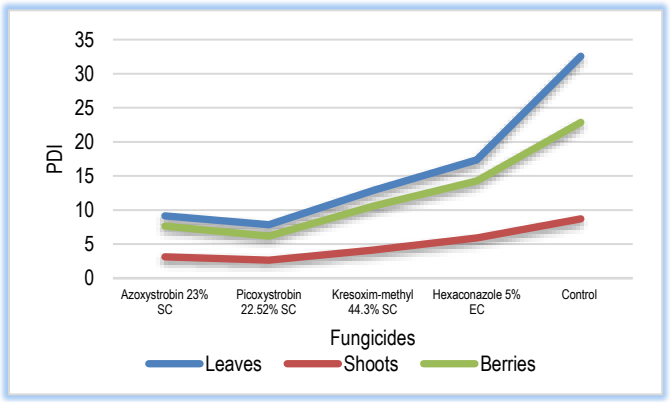

Fig-1 Percent disease index (PDI) in different fungicides against anthracnose disease of grapes

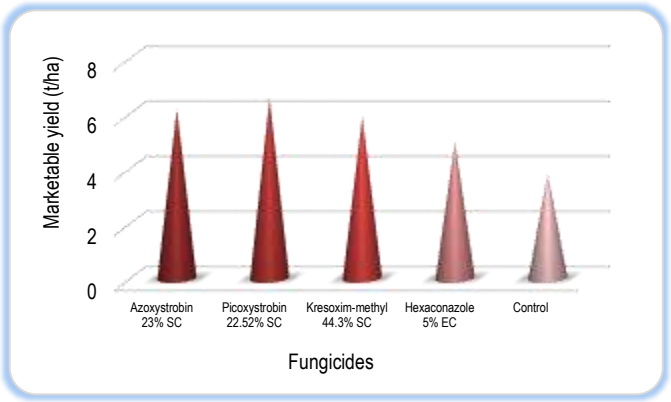

Fig-3 Effect of fungicides on marketable yield in grapes

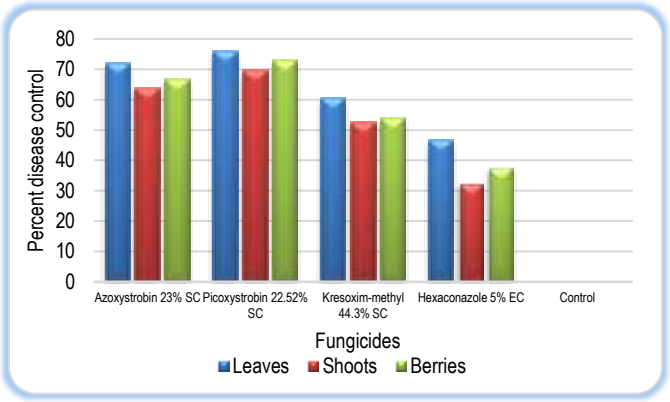

Fig-2 Influence of fungicides on anthracnose disease control in grapes

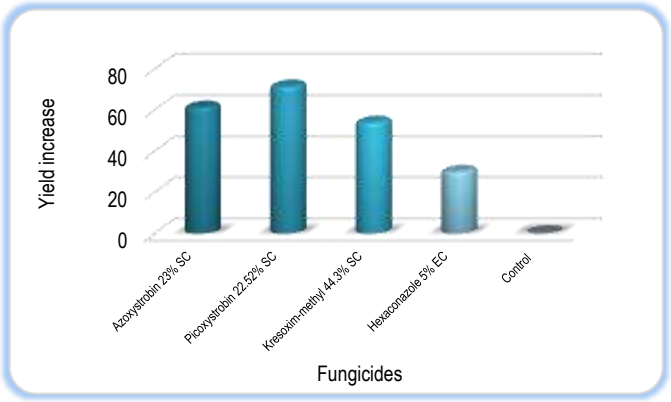

Fig-4 Influence of fungicides on marketable yield increase in grapes

Depending on the prevailing weather conditions, maximum disease severity (32.56%, 8.71% and 22.86 %) was recorded on leaves, shoots and bunches in control, respectively at 15 days after 2nd spray. Among the treatments T_2: Picoxystrobin 22.52% SC @ 400 ml/ha (7.85 %, 2.65 % and 6.18 %) exhibited minimum disease severity on leaves, shoots and bunches respectively followed by T_1: Azoxytrobin 23 % SC @ 500 ml/ha (9.14%, 3.15 % and 7.65 %), T_3: Kresoxim-methyl 44.3% SC @ 700 ml/ha (12.86 %, 4.12 % and 10.54 %) and T_4: Hexaconazole 5% EC @ 1000 ml/ha (17.35 %, 5.89 % and 14.27 %) at 15 days after final spray, respectively. Results among these four treatments (T_1, T_2, T_3 & T_4) were found good efficacy against the disease over control. The percent reduction in terminal PDI was also calculated over control [Table-2] and [Fig-2].

The data revealed that highest disease control was in T_2: Picoxystrobin 22.52% SC @ 400 ml/ha (75.89%, 69.58% and 72.97 %) followed by T_1: Azoxytrobin 23 % SC @ 500 ml/ha (71.93%, 63.83% and 66.54 %), T_3: Kresoxim-methyl 44.3% SC @ 700 ml/ha (60.50%, 52.70% and 53.89 %) and T_4: Hexaconazole 5% EC @ 1000 ml/ha (46.71%, 32.28% and 37.58 %) on leaves, shoots and bunches respectively at 15 days after 2nd spray. All treatments controlled effectively the anthracnose disease in grapes. The yield data has been presented in [Table-3] and [Fig-3]. The results revealed that maximum yield was obtained from T_2: Picoxystrobin 22.52% SC @ 400 ml/ha (5.85 kg/vines and 6.54 t/ha) followed by T_1: Azoxytrobin 23 % SC @ 500 ml/ha (5.53 kg/vines and 6.15t/ha), T_3: Kresoxim-methyl 44.3% SC @ 700 ml/ha (5.26 kg/vines and 5.87t/ha) and

T_4: Hexaconazole 5% EC @ 1000 ml/ha (4.42 kg/vines and 4.96t/ha) for Marketable yield/vine and Marketable yield/ha respectively. The lowest yield was recorded in control (3.38 kg/vines and 3.81t/ha). Highest increase of marketable yield was recorded from T_2: Picoxystrobin 22.52 % SC @ 400 ml/ha (71.65 %) followed by T_1: Azoxytrobin 23 % SC @ 500 ml/ha (61.42%), T_3: Kresoxim-methyl 44.3% SC @ 700 ml/ha (54.07 %) and T_4: Hexaconazole 5% EC @ 1000 ml/ha (30.18 %) presented in [Table-3] and [Fig-4].

The results are in consistent with the findings *i.e*., WANIS (5 ml/l) was effective in reducing the incidence of downy mildew and anthracnose diseases of grapes [6]. In mango, Azoxystrobin at 0.5 ml/l suppressed the development of leaf anthracnose by about 50% [7,8]. Pyraclostrobin 5% + Metiram 55% WG, Carbendazim 50 WP, Flusilazole 40 EC and Kresoxim methyl 44.3 SC gave similar results against grapes anthracnose [9]. Picoxystrobin 22.52 % SC was very effective against Leaf blight Pathogen of Lilium [10].

So, the findings of the present investigation are comparable with the findings of the previous researchers. Based on findings of the present study, it may be concluded that two times foliar spray with Picoxystrobin 22.52% SC@ 400 ml/ha at an interval of 15 days may be recommended to control of Anthracnose disease of grapes in West Bengal condition.

Application of research: The fungicide Picoxystrobin 22.52% SC@ 400 ml/ha will be very effective for management of anthracnose disease of grapes.

Research Category: Plant disease management by chemical fungicide.

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Research project name or number: Research station study

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Study area / Sample Collection: Regional Research Sub Station (Red & Laterite Zone), Sekhampur, P.O. Gadadharpur, Birbhum, 731129

Cultivar / Variety / Breed name: Arka Neelamani

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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