

## Research Article

### **Downy Mildew of Pointed Gourd and its Management**

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**Abstract:** Pointed gourd (*Trichosanthes dioica* Roxb.) is a popular cucurbitaceous vegetable crop in West Bengal. It is affected by Downy mildew disease incited by *Pseudoperonospora cubensis* (Berk. & Curt.) Rostow. every year. The disease appears in December and continues up to the end of March. It causes drying up of leaves in growth stage of the crop. Spraying of Krilaxyl Gold (Metalaxyl 8% WP + Mancozeb 64% WP), Blitox (Copper Oxy-chloride 50% WP) and Indofil M-45 (Mancozeb 75% WP) recorded better and gave good protection against downy mildew in pointed gourd. Spraying should be done just before sunset. Retarded growth of vine of pointed gourd was noticed due to spraying of Contaf (Hexaconazole 5% EC) and Tilt (Propiconazole 25% EC).

**Keywords:** Chemical control, downy mildew, pointed gourd, *Pseudoperonospora cubensis*, *Trichosanthes dioica*

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#### **INTRODUCTION**

Pointed gourd (*Trichosanthes dioica* Roxb.) also called 'parwal' or 'patal' is an important and highly accepted cucurbitaceous vegetable crop. It is called 'King of gourds' because of its higher nutrient content than other cucurbits. Pointed gourd is extensively cultivated in Eastern Indian states particularly in Bihar, Eastern Uttar Pradesh, West Bengal, Assam, Tripura and to some extent in Orissa. It is also grown in Madhya Pradesh, Maharashtra and Gujarat. This crop is widely accepted and is available for nearly eight to ten months of a year. Among the diseases of pointed gourd, Downy mildew [1 – 2], Fruit and vine rot [2 - 3] and Root knot nematode [4] cause major damage to the crop. Berkeley and Curtis first reported the downy mildew of cucurbitaceous plants from Cuba in 1868. Downy mildew is especially damaging in warm, humid climates where the pathogen thrives well [5]. Though various informations are available for managing the Downy mildew disease in cucumber, water melon and pumpkin [6- 10], no information is available on management of downy mildew of pointed gourd. In present investigation attempt has been made to develop suitable chemical control of the disease.

#### **METHODOLOGY**

The experiments were conducted at three different locations in the Village Ghoragacha, Nadia district of West Bengal. Distance between the individual locations was nearly half a kilometer. The

crop was planted in October 2010. Stem cuttings were used as propagative materials. Randomized Block Design was followed for this experiment [11]. Individual plot size was 12.3m x 1.2m and there was irrigation channel in between two plots. Farmer's practices were followed in relation to method of planting and crop management, excepting use of fungicides. In all the locations there were three replications for each treatment and suitable control was maintained where no fungicide was sprayed. Eight fungicides were included in this trial.

From the middle of January, Downy mildew appeared in the field. Spraying of fungicides was started on 15th January 2011 and continued at an interval of 15 days. Spraying was done at the time of sunset. Number of plants infected by Downy mildew disease and that of leaves were recorded on 1st March, 2011.

#### **RESULTS AND DISCUSSION**

##### ***The disease symptom***

The disease appeared in December and became severe in February-March. Angular lesions were limited by the leaf veins or circular to irregular yellow coloured spot developed on leaf. One or more spot(s) might be formed on a single leaf. Early spots/lesions were light green in appearance which later turn into chlorotic and finally become necrotic as the affected host plant cells die. Development of many spot in one leaf and drying up of diseased tissue led to drying of the entire leaf. As more and more leaves dried up, the growth of vine

became arrested. Downy growth of the fungus was not found even in humid weather on rainy day. Dichotomously branched sporangiophores were found on microscopic examination of the disease tissue. Spread and development of the disease was arrested after the end of April under high temperature and low humidity.

#### The causal organism

Mycelium of *Pseudoperonospora cubensis* (Berk. & Curt.) Rostow., the causal organism of Downy mildew was hyaline, coenocytic and intercellular, developed abundantly in the mesophyll, but also penetrated palisade tissues. Haustoria were small, ovate, intercellular sometimes with finger-like branches. Sporangiophores were 180-400µm in length, dichotomously branched in their upper third, emerged in groups of 1-5 from stomata. The sporiferous tips, on which the sporangia were borne singly were subacute. Sporangia were pale grayish to olivaceous-purple, ovoid to ellipsoidal, thin-walled, with a papilla at the distal end, measuring 20-40 x 14-25µm. Sporangia germinated by production of flagellate zoospores, rarely by infection hyphae.

#### Management of the disease

There was reduction in Downy mildew disease through protection of plants in general and leaf in particular by spraying fungicides. But significant difference in efficacy of individual fungicide in

different locations was observed. No general trend was noticed in the performance of a fungicide in three locations.

In three locations (Table 1 and 2) spraying of Contaf and Tilt reduced growth of vine to a large extent. The leaf size was reduced and various types of curling with chlorosis or browning of leaves was observed. On withdrawal of spraying, plants became gradually normal and subsequently gave normal fruiting. In Contaf and Tilt treated plot in location-I, a good number of plants escaped from Downy mildew infection and percentage of leaf infection was low. In location-III, percentage of leaf infection was low in Tilt treated plot. Hinosan did not show good performance in reduction of Downy mildew disease.

In location-I, percentage of plant infected and percentage of Downy mildew infected leaf/plants was found less in Shield and Krilaxyl Gold treated plots, and effect was similar in two fungicides. In location-II, significant reduction in number of plant infected was obtained only in Blitox. But significant reduction in leaf infection was obtained in Blitox and Indofil M-45 followed by Krilaxyl Gold. In location-III, less numbers of plant and leaf infection were recorded in the plots treated with Blitox, Indofil M-45 and Krilaxyl Gold. In addition, reduced leaf infection was also observed in Thiram treated plots (Table 1 and 2).

**Table-1: Effect of fungicidal spray on number of pointed gourd plants infected by Downy mildew disease**

| Fungicides  | Dose<br>g or ml/l | % of infected plants |                 |                 | % disease control |      |      | Average |
|---|-------------------|----------------------|-----------------|-----------------|-------------------|------|------|---------|
|   |                   | Location             |                 |                 | Location          |      |      |         |
|   |                   | I                    | II              | III             | I                 | II   | III  |         |
| Blitox (Copper Oxy-chloride 50% WP)               | 4.0g              | 78.3<br>*(62.7)      | 71.6<br>(59.0)  | 52.7<br>(46.5)  | 7.2               | 28.4 | 47.3 | 27.6    |
| Shield (Copper Sulphate 2.62 % EC )               | 1.5 ml            | 60.5<br>(51.1)       | 98.3<br>(85.7)  | 92.7<br>(77.1)  | 28.4              | 1.7  | 7.3  | 12.4    |
| Thiram (Thiram 75% WS)                            | 2.0g              | 79.1<br>(63.2)       | 98.2<br>(85.6)  | 81.7<br>(64.9)  | 6.3               | 1.8  | 18.3 | 8.8     |
| Indofil M-45 (Mancozeb 75% WP)                    | 2.5g              | 71.9<br>(58.4)       | 82.6<br>(67.4)  | 39.3<br>(38.7)  | 14.9              | 17.4 | 60.7 | 31.0    |
| Hinosan (Edifenphos 50% EC)                       | 1.0 ml            | 74.1<br>(60.2)       | 100.0<br>(90.0) | 98.0<br>(83.4)  | 12.3              | 0    | 2.0  | 4.7     |
| Contaf (Hexaconazole 5% EC)                       | 1.0ml             | 58.0<br>(50.5)       | 97.9<br>(85.2)  | 98.3<br>(83.9)  | 31.3              | 2.1  | 1.7  | 22.13   |
| Tilt (Propiconazole 25% EC)                       | 1.0 ml            | 10.6<br>(13.5)       | 88.0<br>(69.9)  | 84.0<br>(66.4)  | 87.5              | 12.0 | 16.0 | 38.5    |
| Krilaxyl Gold (Metalaxyl 8% WP + Mancozeb 64% WP) | 3.0 g             | 59.1<br>(50.1)       | 96.4<br>(81.0)  | 44.7<br>(41.8)  | 30.1              | 3.6  | 55.3 | 29.6    |
| Untreated control                                 | -                 | 84.5<br>(67.1)       | 100.0<br>(90.0) | 100.0<br>(90.0) |                   |      |      |         |
| C. D. (p=0.01)                                    | -                 | 20.3<br>(13.5)       | 16.4<br>(14.2)  | 13.5<br>(11.3)  |                   |      |      |         |

\*Figures in parentheses are the corresponding angular transformed value

**Table-2: Effect of fungicidal spray on intensity of leaf infection by Downy mildew of pointed gourd**

| Fungicides  | Dose<br>g or ml/l | % of infected leaves |                |                | % disease control |      |      | Average |
|---|-------------------|----------------------|----------------|----------------|-------------------|------|------|---------|
|   |                   | Location             |                |                | Location          |      |      |         |
|   |                   | I                    | II             | III            | I                 | II   | III  |         |
| Blitox (Copper Oxy-chloride 50% WP)                     | 4.0g              | 40.0<br>(39.2)*      | 14.7<br>(22.5) | 0.8<br>(5.2)   | 12.3              | 69.6 | 97.6 | 59.8    |
| Shield (Copper Sulphate 2.62 % EC)                      | 1.5 ml            | 30.5<br>(33.4)       | 45.1<br>(42.2) | 30.1<br>(33.3) | 33.1              | 6.8  | 13.2 | 17.7    |
| Thiram (Thiram 75% WS)                                  | 2.0g              | 42.7<br>(40.7)       | 38.7<br>(38.4) | 16.9<br>(24.3) | 6.3               | 20.0 | 51.2 | 25.8    |
| Indofil M-45 (Mancozeb 75% WP)                          | 2.5g              | 35.7<br>(36.7)       | 18.2<br>(25.1) | 0.8<br>(5.0)   | 21.7              | 62.4 | 97.6 | 60.5    |
| Hinosan (Edifenphos 50% EC)                             | 1.0 ml            | 38.1<br>(38.0)       | 46.8<br>(43.1) | 34.7<br>(36.1) | 16.4              | 3.3  | 0    | 6.5     |
| Contaf (Hexaconazole 5% EC)                             | 1.0ml             | 33.2<br>(34.9)       | 45.0<br>(42.1) | 32.9<br>(34.9) | 27.2              | 7.0  | 5.2  | 13.1    |
| Tilt (Propiconazole 25% EC)                             | 1.0 ml            | 4.7<br>(8.3)         | 40.9<br>(39.8) | 22.0<br>(27.6) | 89.7              | 15.4 | 36.6 | 47.2    |
| Krilaxyl Gold<br>(Metalaxyl 8% WP +<br>Mancozeb 64% WP) | 3.0 g             | 26.3<br>(30.4)       | 27.4<br>(31.5) | 0.8<br>(5.2)   | 42.3              | 43.4 | 97.6 | 60.1    |
| Untreated control                                       | -                 | 45.6<br>(42.4)       | 48.4<br>(44.1) | 34.7<br>(35.9) |                   |      |      |         |
| C. D. (p=0.01)  | -                 | 12.7<br>(9.5)        | 11.7<br>(7.2)  | 7.2<br>(4.7)   |                   |      |      |         |

\*Figures in parenthesis are the corresponding angular transformed value

Considering the field performance of eight fungicides in relation to protection of plants and leaf from Downy mildew disease and growth reduction, three fungicides viz. Krilaxyl Gold, Blitox, Indofil M-45 were selected as good performing fungicides. Blitox did not cause injury to pointed gourd plants upto first March. In three locations significant control of Downy mildew was obtained with these fungicides. Control of Downy mildew of cucumber [12-13], cantaloup [14] and muskmelon [15- 16] by Mancozeb have been reported earlier. Copper fungicide gave similar control like Mancozeb of the disease. Though some researchers [7] reported the effectiveness of Copper fungicide and Mancozeb for the control of cucumber downy mildew; it was reported by others [8] that Copper oxychloride, folpet and thiram were less effective when applied against Downy mildew of melon.

Successful control of Downy mildew disease of cucurbits with Metalaxyl + Mancozeb formulation [17-18], obtained by previous workers also support the performance of Krilaxyl Gold in field condition, in respect to control of Downy mildew of pointed gourd.

## CONCLUSION

Downy mildew cause extensive damage to the pointed gourd in West Bengal. The disease favours warm and humid climates. Various information are available for managing the Downy mildew disease in cucurbits viz. cucumber, water melon, pumpkin etc. but no information is available on that of pointed gourd. In

our study the fungicides Krilaxyl Gold (Metalaxyl 8% WP + Mancozeb 64% WP) and Indofil M-45 (Mancozeb 75% WP) were found good in relation to management of Downy mildew disease. Whereas, the fungicides found to have growth reduction effect were Contaf (Hexaconazole 5% EC) and Tilt (Propiconazole 25% EC). Phytotoxic effect was recorded in the field applied with Blitox (Copper Oxy-chloride 50% WP) at a hot climatic condition. Extensive study should be required to develop suitable management practices for this disease.

## REFERENCES

1. Bilgrami KS, Jamaluddin, Rizwi MA; Fungi in India Part I. Today and Tomorrow's Printers and Publishers, New Delhi, 1979; 467.
2. Khatua DC, Das A, Ghanti P, Sen C; Downy mildew of cucurbits in West Bengal and preliminary field assessment of fungicides against downy mildew of cucumber. Pestology, 1981; 5 (2): 30-31.
3. Mondal B, Saha G, Khatua DC; Fruit and vine rot of pointed gourd in West Bengal. Research Journal of Agricultural Sciences, 2013; 4(1): 44-47.
4. Mukherjee SK, Sharma BD; Root knot disease of *Trichosanthes dioica*. Indian Phytopathology, 1973; 26: 248-249.
5. Colucci SJ, Holmes GJ; Downy Mildew of Cucurbits. The Plant Health Instructor. 2010; DOI:10.1094/PHI-I-2010-0825-01.

6. Ahamad S, Narain U, Prajapati RK, Chhote Lal; Management of downy mildew of cucumber. *Annals of Plant Protection Sciences*, 2000; 8(2): 254-255.
7. Khetmalas MB, Memane SA; Management of downy mildew disease of cucumber during rainy season. *Journal of Maharashtra Agricultural Universities*, 2003; 28(3): 281-282.
8. Brunelli A, Davi R, Finelli F, Emiliani G; Control trials against cucurbit downy mildew (*Pseudoperonospora cubensis* (Berck. & Kurt.) Rostow) on melon. *Difesa delle Piante*, 1989; 12(1-2): 265-273.
9. Mullins CA, Straw RA, Bost SC, Onks DO, Pitt WD Jr; Pumpkin cultivar and fungicide trials. *Tennessee Farm and Home Science*, 1993; 168: 29-34.
10. Velichi E; Dynamics of appearance and evolution to the water melon (*Citrullus lanatus* L.), of downy mildew [*Pseudoperonospora cubensis* (Berk. & Curt.) Rostow.], in the rainy years 2004, 2005, in Baragan field, (Braila area). *Research Journal of Agricultural Science*, 2009; 41(1): 345-350.
11. Panse VG, Sukhatme, PV; Statistical methods for agricultural research workers, ICAR, New Delhi, 1964; 287.
12. Epps WH; An evaluation of fungicides for the control of diseases of cucumber in South Carolina, 1946-55. *Plant Disease Reporters*, 1956; 40: 441-442.
13. Jones JP, Everett PH; Control of anthracnose, downy mildew and soil rot of cucumbers. *Plant Disease Reporters*, 1966; 50: 340-344.
14. Grove MD; Downy mildew control on susceptible cantaloup. *Plant Disease*, 1980; 64: 390-391.
15. Bains SS, Jhooty JS; Epidemiological studies on downy mildew of muskmelon caused by *Pseudoperonospora cubensis*. *Indian Phytopathology*, 1978; 31: 42-46.
16. Patel JG, Patel AJ; Efficacy of systemic and non-systemic fungicides on the control of downy mildew on muskmelon. *Indian Journal of Mycology and Plant Pathology*, 1980; 10: 87.
17. Samoucha Y, Cohen Y; Synergy between metalaxyl and mancozeb in controlling downy mildew in cucumbers. *Phytopathology*, 1984; 74: 1434-1437.
18. Urech PA, Schwinn FJ, Staub AJ; CGA 48988, a novel fungicide for the control of late blight, downy mildew and related soil borne disease. *Proceedings of British Crop Protection Conference*, Brighton, 1977; 623-632.