

## Identification of susceptible stage of gherkin for Downy Mildew and sporangial morphology of *Pseudoperonospora cubensis* in different cucurbitaceous vegetables

MACHENAHALLI SANTOSHREDDY\*, M. S. L. RAO AND V. B. NARGUND

Department of Plant Pathology, College of Agriculture, Dharwad, University of Agricultural Sciences, Dharwad 580 005, Karnataka

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Downy mildew caused by *Pseudoperonospora cubensis*, is posing a serious threat to the successful large-scale cultivation of gherkin or pickling cucumber in India. Identification of the susceptible stage at which the crop is vulnerable to maximum infection is very important. If susceptible stage is determined then one can take precautionary measures at right time to avoid the disease incidence. The experiment was carried on susceptible *Ajax* variety to find out the most vulnerable stage of the crop against Downy Mildew infection by *Pseudoperonospora cubensis* under green house condition. Disease symptoms were observed from 20 days old crop to 70 days old crop. The sporangial characters of *P. cubensis* from different cucurbitaceous vegetables was studied under microscope. The results revealed that sporangia were grayish to olivaceous purple, ovoid to elliptical, thin walled and with a papilla at the distal end. The size of sporangia from different hosts varied between 45-56 × 26-37 µm. There was some morphological similarity observed in sporangia from gherkin, cucumber and bitter guard but they exhibited variability in sporangial size in isolates infecting pumpkin, coccinia and ridge guard.

**Key words:** Cucurbitaceous vegetables, Downy Mildew, *Pseudoperonospora cubensis*, susceptible stage, sporangial morphology

### INTRODUCTION

Cucurbits are among the important vegetable crops in India and in the world. Cucurbitaceae is one of the most important families of plants that supplies man with edible fruit and valuable fibers. Among the various cucurbitaceous vegetables gherkin or pickling cucumber (*Cucumis sativus* L.) is an exotic vegetable being grown in several parts of Karnataka exclusively for export markets in Spain, Belgium, Australia, Germany, USA etc. Several private organizations in Karnataka are engaged in the cultivation of this vegetable through contract farming. This vegetable is suffering from several economically important foliar diseases like Downy Mildew caused by *Pseudoperonospora cubensis*, which is posing a serious threat to the successful large-scale cultivation. Initial symptoms are found on the top surface of leaves and consist of small,

pale green to greasy looking angular or rectangular spots that are delimited by leaf veins and vein lets. These patches later turn slightly chlorotic to bright yellow. The early symptoms can give the leaf a mosaic or mottled appearance. Later downy mildew lesions turn brown and necrotic. Lesions can expand and coalesce, resulting in the shriveling and death of large areas of leaf surface. Identification of the susceptible stage of gherkin for this disease and also the sporangial characters of pathogen in different cucurbitaceous vegetables is presented in this research paper.

### MATERIALS AND METHODS

The experiment was carried on susceptible *Ajax* variety to find out the most vulnerable stage of the crop against downy mildew infection by *Pseudoperonospora cubensis* under green house condition. The sowing was done in the pots and each treatment was replicated thrice. When crop

\*santosh3881@gmail.com

was 10,20,30,40,50,60 and 70 days old inoculation was made by spraying sporangial suspension on the plant uniformly. Observations on reaction of the crop were recorded. Leaves with downy mildew symptoms were collected from gherkin and other cucurbitaceous vegetable hosts viz., pumpkin, coccinia, ridge gourd, cucumber bitter gourd. The sporangia were harvested from lower surface of leaf with the help of small camlin paint brush and placed on slides under cover slip and observed under microscope. Sporangial measurement were taken with the help of motic microscopic software under 400 X magnification, both length and breadth of sporangia were recorded.

## RESULTS AND DISCUSSION

Identification of the susceptible stage at which the crop is vulnerable to maximum infection is very important. If susceptible stage is determined then one can take precautionary measures at right time to avoid the disease incidence. The results revealed that (Table 1) the crop was susceptible at almost all stages except 10 days age crop. Disease symptoms were observed from 20 days old crop to 70 days old crop. Similar results were reported by Lebeda (1990) who reported that the host plants were infected at all developmental stages, seedlings, young and adult plants, but symptoms on young and newly developing leaves were rather rare. Bains (1974) reported that muskmelon plants were equally susceptible in different growth stages of the host but the diseases reached at its peak at the time of fruit set till maturity in water melon, ash gourd, and sponge gourd developed resistance with the advancement in age. The ridge gourd

**Table 1:** Determination of susceptible stage of the crop against Downy Mildew of gherkin caused by *Pseudoperonospora cubensis*

Age of the crop (days)	Reaction
10	-
20	+
30	+
40	+
50	+
60	+
70	+

Where, + Susceptible, - Not susceptible

plants of all the ages were susceptible to the downy mildew disease (Gurushanthappa 1990). Downy Mildew was severe on almost all cucurbitaceous vegetables like muskmelon, cucumber, sponge gourd, and ridge gourd and less severe on bottle gourd, bitter gourd, and snake gourd. Slightest infection was noticed on pumpkin and ash gourd (Bains and Jhooty 1976). Mor-

**Table 2:** Size of spora of *Pseudoperonospora cubensis* in different host crops

Host Crop	Length and Breadth of sporangia ( $\mu\text{m}$ )
Gherkin ( <i>Cucumis sativus</i> )	50-55 x 32-37
Pumpkin ( <i>Cucurbita moschata</i> )	47-54 x 28-34
Coccinia ( <i>Coccinia indica</i> )	46-48 x 26-30
Ridge guard ( <i>Luffa acutangula</i> )	48-52 x 28-32
Cucumber ( <i>Cucumis sativus</i> )	52-56 x 33-36
Bittergourd ( <i>Momordica charanita</i> )	50-53x 30-35

phology of pathogen is very important for identification of disease and variability of pathogen in different host crops. The sporangia were grayish to olivaceous purple, ovoid to elliptical thin walled and with a papilla at the distal end and the data in Table 2 indicated that the size of sporangia of *P. cubensis* ranged from 50-55 x 32-37  $\mu\text{m}$  (gherkin), 48-52 x 28-32  $\mu\text{m}$  (ridge gourd), 52-56 x 33-36  $\mu\text{m}$  cucumber, 50-53x 30-35  $\mu\text{m}$  bitter gourd. Palti and Cohen (1981) reported that size of sporangia was 20 to 40 x 14-25  $\mu\text{m}$ . The hyaline sporangio-phores (180-400  $\mu\text{m}$ ) bearing papillate, lemon shaped, gray purple sporangia (20- 40 x 14 - 25  $\mu\text{m}$ ) on sterigmata emerged in groups of one to six from stomata on the abaxial surface of infected leaves (Choi *et al.*, 2005). Since disease initially occur in 20 days old crop the management practices like application of effective fungicides at this stage manages the disease effectively and that avoids the further disease spread. There is some morphological similarity observed in sporangia from gherkin, cucumber and bitter guard but varied in sporangia from pumpkin, coccinia and ridge guard. It appears from this study, that the isolates of *Pseudoperonospora cubensis* infecting gherkin,

cucumber and bitter guard may be the same. Accordingly, care should be taken if the gherkin crop is surrounded by downy infected cucumber and bitter guard crop by taking spraying in those crops also.

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