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VARIATION IN ONION VARIETIES FOR REACTION TO NATURAL INFECTION OF *ALTERNARIA PORRI* (ELLIS) CIFF. AND *STEMPHYLIUM VESICARIUM* (WALLR.)

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ABSTRACT
Twenty two onion varieties were tested during 2010-2012 at Kalyani, West Bengal, for evaluating their resistance levels against *A. Porri* and *S. vesicarium*, causal agents of purple blotch and stemphylium blight diseases, respectively under field condition. Disease severity was recorded by using 5 point rating scale when the disease was developed to its maximum extent and percent disease index was calculated. None of the 22 varieties, screened against purple blotch & stemphylium blight disease, was free from the disease. There were significant variations were existed among the varieties under study. Results revealed that, only one variety viz VG-18 performed best among all the tested cultivars by displaying resistant and moderately resistance to purple blotch and stemphylium blight, respectively, while its comparative yield (288.18 q/ha) also remained at top. While three varieties viz. NRCRO-4(1168), Sel.157and COLL-652 are susceptible, varieties VG-18 and VG-19 were found moderately resistant and remaining 17 are moderately susceptible to stemphylium blight only. In case of purple blotch, only VG-18 is resistant, 12 varieties are moderately resistant and nine varieties are moderately susceptible. Total yield also affected with the increase in disease severity. Highest yield recorded in variety VG-18(288.18 q/ha) followed by VG-19 (285.72).

INTRODUCTION

Onion (*Allium cepa,* L. *Alliaceae*) is one of the five most important fresh vegetable crop in the world [Cramer, 2000] and it is the most important bulb crop grown for human consumption worldwide and it is among the most important horticultural crops (FAOSTAT, 2004; HCDA, 2008). It is grown in almost all the parts of India for thousands of years. Onion contains a lachrymatic agent, a strong antibiotic in addition to fungicidal, bacterial, anti-cholestrol, anti-cancer and anti-oxidant components such as quercetin (Baghizadeh *et al*., 2009). In addition, it has been reported to be rich in phytochemicals especially flavonols which are medicinal (Javadzadeh *et al*., 2009). Onion is regarded as a highly export oriented crop and earn valuable foreign exchange for the country. India produces 55 to 60 lakh tons of onion annually. 50% produce comes from *rabi* onion harvested in April-May, 30% from late *kharif* harvested in Jan-Feb and 20% from *kharif* onion harvested in Oct-Nov. The productivity of *kharif* onion is very low (10 to 12 t/ha). Several factors have been identified for the low productivity of onion in India. The most important factors responsible are the diseases like purple blotch, Stemphylium blight, downy mildew, basal rot and storage rots and non availability of varieties resistant to biotic and abiotic stresses.

Purple blotch disease of onion is a serious menace in onion-producing countries of the world (Pandotra, 1965) Purple blotch of onion caused by *Alternaria porri* (Ellis) Cif. 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 (Srivastava *et al*., 1994).Purple blotch lesions may be invaded by another fungus, *Stemphylium vesicarium* (Wallr.), and turn black with spore masses of this fungus. *S. vesicarium* normally invades dead and dying onion tissue, such as leaf tips, purple blotch, injured tissue, and senescent tissue and is often identified as purple blotch. The diseases are primarily managed by application of chemical fungicides. However, success of chemical control mainly depends on high frequency of spraying (Abubakar and Ado, 2008a; Kucharek, 2004). In addition, increased frequency of chemical application leads to development of pathogen resistant strains and accumulation of residues in produce and environment resulting in risks to health, environment and non-target organisms (Burkett-Cadena *et al*., 2008).So management of disease through chemicals is not always effective and desirable. Selection of resistant / tolerant variety is a viable option for managing these diseases. Hence the present studies were conducted to find the resistance source of these two diseases.

MATERIALS AND METHODS

The experiment for screening the resistant lines was conducted at 'C' Block Farm, Kalyani, BCKV during late *kharif* season in 2010-2012. A total of 22 onion varieties were grown in

randomized block design with three replications. The net plot size of 1x1m and spacing of 15x10cm was followed. The observations on disease intensity were recorded using 0-5 scale of (Sharma, 1986) 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)

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

The data on disease intensity showing the relative reaction of different varieties are presented in Table 2. None of the 22 varieties screened against stemphylium blight & purple blotch disease, was free from the disease. Therefore no variety could be included in the category 0. However, in 2010 and 2011 in case of purple blotch only one variety viz., VG-18 registered resistant by recording a disease intensity of 10.28% and 9.45% respectively and was grouped in resistant category I. But in case of stemphylium blight, no variety was categorized as I (Resistant) the results are in agreement with (Dhiman *et al*., 1986) who 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. (Sugha *et al*., 1992) evaluated 94 onion genotypes resistance to *A. porri* under natural epiphytotic conditions and found that IC39178 and IC49371 was resistant (0-50 lesions/100 flowering stalk. (Bhonde *et al*., 1992) conducted a trial on eight onion cultivars and evaluated that Agrifound Light Red had the lowest incidence and intensity of purple blotch of all cultivars. Sharma (1997) grown 86 onion genotypes and investigated that lines IC48059, IC48179, IC39887, IC48025 and ALR showed resistance and another 10 lines were moderately resistant to *A. porri*. (Supe *et al.,* 2008) conducted an experiment to evaluate the performance of eight new onion genotypes (S-1, S-2, S-3, M-9, M-11, N-53, AFDR and B-780 and recorded the genotype S-1 had the lowest purple blotch [*A. porri]* index (12%). In the present

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

Sl.no	Disease severity	Category	Reaction
1	< 5	0	Immune
2	5-10	I	Resistant
3	11-20	II	Moderately resistant
4	21-40	III	Moderately susceptible
5	41-60	IV	Susceptible
6	> 61	V	Highly susceptible

Table 2: Mean disease severity of purple blotch and stemphylium blight and total yield of onion varieties tested under natural field condition.

Entry	2010-2011PDI (%)					2011-2012PDI (%)				
	PB	Reaction	SB	Reaction	TY (q/ha)	PB	Reaction	SB	Reaction	TY (q/ha)
NRCRO-1(1133)	18.01	MR**	28.74	MS***	232.51	21.82	MS***	25.26	MS	240.09
NRCWO-1(W-448)	14.22	MR	21.32	MS	269.98	14.12	MR**	22.78	MS	249.23
NRCRO-2(1156)	17.99	MR	28.24	MS	233.16	19.26	MR	25.60	MS	241.68
NRCWO-2(W El composite)	20.27	MR	31.24	MS	216.66	24.62	MS	28.53	MS	232.83
NRCRO-3(RGO-53)	18.7	MR	30.5	MS	218.68	21.69	MS	26.23	MS	235.31
NRCRO-4(1168)	37.59	MS	51.17	S****	191.90	28.37	MS	36.78	MS	206.19
NRCWO-3(W-302)	28.88	MS	39.4	MS	206.38	26.15	MS	31.56	MS	226.12
NOL.115	18.44	MR	30.18	MS	230.53	16.58	MR	25.00	MS	241.44
NRCWO-4(W-009)	16.11	MR	24.28	MS	269.27	14.04	MR	20.71	MR	252.44
NOL.103	13.45	MR	21.06	MS	270.23	13.80	MR	18.79	MR	252.54
Sel.157	32.04	MS	45.15	S	201.97	26.82	MS	34.20	MS	222.03
Bhima super	30.57	MS	40.06	MS	202.51	25.77	MS	33.62	MS	225.33
VG-19	11.79	MR	20.99	MR	285.72	13.15	MR	16.70	MR	253.61
VG-18	10.28	R*	19.92	MR	288.18	9.45	R*	15.83	MR	255.96
Soyal-2009	20.32	MR	31.48	MS	212.74	24.93	MS	30.96	MS	231.25
COLL-652	33.11	MS	46.07	S	192.44	27.35	MS	35.14	MS	212.14
Syn-6	25.66	MS	34.33	MS	208.66	25.58	MS	29.17	MS	226.62
L-28(C)	16.47	MR	26.12	MS	257.54	15.14	MR	24.54	MS	244.95
Bhima Raj(C)	28.08	MS	37.91	MS	249.61	16.38	MR	26.86	MS	242.04
N-2-4-1(C)	24.35	MS	33.77	MS	210.72	25.13	MS	30.98	MS	229.14
Bhima Red(C)	26.51	MS	35.98	MS	217.95	22.83	MS	27.39	MS	233.69
Arka Niketan(C)	17.7	MR	27.08	MS	258.89	14.70	MR	23.71	MS	246.49
Mean	16.84		30.05		233.01	20.34		26.834		236.42
Sem ±	1.128		1.254		8.019	0.857		1.260		6.891
C.D. 5%	4.114		3.703		26.59	2.815		4.137		22.61

investigation three varieties are susceptible, two are moderately resistant and remaining 17 are moderately susceptible to stemphylium blight in2010.But in 2011, only four varieties are moderately resistant and remaining 18 are moderately susceptible to stemphylium blight. Total yield also affected with the increase in disease severity. Highest yield recorded in variety VG-18 in both the year.

Purple blotch severity of 10.28% and Stemphylium blight severity of 19.92% was recorded on variety VG-18. It was scored as resistant (R) against Purple blotch and moderately resistant (MR) against stemphylium blight. This variety, because of its best performance against Purple blotch, somewhat good performance against stemphylium blight, and best yield characteristics, prior recommending it for wider cultivation; this cultivar should be evaluated at multi-location hot spots in order to determine its true genetic potential recommended. However regarding chemical control, Spraying of Propiconazole 1.5ml/L + Methomyl 0.8g/L is effective in controlling both purple blotch and stemphylium blight of onion.

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