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Prevalence and Evaluation of Different Germplasm Lines/Cultivars against Anthracnose of Bottle Gourd under Artificial Inoculation Conditions

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A B S T R A C T

Bottlegourd is prone to various fungal, bacterial and viral diseases. Among various fungal diseases, anthracnose, downy mildew and cercospora leaf spot are prevalent in different bottlegourd growing areas. Anthracnose caused by *Colletotrichum lagenarium* (Pass) Ellis. and Halsted is of major economic importance. The pathogen is seed borne in nature but initiation as well as spread of disease largely depends upon the environmental factors. This disease is widespread under both greenhouse and field cultivation resulting in poor fruit quality and yield. Keeping its economic importance, the experiment was under taken to study the survey among major growing areas and screening of different genotypes under field conditions. During survey minimum per cent disease intensity on leaves was observed in Arjaheri village of Karnal district, whereas on fruits per cent disease intensity was minimum in Dadupur village of Karnal district in Haryana. A total of 24 cultivars/germplasm lines were screened under artificial inoculation conditions created at Plant Pathology farm of CCS HAU, Hisar (Haryana). All the bottlegourd germplasms were sown on 30th June 2016. Two plants per cultivars/germplasm line were maintained and inoculated with a standard spore suspension (3×10^4 conidia ml^{-1}) at 4-5 leaf stage. Per cent disease intensity was recorded 15 days after inoculation. The entries/germplasms/cultivars and categorized as per the status of disease intensity. Three genotype *viz*., K-92420, GH-3 and GH-11 were found resistant to anthracnose of bottlegourd whereas, genotypes K-92426 and Gh-18 were moderately resistant to anthracnose and remaining genotypes were susceptible to the disease.

Introduction

Bottle gourd is a very important crop in India and belongs to cucurbitaceae family. It can be grown both during warm and rainy season in northern parts of India. It has wide genetic diversity and is grown throughout the tropics and subtropics of the world. The origin of bottle gourd is assumed from Africa and domestication occurred in tropical low lands of south Central America. In India bottle gourd is cultivated in an area of 103.23 thousand ha with productivity of 17.61 ton/ha (Anonymous, 2016). In Haryana bottle gourd is cultivated during summer and rainy season. Bottle gourd is attacked by various fungal, bacterial and viral diseases. Among fungal diseases anthracnose of bottle gourd caused by *Colletotrichum lagenarium* is an important disease resulting in considerable damage to

the crop. In India the disease was first reported by Mundkur on kakri (*Cucumis melo* var. *utilissimus* Roxb.) and kaddu (*Lagenaria siceraria* (Monila) Standl.) in 1937. In Haryana the disease was first observed by Madan and Grover in 1977. *Colletotrichum lagenarium* is an asexually reproducing organism and produces conidia in acervuli with rare presence of setae (Mundkur, 1937). Several species of plant pathogenic fungi under the genus *Colletotrichum* cause anthracnose in bottle gourd, other vegetables and fruits.

Anthracnose of bottle gourd regularly occurs in different bottle gourd growing area during both the seasons. The pathogen is seed borne in nature but initiation as well as spread of disease largely depends upon the environmental factors. This disease is widespread under both greenhouse and field cultivation resulting in poor fruit quality and yield. Direct infection on the fruit also results in loss of market value.

The symptoms appears as brownish specks, which grows into angular and roughly circular spots on the leaves, whereas on young fruits numerous water soaked, depressed, oval or circular spots are observed. *Colletotrichum lagenarium* also cause premature plant death by reducing the photosynthetic surface area to the extent of 29–42 per cent, resulting in yield losses of 6–48 per cent.

The disease is reported to occur in epiphytotic form in India (Madan and Grover, 1977) and Japan (Kobayshi *et. al*., 1998). The extent of damage inflicted by the disease has necessitated conducting studies on some important aspects of the disease. Keeping in view the importance of this disease in this region, the present study has been under taken with the objectives to study prevalence/status and screening of different genotypes against anthracnose disease of bottle gourd.

Materials and Methods

Survey of anthracnose disease in major bottle gourd growing locations of Haryana

Survey of bottle gourd anthracnose was conducted during month of July-August, 2016 in different bottle gourd growing locations of five districts *viz*., Kurukshetra, Karnal, Kaithal, Ambala and Yamuna nagar of Haryana. Two villages from each district were selected.

Twenty five vines per field were tagged randomly. Observations on per cent anthracnose intensity on leaves and fruits were recorded during first and second survey, respectively by using the following scale as given by Chauhan, (2002) on the basis of symptoms as in (Figure 1).

$$\text{Disease intensity (\%)} = \frac{\text{Sum of all numerical ratings}}{\text{Total no.of leaves or fruits observed} \times \text{Maximum rating}} \times 100$$

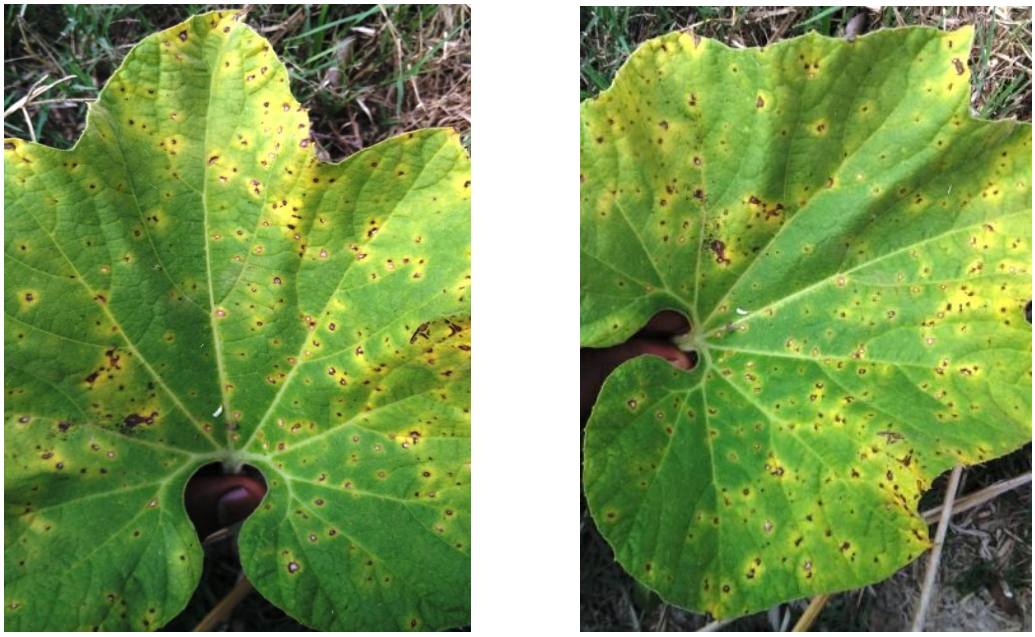
Screening of different germplasm lines /cultivars against anthracnose of bottle gourd under artificial inoculation conditions

A total of 24 cultivars/germplasm lines were screened under artificial inoculation conditions at Plant Pathology farm of CCS HAU, Hisar during *kharif*, 2016.

Bottle gourd germplasms were sown on 30th June 2016. Two plants per cultivars/germplasm line were maintained and inoculated with a spore suspension (3×10^{4} conidia ml^{-1}) at 4-5 leaf stage. Disease intensity (%) was recorded 15 days after inoculation.

The entries/ Germplasm/cultivars are categorized as per the status of disease intensity

Fig.1 Symptomatology of *Colletotrichum lagenarium* causing bottle gourd anthracnose



(On leaves)

(On fruits)

Survey of anthracnose disease in major bottle gourd growing locations of Haryana

Grade	Description
0	No spots/leaf or fruit
1	1-10 spots/leaf or fruit
2	11-20 spots/leaf or fruit
3	21-50 spots/leaf or fruit
4	More than 50 spots/leaf or fruits

Table.1 Prevalence of bottle gourd anthracnose in major bottle gourd growing location(s) of Haryana

Districts	Villages	Disease intensity (%) on leaves	Disease intensity (%) on fruits
Kurukshetra	Amin	59.25	67.50
	Dayalpur	61.75	71.50
Kaithal	Pabnawa	67.75	71.00
	Khanoda	63.50	69.00
Karnal	Dadupur	56.75	61.50
	Arjaheri	52.75	68.50
Ambala	Barara	75.75	80.50
	Hema Majra	69.25	74.50
Yamuna nagar	Bhut Majra	62.75	72.50
	Akal Garh	70.25	75.00

Table.2 Screening of bottle gourd genotypes against anthracnose under disease stress conditions

Category	Bottle gourd entries/genotypes
Resistant(R)	K-92420, GH-3, GH-11
Moderately resistant(MR)	K-92462, GH-18
Moderately susceptible(MS)	K-92372, K-92414, K-92436, GH-19
Susceptible(S)	K-42345, K-92363, K-92404, K-92424, GH-10, GH-14, GH-25, GH-28, GH-23
Highly Susceptible(HS)	PSPL, K-92371, K-92426, K-92428, K-92465, GH-29

Category Disease intensity (%)

Highly Resistant (HR):	0
Resistant (R):	>0-5
Moderately susceptible (MS):	>5-20
Susceptible (S):	>20-50
Highly susceptible (HS):	>50-100

Results and Discussion

Survey of bottle gourd anthracnose

It is evident from the observations that per cent disease intensity on fruits was higher than per cent disease intensity on leaves at each surveyed locations/districts (Table 1).

Anthracnose of bottle gourd was recorded maximum on leaves (75.75%) and fruits (80.50%) in Barara village of Ambala district followed by Akal garh, location with anthracnose on leaves (70.25%) and on fruits (75.00%) and minimum per cent disease intensity on leaves (52.75%) was observed in Arjaheri village of Karnal district, whereas on fruits per cent disease intensity (61.50%) was minimum in Dadupur village of Karnal district in Haryana.

Screening of bottle gourd genotypes against bottle gourd anthracnose

The experiment was conducted under field conditions during *kharif* 2016. Twenty four bottle gourd genotypes were screened against anthracnose disease under artificial disease stress conditions. The observations were presented in Table 2.

It is evident from results that three genotypes *viz*., K-92420, GH-3 and GH-11 were resistant to anthracnose of bottle gourd whereas, genotypes K-92426 and GH-18 were moderately resistant to bottle gourd anthracnose

and remaining genotypes were susceptible to the disease.

During survey (*kharif* 2016), it was observed that the prevalence of bottle gourd anthracnose ranged from 52.75-75.75 per cent and 61.50-80.50 per cent on leaves and fruits, respectively. Anthracnose intensity was observed maximum in Ambala district, whereas it was minimum in Karnal district. Our observations are corroborative to Chauhan (2002) who reported that per cent disease intensity on fruits was generally higher as compared to that on leaves in different locations of Haryana. Similarly, Gupta *et al.,* (2009) observed that bottle gourd crop was severely affected with anthracnose disease during 2008 in Himachal Pradesh. The variation in anthracnose intensity might be attributed due to variation in environmental conditions, inoculum potential of isolates, inoculum density as well as host variety.

Out of 24 bottle gourd germplasm lines, three germplasms lines *viz*., K-92420, GH-3 and GH-11 were found resistant to the anthracnose disease. Chauhan and Bhatia (2013) found that germplasm GH-3, GH-9 and winter ghiya-1 were resistant to bottle gourd anthracnose under disease stress conditions. It is concluded that lines K-92420, GH-3 and GH-11 which were resistant under artificial disease stress conditions may be utilized in donors in resistance breeding programme.

In conclusion, Survey conducted during *Kharif* 2016, minimum per cent disease intensity on leaves was observed in Arjaheri village of Karnal district, whereas on fruits per cent disease intensity was minimum in Dadupur village of same district Three genotypes K-92420, GH-3 and GH-11 were found resistant, whereas, only two genotypes K-92462 and GH-18 were found moderately resistant to the anthracnose disease under artificial inoculation conditions. The resistant source identified can be used for future breeding programme.

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