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Exploration of fungicides against *Alternaria* leaf blight of cotton in Northern parts of Karnataka, India

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Abstract

An investigation studies on *Alternaria macrospora* Zimm., causing leaf blight of Cotton was carried out at Agricultural Research Station, Dharwad Farm during *khariif* 2013 in order to test the efficacy of chemical fungicides both *in vitro* and *in vivo*. Among the tested fungicides, Hexaconazole, Propiconazole and Avatar recorded cent percent inhibition at all the test concentrations (0.05%, 0.075% and 0.1%). *In vivo* trials revealed that both Hexaconazole and Propiconazole at 0.1 percent concentration were found very effective in managing the disease by recording a kapas yield of 15.37 and 14.84 qtl/ha with a benefit cost ratio of 2.04 and 1.70, respectively.

Keywords: *Alternaria macrospora*, cotton, fungicides, management

Introduction

Cotton, known as the “King of fibres” occupies a unique position in Indian Agriculture. Presently, this crop is grown under varying agro-climatic conditions owing to the largest cotton area of 11.61 million hectares with a production of 33.4 million bales and a productivity of 489 kg/ha. Karnataka state has an area of 5.16 lakh hectares and a production of 12 lakh bales with a productivity of 572 kg/ha (Anon., 2012) [1]. It is noticed with distress that innumerable abiotic and biotic factors affect cotton, thus limiting productivity. Diseases have been referred as important limiting factors in this high value commercial crop. Among them, the economically most important ones are bacterial blight, *Alternaria* leaf spot, grey mildew, rust and vascular wilts which occur throughout the world (Kotasthane and Agrawal, 1970) [2]. *Alternaria* leaf spot causes yield losses upto 26 percent (Chattannavar *et al.*, 2006) [3]. Hence, usage of fungicides becomes inevitable in controlling the disease.

Materials and Methods

The efficacy of systemic and combi product fungicides against *Alternaria macrospora* were evaluated *in vitro* by poisoned food technique (Nene and Thapliyal, 1993) [4] using PDA as basal medium with three replications. Different treatments *viz.*, Pyraclostrobin 20% WG, Trifloxystrobin 50% WG, Propiconazole 25% EC, Tebuconazole 25% EC, Hexaconazole 5% SC, Sprint 75 WS, Cabrio Top 60 WG, Nativo 75 WG and Avatar 72 WP were imposed at 0.05, 0.075 and 0.1 percent concentrations along with untreated control. Required quantity of test fungicides were added to the sterilized medium and poured onto petriplates. The plates were then inoculated with 5mm discs of one week old culture of *Alternaria macrospora* using cork borer. Then they are incubated at 27±1 °C for 15 days. The colony diameter was measured when maximum growth was achieved in control plate. The percent inhibition was calculated by using the formula given by Vincent (1947),

$$I = \frac{C - T}{C} \times 100$$

Where,

I - Percent inhibition

C- Mycelial growth in control

T- Mycelial growth in treatment

A field experiment was conducted at Agricultural Research Station, Dharwad Farm during *khariif* 2013 in order to estimate the disease severity and yield losses due to *Alternaria* leaf blight on cotton and to find out a suitable fungicide in controlling the disease effectively at field level. Experiment was laid out in plots of 2.7X6 m at 90X60 cm spacing in RBD with three replications and sowing was done on 1st July, 2013 using a susceptible variety, Bunny Bt. Different treatments *viz.*, Trifloxystrobin 50 WG (0.1%), Nativo 75 WG (0.1%), Pyraclostrobin 20 WG (0.1%), Cabrio Top 60 WG (0.1%), Kresoxymethyl 50 WG (0.1%), Tebuconazole 25 EC (0.1%), Propiconazole 25 EC (0.1%), Saaf 75 WP (0.2%), Hexaconazole 5 SC (0.1%) and Mancozeb 75 WP (0.25%) along with untreated control were given. All other cultural and pest management practices were imposed as recommended in package of practices. Spray schedule was initiated after the initiation of symptom in the field. Observations on percent disease severity of *Alternaria* blight was recorded at 105 days after sowing using 0-4 scale. The kapas yield was recorded in each treatment and the data was statistically analyzed.

Results and Discussion

The systemic fungicides tested at different concentrations are presented in Table 1. All the fungicides tested at all concentrations were significantly effective in reducing the mycelial growth of *Alternaria macrospora*. Among them, Hexaconazole, Propiconazole and Avatar 72 WP recorded cent percent inhibition at all the concentrations (0.05%, 0.075% and 0.1%). The next best treatment was Nativo 75 WG (91.36%) which was on par with Tebuconazole (91.17%) whereas Sprint 75 WS was least effective in reducing the mycelial growth (65.12%). The effectiveness of triazole fungicides may be attributed to their inhibition of ergosterol biosynthesis. The result was further supported by Arun Kumar (2008) [6] who reported that Propiconazole and

Hexaconazole was best at all concentrations (0.1%, 0.2% and 0.3%) which completely inhibited the mycelial growth. Efficacy of these fungicides were also reported by Mallikarjun (1996) [7]; Chattannavar *et al.* (2004) [8]; Mesta (2006) [9]; Surviliene and Dambrauskiene (2006) [10].

The results after two sprays (Table 2) revealed that, Hexaconazole at 0.1 percent recorded significantly lower percent disease index (14.33) which was on par with Propiconazole at 0.1 percent (15.67). The next best treatments were Tebuconazole at 0.1 percent (17.33 PDI) and Cabrio Top 60 WG at 0.1 percent (17.67 PDI) followed by Nativo 75 WG at 0.1 percent (18.00 PDI) and Sprint 75 WS at 0.2 percent (18.33 PDI). Maximum percent disease index was noticed in untreated check (35.33) followed by Mancozeb at 0.25 percent (27.33). Out of different treatments, the highest percent decrease over control (PDC) was shown by Hexaconazole (59.44) followed by Propiconazole (55.65), Tebuconazole (50.95) whereas, least PDC was shown by Mancozeb (22.64). The maximum kapas yield was recorded in Hexaconazole (1536.76 kg/ha) followed by Propiconazole (1484.10 kg/ha) and Tebuconazole (1453.87 kg/ha) whereas, least kapas yield was recorded in Mancozeb (1078.13 kg/ha). Hosagoudar (2012) reported that the seed treatment (ST) of Vitavax power (0.3%) + foliar spray (FS) with Propiconazole (0.1%) significantly reduced *Alternaria* leaf blight percent disease index (5.54) which was on par with ST of Vitavax power (0.3%) + FS with Tebuconazole (0.1%) (6.92) followed by ST of Vitavax power (0.3%) + FS with Hexaconazole (0.1%) (8.47). Similarly Chattannavar *et al.* (2004) [8] observed that the new chemical Tebuconazole (Folicur) at 0.05 and 0.07 percent was very effective against *Alternaria* leaf blight and grey mildew followed by Copper oxychloride. Shtienberg and Dreishpoun (1991) [11] reported that Difencnazole @ 0.125 kg a.i./ha and Tebuconazole at 0.187 kg a.i./ha suppressed *Alternaria* leaf blight to a significant extent as compared to untreated plots.

Table 1: *In-vitro* evaluation of fungicides in inhibiting mycelial growth of *Alternaria macrospora*

Treatments	Percent inhibition of mycelial growth			
	Concentrations			Mean
	0.05%	0.075%	0.1%	
Pyraclostrobin	72.04 (58.09) *	80.19 (63.58)	84.93 (67.18)	77.72 (58.09)
Trifloxystrobin	70.56 (57.14)	76.67 (61.31)	80.53 (63.82)	70.19 (57.07)
Propiconazole	100 (90)	100 (90)	100 (90)	100 (90)
Tebuconazole	89.44 (71.04)	90.74 (72.31)	93.33 (75.05)	91.17 (72.80)
Hexaconazole	100 (90)	100 (90)	100 (90)	100 (90)
Carbendazim 25% + Mancozeb 50%	63.15 (52.63)	64.44 (52.63)	67.78 (55.42)	65.12 (53.82)
Pyraclostrobin 5% + Metiram 55%	81.85 (64.79)	84.44 (64.79)	85.93 (67.99)	84.07 (66.53)
Tebuconazole 50% + Trifloxystrobin 25%	84.07 (66.50)	90 (66.50)	100 (90)	91.36 (76.03)
Hexaconazole 4%+ Zineb 68%	100 (90)	100 (90)	100 (90)	100 (90)
Mean	84.57 (71.13)	87.39 (73.22)	90.28 (76.61)	77.72 (58.09)
	S. Em.±			CD at 1%
Treatments (T)	0.43			1.71
Concentrations (C)	0.25			0.99
T x C	0.74			2.97

* Figures in parentheses indicates angular transformed values

Table 2: Efficacy of fungicides against *Alternaria* leaf blight of cotton

Sl. No.	Treatment details	Percent disease index (PDI) at 105 DAS	Percent decrease over control (PDC)	Yield (kg/ha)	B:C ratio
T ₁	Trifloxystrobin	20.33 (26.80) *	42.46	1254.33	1.26
T ₂	Tebuconazole 50% + Trifloxystrobin 25%	18.00 (25.10)	49.05	1355.96	1.05
T ₃	Pyraclostrobin	23.67 (29.11)	33.00	1163.63	1.08
T ₄	Pyraclostrobin 5% + Metiram 55%	17.67 (24.85)	49.99	1412.90	1.59
T ₅	Kresoxim methyl	22.00 (27.97)	37.72	1199.35	1.18
T ₆	Tebuconazole	17.33 (24.60)	50.95	1453.87	1.61
T ₇	Propiconazole	15.67 (23.32)	55.65	1484.10	1.70
T ₈	Carbendazim 12%+ Mancozeb 63%	18.33 (25.35)	48.12	1291.63	1.47
T ₉	Hexaconazole	14.33 (22.25)	59.44	1536.76	2.04
T ₁₀	Mancozeb	27.33 (31.52)	22.64	1078.13	1.46
T ₁₁	Control	35.33 (36.47)		814.00	1.22
	S. Em.±	0.99		26.15	
	CD at 5%	2.93		77.15	

* Figures in parentheses indicates angular transformed values

Conclusion

In *in-vitro* evaluation of systemic fungicides, Hexaconazole, Propiconazole and Hexaconazole 4% + Zineb 68% showed cent percent inhibition at all the concentrations (0.05%, 0.075% and 0.1%). In field management of *Alternaria* blight of cotton, Hexaconazole @ 0.1% showed best disease control and high yield. Next best were Propiconazole and Tebuconazole.

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