



P-ISSN: 2349-8528
E-ISSN: 2321-4902
IJCS 2018; 6(6): 85-87
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Received: 19-09-2018
Accepted: 20-10-2018

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Evaluation of different varieties of bottle gourd against downy mildew

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Abstract

Thirteen varieties of bottle gourd were evaluated for resistance against downy mildew disease during *rabi* 2017 at Horticultural Instructional-cum Research Farm, College of Agriculture, IGKV, Raipur, Chhattisgarh. Out of thirteen varieties tested three viz. Amrit, Ankit and Anmol were free from the disease and showed immune response against downy mildew. Two (Manya, Ns-433), four (Chutki, Haruna, Latto and Naveen) and three (Angad, Mahima and Sarita) varieties were found resistant, moderately resistant and moderately susceptible, respectively. One variety (Divya) was susceptible against the disease and none of the variety was found highly susceptible.

Keywords: Bottle gourd, disease, downy mildew, susceptible

1. Introduction

Bottle gourd, *Lagenaria siceraria* (Mol) stand L) is a cosmopolitan cucurbitaceous vegetable grown successfully in tropical and sub-tropical regions for its young, tender and non-bitter fruits. It is widely grown in India and is cultivated almost round the year. Although bottle gourd does not rank high in nutritional value, but by virtue of volume consumed it contributes significantly to dietary intake of vitamins (Vitamin A, B, C) minerals (0.5%) such as calcium, iron, potassium, phosphorus and carbohydrates (2.9%), proteins (0.25%) and fats (0.5%) (Bose *et al.*, 1993 and Morimoto and Mvere 2004) [2, 10]. The crop is being affected by different group of pathogens such as fungi, bacteria, virus and nematodes (Gaie *et al.*, 1998) [4]. Downy mildew caused by *Pseudoperonospora cubensis* is one of the important foliar diseases of bottle gourd. It was reported for the first time in 1868 and still it is considered as one of the serious problem. In India, it is present all over the country except in high altitude temperate zone in the Himalaya (Hansen, 2000 and Rai and Yadav, 2005) [5, 11]. The symptoms of bottle gourd first appear as pale green areas on the upper leaf surface which change to yellow angular spots. A fine white to grayish downy growth soon appears on the lower leaf surface. Infected leaves generally die but may remain erect while the edges of the leaf blades curl inward. Usually, the leaves near the center of a hill or row are infected first. The infected area spreads outward, causing defoliation, stunted growth and poor fruit development. The entire plant may eventually be killed (Kuepper, 2003 and Rai and Yadav, 2005) [7, 11]. During moist weather the corresponding lower leaf surface is covered with a downy, pale gray to purple mildew. The colour of the mildew ranges from white to near black. The infection area spreads outward, causing defoliation and poor fruit development which reduces yield. In rainy humid weather entire vein is killed (Babadoost, 2001) [1]. Early infection of downy mildew can cause reduction in crop yield up to 60% where as late infection is less damaging (Colucci and Holmes, 2010 and Wallace *et al.*, 2014) [3, 14], downy mildew on bottle gourd has been successfully controlled for many years through host resistance. To control this disease, fungicides are used in high dosages that cause environmental hazards and also leaving residues of fungicides which are toxic to the consumers. In the light of World Trade Organization, the major obstruction in the export of vegetables from India is the presence of excess amount of pesticide residues. So as to avoid the problem of pesticide residues and to reduce the cost of inputs and save the environment from pollution hazards, it is thought appropriate to look alternate methods like use of resistant varieties in the management of bottle gourd downy mildew (Srinivas, 2006) [13]. Identification of resistant genotypes/ lines/ varieties and exploration of sources of resistance in bottle gourd germplasm is very much important for the effective and ecofriendly management of downy mildew.

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2. Material and Methods

Thirteen varieties of bottle gourd were evaluated for resistance against downy mildew disease during *rabi* 2017 at Horticultural Instructional-cum Research Farm, College of Agriculture, IGKV, Raipur, Chhattisgarh. Each variety of bottle gourd was raised in twenty polyethylene bags having one seed in each bag. Sowing of seeds was done on 23rd December 2017. The thirty five day old seedlings were transplanted on 27th January 2018 in rows. Each variety was planted in three rows with 1.5 m row-row and 1 m plant-plant spacing and each row had five plants. No any chemical pesticides were applied during the experimental period.

The severity of downy mildew was recorded for each variety at 30, 60 and 90 days after transplanting. The severity and location severity index (LSI) were calculated by using the formulae as given below. Thereafter, all the varieties were grouped in different reaction categories by using the 0-5 scale (Metwally and Rakha, 2015 and Santos *et al.*, 2009) [9, 12].

$$\text{Percent disease severity} = \frac{\text{Total leaf tissue damaged}}{\text{Total healthy tissue of leaf}} \times 100$$

$$\text{LSI} = \frac{\text{Sum of multiplication of variety and scales}}{\text{Total number of variety}} \times 100$$

| Grade/Rating | Reaction | Disease severity (%) | Symbol |
|--------------|------------------------|----------------------|--------|
| 0 | Immune | 0 | I |
| 1 | Resistant | 0.10-15.0 | R |
| 2 | Moderately resistant | 15.1-25.0 | MR |
| 3 | Moderately susceptible | 25.1-50.0 | MS |
| 4 | Susceptible | 50.1-75.0 | S |
| 5 | Highly susceptible | >75 | HS |

3. Result and Discussion

Among the thirteen varieties of bottle gourd evaluated three varieties viz. Amrit, Ankit and Anmol were free from the disease and showed immune reaction against disease. However, two (Manya, Ns-433), four (Chutki, Haruna, Latto and Naveen) and three (Angad, Mahima and Sarita) varieties were resistant, moderately resistant and moderately susceptible, respectively. One variety i.e. Divya showed susceptible reaction against downy mildew while none of the variety was found highly susceptible (Table 1 and 2; Fig. 1). Metwally and Rakha (2015) [9] evaluated 133 Plant Introduction (PI) cucumber accessions from the U.S. National Plant Germplasm System for downy mildew resistance under natural field conditions during the summer 2013 at El-Beheira Governorate, Egypt. The most resistant PI accessions were PI 432870, PI 432873, PI 432878, PI 432884, and PI 432886 with a rating of 1, which originated from China. The most susceptible PI accessions were Ames 7736, PI 211979, PI 288991, PI 288992 and PI 289698 with a rating of 9. They further evaluated five most resistant and five most susceptible accessions in the next year. Results from the repeated test confirmed the results from the first screening. The reaction of bottle gourd genotypes to downy mildew and fruit fly infestation was done under natural condition at the Kittur Rani Channamma College of Horticulture, Arabhavi during *kharif* season of 2009-2010. Each treatment was replicated thrice. The material for the present study consisted 25 diverse genotypes which comprise of six open pollinated varieties and 19 hybrids. The genotypes Gutkha, Sarika and Kaveri were found to show resistant reaction (disease score of 1.0) against downy mildew while Arka Bahar, INDAM-204, NS-421,

NBOH-1, Bio Gaurav, US-15, Reena, Super Dhana, Anand and Sharada were found to exhibit moderately resistant reaction (Harika *et al.*, 2012) [6]. Kumar *et al.* (2018) [8] evaluated nineteen varieties of bitter gourd and found that two (Unnat Kathi Gaurav, Kathi Selection) were highly resistant, three (No. 4003, Bujji, Meghanaa- 2) were moderately resistant, thirteen (VNR28, VNR Kanhaiya, Vivek, Sagar (AG811), Nanha, Ankur Tillu, Sunil Karela, Indra Karela, Raman, Selection 05, NS1018, Katahi, Uchha Bolder) were moderately susceptible and only one variety i.e. VNR-22 was susceptible against downy mildew.

Table 1: Evaluation of different varieties of bottle gourd against downy mildew

| S. N. | Variety | Duration (Days) | Percent disease severity (DAT) | | | | Reaction |
|-------|---------|-----------------|--------------------------------|-------|-------|-------|----------|
| | | | 30 | 60 | 90 | 100 | |
| 1. | Sarita | 90-100 | 0 | 12.50 | 37.50 | 37.50 | MS |
| 2. | Haruna | 90-110 | 0 | 25.00 | 25.00 | 25.00 | MR |
| 3. | Divya | 90-110 | 0 | 37.50 | 62.50 | 62.50 | S |
| 4. | Chutki | 90-115 | 0 | 12.50 | 25.00 | 25.00 | MR |
| 5. | Manya | 90-115 | 0 | 12.50 | 12.50 | 12.50 | R |
| 6. | Ankit | 90-110 | 0 | 0 | 0 | 0 | I |
| 7. | Anmol | 90-115 | 0 | 0 | 0 | 0 | I |
| 8. | Mahima | 90-115 | 0 | 25.00 | 37.50 | 50.00 | MS |
| 9. | Naveen | 90-110 | 0 | 25.00 | 25.00 | 25.00 | MR |
| 10. | Ns-433 | 90-115 | 0 | 0 | 12.50 | 12.50 | R |
| 11. | Latto | 90-115 | 0 | 12.50 | 25.00 | 25.00 | MR |
| 12. | Angad | 90-110 | 0 | 37.50 | 37.50 | 37.50 | MS |
| 13. | Amrit | 90-110 | 0 | 0 | 0 | 0 | I |

Table 2: Grouping of bottle gourd varieties on the basis of their reactions against downy mildew

| Grade | Percent disease severity | Reaction | No. of variety | Variety |
|-------------|--------------------------|------------------------|----------------|-------------------------------|
| 0 | 0 | Immune | 3 | Amrit, Ankit, Anmol |
| 1 | 0.10-15.0 | Resistant | 2 | Manya, Ns-433 |
| 2 | 15.1-25.0 | Moderately resistant | 4 | Chutki, Haruna, Latto, Naveen |
| 3 | 25.1-50.0 | Moderately susceptible | 3 | Angad, Mahima, Sarita |
| 4 | 50.1-75.0 | Susceptible | 1 | Divya |
| 5 | >75 | Highly susceptible | 0 | - |
| LSI = 1.769 | | | | |

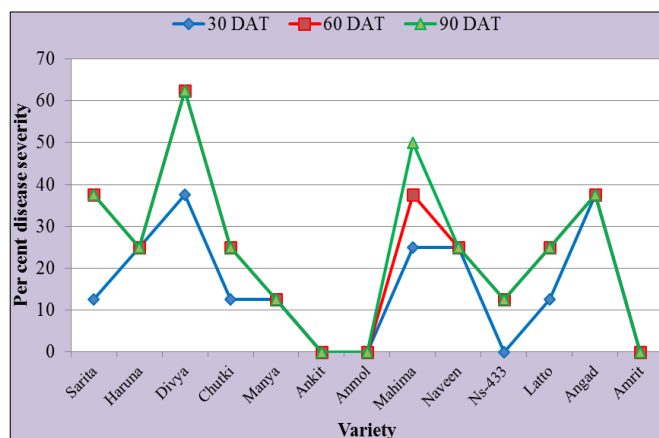


Fig 1: Evaluation of different varieties of bottle gourd against downy mildew

4. Conclusion

Out of thirteen varieties of bottle gourd tested five (Amrit, Ankit, Latto, Manya and NS-443) and two (Manya, Ns-433)

varieties were found successively immune and resistant against downy mildew.

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