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MANAGEMENT OF POWDERY MILDEW (*ERYSIPHE CICHORACEARUM*) OF OKRA THROUGH DIVERSE GERMPLASM

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A B S T R A C T

Fifteen okra varieties/Lines (Green water, Hybrid-133 Sanam, Laxmy, PMF-Beauty, Sabzpari, Super Star, Adventa Selection, Okra1548, JK-Tetra-6, Okra-7100, Pusa Sawani, Kirn, Click-5769 and OH-152 were cultivated in experimental area of Department of Plant Pathology, University of Agriculture, Faisalabad on April 10,2011to determine their response against powdery mildew of okra under augmented design. No cultivar was found immune. Sabzpari and Hybrid-133 expressed resistant response (2-3%), while Okra-7100, Adventa selection, Okra-1548 and Kirn exhibited moderately resistant (7-9%) while Super star, PMF-Beauty and OH-152 were found moderately susceptible (23-29%) Pusa Swani, JK-Tetra-6, Laxmy and Green water were susceptible (42-47%), while Sanam and Click-5769 were highly susceptible with 76-85% disease incidence.

Keywords: *Erysiphe cichoracearum,* resistance, catalase, Phenolase.

INTRODUCTION

Hibiscus esculentus L. commonly known as lady finger is one of the most widely known species of family *Malvaceae* (Bayer & Kubitzki, 2003). It originated in tropical Africa (Akanbi *et al.,* 2010) and is cultivated in different parts of the world including India and Pakistan (Anonymous, 2003.). Its seeds contain protein, edible oil (Oyelade *et al.,* 2003), vitamin A, B, C, minerals and Iodine (Baloch *et al.,* 1990) unsaturated fatty acids like linoleic acid (Savello *et al.,* 1980).Green fresh okra pods contain 80% water and 100gm pods contain 2.7gm carbohydrate 0.1gm fat, 0.2mg thiamine and 81mg Ca (Norman, 1992).

Total world area under cultivation is 101631thousand hectares with 6.9 million tons yield while in Pakistan, area under cultivation is 15.081 thousand hectares with 11.46million tons yield (Sajid *et al.,* 2012).A number of biotic and abiotic factors are responsible for low yield of okra in Pakistan. Among biotic factors powdery mildew disease is the principal one (Franco, 1983) which cause 20-40% yield losses (Agrios, 2005). Small round yellowish or whitish spots on stems and leaves are characteristic symptoms of disease. These spots enlarge and a white mass like talcum powder become visible on the surface of the older leaves. Whitish powder consists of spores which are spread by wind (Pandey *et al.,* 2005).Although fungicides offer easy management of the disease, the use of resistant cultivars make it possible to decrease the reliance on pesticides (Gebhardt and Valkonen, 2001).The objective of the present study was to find out the resistant source for management of powdery mildew disease and to develop the production of okra in Pakistan.

MATERIAL AND METHODS

Fifteen okra varieties were screened for resistance against powdery mildew disease caused by *Erysiphe cichoracearum* fungus. Seed of okra varieties were taken from Vegetable Research Institute, Ayyub Agricultural Research Institute, Faisalabad. Experiments were conducted in the field area of Department of Plant pathology University of Agriculture Faisalabad. Seeds

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were sown on ridges (P×P) distance 2-4cm and (R×R) distance 75cm. Field area was divided into 3 blocks and each variety was replicated in each block under augmented design. Crop was sown on 10 April, 2011. Recommended dose of fertilizers and water were applied to ensure good and healthy crop and intercultural operations were done when needed. The varieties/Cultivars used were: Super Star, Sabzpari, PMF-Beauty, OH-152, Laxmy, Green Water, Okra-7100, Hybrid-133, Adventa Selection, Sanam, Click-5769, Okra-1548, Kirn, Jk-Tetra-6 and Pusa Sawani. Data were collected on the basis of adjusted scale (Table.1).

Table.1. Disease rating scale for powdery mildew of okra

Sr.	Ranking	Disease Incidence (%)	Responses	Expression
1	0	0	Immune	No infection
2	1	1-5	Resistant	Traces of infection on lower leaves covering up to 1 % leaf area
3	2-3	6-10	Moderately resistant	White patches on leaves covering 1-10% leaf area
4	4-5	11-30	Moderately susceptible	White powdery growth covering 11-25% leaf area
5	6-7	31-50	Susceptible	Powdery growth covering 26-50% Leaf area, pods slightly affected
6	8-9	51-100	Highly susceptible	51-100% Leaf area, pods severely infected

(Singh *et al* 1991).

Statistical Analysis: Data regarding disease incidence were subjected to statistical analysis. All statistical tests were performed by using SAS/STAT statistical analysis software (SAS Institute, 1990). Means were compared by using Least Significant Test (LSD) methods (Steel *et al*., 1997).

RESULTS

Disease symptoms appeared fifty days after sowing on older leaves, initially white spots formed on lower side of leaves and then these spots spread and appeared on upper surface of leaves, stem and pods in the form of white powder (which is mycelium). Later on these leaves became weak and fell off. No variety was found immune, while two cultivars Sabzpari and Hybrid-133were resistant with 2-3% disease incidence, four cultivars Okra-7100, Adventa selection, Okra-1548 and Kiran exhibited moderately resistant reaction with 7-9% disease incidence, while three cultivars Super Star, PMF-Beauty and PK-OK-1were moderately susceptible with 23-29% disease incidence, four cultivars Pusasawani, JK-Tetra six, laxmi and Green water were susceptible with 42-47% disease incidence and two cultivars Sanam and Click-5769 were highly susceptible with 76-85% disease incidence range (Table.2).

Table 2. Degree of resistance/susceptibility of fifteen cultivars of okra against Powdery Mildew.

Name of variety/line	No. of Varieties	Dis. Incidence (%)	Disease rating	Response
-	-	0	0	Immune
Sabzpari, Hybrid-133	2	2-3	1	R
Okra-7100, Adventa, Okra-1548, Kiran	4	7-9	2-3	MR
Super star, PMF Beauty, PK-OK-1	3	23-29	4-5	MS
Pusasawani, JK-Tetra six, laxmi, Green water	4	42-47	6-7	S
Sanam, Click-5769	2	76-85	8-9	HS

DISCUSSION

Symptoms of a disease reflect a possible picture of disease development and physiological process (Lucas *et al.,*1996). On upper and lower surface of the leaves, pods, stem and petioles whitish mycelium were seen clearly. Leaves fell/dropped, growth stunted. Pathogens have made a peculiar space in production of crops in Pakistan. Fungal diseases hammered successful Okra production in different regions of world including Pakistan. Different methods were adopted to protect the crop from powdery

mildew disease of Okra but the genetic resistance against pathogen is the best management strategy because it is ideal, economical and environmentally safe (Mishra *et al.,* 2005). However variation in pathogens threatens the Okra crop. So it is very important to continue breeding program for source of resistance against powdery mildew because whole crop can be saved from disease, if plants are genetically resistant. When disease develops in epidemic form then resistant plants mostly escape the disease due to natural selection and create equilibrium between host and pathogen in natural communities. Disease developed through interaction of pathogen and host under favorable environmental conditions can easily be managed through chemicals but this is not environment friendly method (Mishra *et al.,* 2005). Therefore, transfer of resistant genes to okra cultivars is the only possible solution, which obviously requires a long time. The short- term solution would be screening of available germplasm for relative susceptibility. So Present study was designed to evaluate the response of okra germplasm against powdery mildew disease under field conditions. Out of fifteen okra cultivars, no variety was immune, while 2 were resistant, 4 were moderately resistant, 3 were moderately susceptible, 4 were susceptible and 2 cultivars were highly susceptible against pathogen. The results of present study are in agreement with Singh and Bedi (1995) who evaluated twelve cultivars against powdery mildew (*Saccharum erysiphe*) of okra under natural condition and found that no variety as immune , one was resistant, 6 were susceptible and 4 were highly susceptible (Singh and Bedi 1995). Malhotra and Singh (2000) evaluated Okra germplasm against powdery mildew disease and found that resistant varieties were the only possible and practically feasible solution for management of disease. The resistant germplasm should be used directly conventional breeding to incorporate the desired attributes in the otherwise good genotypes by following good horticultural practices(Hussain *et al* 2002).Genetic resistance against powdery mildew of okra cultivars is due to 2 gene pairs, a recessive gene and an incompletely dominant gene, with the genotype designated as aaBB (Hussain *et al.,* 2002). The actual reason for the susceptibility or resistance of okra cultivars to powdery mildew of okra is the concentration of phenolase and catalase in cultivars. More concentration phenolase and catalase was observed in resistant cultivars than susceptible ones (Bhattacharya *et al.* 2000).

CONCLUSION

Powdery mildew is important disease of okra. It causes severe losses in yield. Resistant source is best way to manage the disease. Sabzpari and Hybrid -133 should be used as cultivars.

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