
Screening of genotypes and effect of fungicides against purple blotch of onion.

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Three nonsystemic fungicides viz., mancozeb, iprodione and copperoxychloride and three systemic fungicides viz., difenconazole, kitazin and propiconazole were evaluated against *Alternaria porri* causing purple blotch of onion under invitro conditions. Among systemic fungicides tested difenconazole at 0.1 percent showed 98.85 per cent inhibition of the fungus while among the non-systemic fungicides mancozeb at 0.3 per cent was best in inhibiting the growth of *A. porri* with 100 percent inhibition. Screening of onion genotypes for purple blotch under field condition of onion revealed that, the genotype Arka Kalyan was found moderately resistant while the genotypes viz., Rampur Rose, Agrifound Rose, Arka Pragati, Arka Niketan, Arka Pitamber and Arka Bindu were found moderately susceptible to purple blotch of onion.

Key words: Purple blotch, *Alternaria porri*, genotypes, fungicides.

Introduction

Onion (*Allium cepa*, L. Alliaceae) is one of the five most important fresh vegetable crops in the world (Cramer, 2000). Onion is an important vegetable and has been grown in almost all the parts of India for thousands of years. The onions are regarded as a highly export oriented crop and earn valuable foreign exchange for the country. Though India produces a significant quantity of onions it is not regular and sufficient enough to meet the demands for both domestic requirement and export. Amongst the onion producing countries in the world India ranks second in area and production, the first being China. The highest productivity of onion in world is of Korea Rep (67.25 MT/ha) followed by USA (53.91 MT/ha), Spain (52.06 MT/ha) and Japan (47.55 MT/ha). India being a second major onion producing country in the world has a productivity of 10.16 MT/ha. Even though India ranks second in area under onions in the

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world and third in production but its productivity is low as compared to world's productivity. Among several factors, diseases are the most important factors associated with low productivity in onion. Onion is susceptible to numerous foliar, bulb and root pathogens that reduce yield and quality (Cramer, 2000).

Purple blotch disease of onion is a serious menace in onion-producing countries of the world (Pandotra, 1965). Purple blotch is prevalent on leaves and seed stalk of onions and cause serious damage throughout the onion producing area in the country every year and due to this onion production is reduced which adversely affects exports and also results price hike within the country. Purple blotch of onion caused by *Alternaria porri* is one among the serious fungal diseases that affect onion, causing heavy yield loss ranging from 2.5 to 87.8 per cent during *kharif* season. Keeping in view of the above reason management of purple blotch of onion has become a issue in present condition. In this regard experiments were carried out to test different fungicides for their effectiveness against the pathogen and to identify the resistant genotype against purple blotch of onion.

Material and methods

The experiment on *in vitro* evaluation of fungicides was carried out at University of Agricultural Sciences, Dharwad, Karnataka. The efficacy of three systemic fungicides viz., propiconazole (tilt 25% E.C), difenconazole (score 25% E.C) and IBP (kitazin 48% E.C) at concentration of 0.025, 0.05 and 0.1 percent and three non-systemic fungicides viz., mancozeb (indofil M-45 75% W.P) Iprodione (rovral 50% W.P) and copper oxychloride (blitox-50% WP at concentration of 0.1, 0.2 and 0.3 percent were assayed by poison food technique of Sharvelle (1961). Required quantity of individual fungicides was added separately into molten and cooled potato dextrose agar so as to get the desired concentration of the fungicides. Later 20 ml of the poisoned medium was poured into sterile petriplates. Mycelial discs of 5 mm size from actively growing culture of the fungus were cut out by a sterile cork borer and one such disc was placed at the centre of each agar plate. Control was maintained without adding any fungicides to the medium. Each treatment was replicated thrice. Then such plates were incubated at room temperature for twelve days and radial colony growth was measured. The efficacy of a fungicide was expressed as per cent inhibition of mycelial growth over control that was calculated by using the formula suggested by Vincent (1947).

$$I = \frac{C-T}{C} \times 100 \quad \text{where,}$$

I : Percent inhibition, C: radial growth of fungus in control and T: radial growth of fungus in treatment.

The experiment for screening the resistant genotypes was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *kharif* season. A total of eighteen onion genotypes were grown in randomized block design with three replications. The net plot size of 2.5x1m and spacing of 15x10 cm was followed. The observations on disease intensity were recorded using 0-5 scale of (Sharma,1986) at two and half months after transplanting when the disease was developed to its maximum extent and percent disease index was calculated by the following formula given by Wheeler (1969). Further, the varieties were placed in different categories of resistance and susceptibility on the basis of method given by (Pathak *et al.*, 1986).

$$PDI = \frac{\text{Total sum of numerical ratings}}{\text{Number of observations}} \times \frac{100}{\text{Maximum disease rating}}$$

The details of 0-5 scale (Sharma, 1986) were as follows:- 0. No disease symptom, 1. A few spots towards tip covering 10 percent leaf area, 2. Several purplish brown patches covering upto 20 percent of leaf area, 3. Several patches with paler outer zone covering upto 40 percent leaf area, 4. Leaf streaks covering upto 75 percent leaf area or breaking of the leaves from center and 5. Complete drying of the leaves or breaking of leaves from center.

Results and discussion

Data for systemic and non-systemic fungicides for inhibition of mycelial growth are presented in Table 2. There was significant difference among the systemic fungicides tested in inhibiting the growth of *Alternaria porri*. Among the systemic fungicides evaluated difenconazole was most effective in inhibiting the growth of *A. porri* at 0.1% with percent inhibition of 98.85% followed by kitazin and propiconazole with 96.70% and 86.15% respectively. Propiconazole was less effective in inhibiting the growth. Sastrahidayat (1994) reported that difenconazole (0.08%) inhibited the growth of *Alternaria porri* under laboratory condition. Among the non-systemic fungicides tested mancozeb (0.3%) was showed most effective in inhibiting the fungal growth by recording 100 percent inhibition followed by iprodione (0.3%) and copper oxy chloride (0.3%) with percent inhibition of 91.50 % and 88.80% respectively. There was no significant difference with respect to percent inhibition between the non-systemic fungicides evaluated and all the three fungicides were found

on par at 0.3% concentration. The results are in agreement with Gupta *et al.*, (1981) who reported mancozeb was most effective against *Alternaria porri* under invitro condition.

Table 1. Scale adopted to indicate degree of resistance against purple blotch of onion.

Disease severity	Category	Reaction
<5	0	Immune
5-10	I	Resistant
11-20	II	Moderately resistant
21-40	III	Moderately susceptible
41-60	IV	Susceptible
>61	V	Highly susceptible

Table 2. Effect of non-systemic and systemic fungicides at different concentration on percent inhibition of *Alternaria porri*.

Non-Systemic fungicides	Percent inhibition of mycelial growth of <i>Alternaria porri</i>				Systemic fungicides	Percent inhibition of mycelial growth of <i>Alternaria porri</i>			
	Concentration(%)			Mean		Concentration(%)			Mean
	0.1	0.2	0.3			0.025	.05	0.1	
Mancozeb	86.02 (68.11)	97.30 (80.02)	100 (90.00)	94.44 (76.90)	Difenconazole	86.15 (68.18)	91.22 (72.69)	98.85 (82.97)	92.07 (73.02)
Iprodione	82.85 (65.63)	91.50 (73.08)	91.50 (73.08)	90.95 (71.85)	Kitazin(1BP)	77.41 (63.56)	87.47 (69.34)	96.7 (79.05)	87.19 (69.83)
Copper Oxy Chloride	79.08 (62.65)	88.88 (70.57)	88.88 (70.57)	88.13 (69.82)	Propiconazole	56.23 (49.75)	78.32 (62.32)	86.15 (68.23)	73.57 (60.10)
Mean	82.65 (65.47)	92.57 (74.66)	92.57 (74.66)	90.58 (73.34)	Mean	73.26 (60.4)	85.65 (68.12)	93.80 (74.35)	84.28 (69.76)
Fungicides (F)				F x C	Fungicides (F)				F x C
S.Em±	1.13	0.65		0.65	S.Em±	1.56	0.9		0.9
CD at 1%	2.49	1.89		1.89	CD at 1%	2.93	2.22		2.22

*Figures in parenthesis indicate angular transformed values

The data on disease intensity showing the relative reaction of different genotypes are presented in Table 3 and Table 4. None of the eighteen genotypes screened against purple blotch disease, was free from the disease. Therefore no variety could be included in the category 0 & I. However, only one variety viz., Arka Kalyan registered moderately resistant by recording a disease intensity of 18.59% and was grouped in moderately resistant category II. Dhiman *et al.*,(1986) studied reaction of onion genotypes against purple blotch disease and was found that off the 18 genotypes raised for bulb crop none was found to be resistant. Pathak *et.al.*, (1986) found only one lineIR-56-1 as resistant and five lines viz., IHR-25, IHR-44, IHR-499, IHR-500 and Arka kalyan as moderately resistant. Six varieties viz., Rampur Rose, Agri found Rose, Arka Niketan, Arka Pitambur Arka Pragathi and Arka Bindu exhibited moderately susceptible reaction and were included category III. Nine Varieties viz., T-50/1, Gulbarga local, Marglobe White, Agrifound Dark Red T-112/1,T-100/1.White onion,

Bijapur local and T-120/1 were rated as susceptible and included in category IV. The varieties Nasik Red and Bellary Local were highly susceptible and were included in category V.

Table 3. Reaction of onion genotypes against purple blotch of onion under field condition.

Rating	Reaction	Genotypes/Varieties
0	Immune	-
1	Resistant (1-10%)	-
2	Moderately Resistant	Arka Kalyan
3	Moderately Susceptible (21-40%)	Rampurrose, Agri Found Rose, Arka Pragati, Arka Niketan, Arka Pitambar, Arka Bindu.
4	Susceptible (41-60%)	Gulbarga Local, Marglobe White, Bijapur Local, Agri Found Dark Red, White onion, T-50/1, T-112/1, T-100/1, T-120/1
5	Highly Susceptible (>60%)	Nasik Red, Bellary Local

Table 4. Screening of varieties for disease resistance under field conditions.

Varieties	PDI(%)	Scale	Reaction
Agri Found Dark Red	48.57	4	S
Agri Found Rose	28.68	3	MS
Arka Bindu	33.18	3	MS
Arka Kalyan	18.59	2	MR
Arka Niketan	34.52	3	MS
Arka Pitambar	37.8	3	MS
Arka Pragati	31.28	3	MS
Bellary Local	71.8	5	HS
Bijapur Local	54.5	4	S
Gulbarga Local	46.1	4	S
Marglobe White	49.53	4	S
Nasik Red	67.4	5	HS
Rampur Rose	23.24	3	MS
T-100/1	50.3	4	S
T-112/1	47.56	4	S
T-120/1	57.86	4	S
T-50/1	43.86	4	S
White Onion	56.67	4	S

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