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# Effect of different integrated disease management components against Downy Mildew of bitter gourd

**S.K.BEURA, S.SARKAR, A.NANDI AND N. SENAPATI**
*All India Coordinated Research Project on Vegetable Crops , Orissa University of Agriculture and Technology Bhubaneswar 751003, Odisha*

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A study was conducted to test the different integrated approaches for management of Downy Mildew of bitter gourd along with bower system and non bower system of planting, Four years pooled data revealed that all the treatments of bower system of planting lowered the disease severity as compared to non bower system of planting. Among the 14 treatments tested, integrated disease management components like seed treatment with ridomil mz (metalaxyl 8 % + mancozeb 64%) @ 0.25 % + 3 (three) times removal of lower infected leaves in the morning and spray of mancozeb 75 % @ 0.25 % in the afternoon on bower system recorded significantly lowest disease severity of downy mildew (4.7 %) with maximum fruit yield of 90.2 q /ha. The same treatment also registered 92.24 % disease control over control plots followed by seed treatment with ridomil mz (metalaxyl 8 % + mancozeb 64%) @ 0.25 % along with one foliar spray of alliete (fosetyl-al) @ 0.25% on bower system of planting registered 79.87% disease control. However, the check plot recorded the maximum disease severity of 60.6 % and 46.6% with minimum green fruit yield of 33.5 q/ha and 41.1 q /ha in non bower and bower system of planting respectively.

**Key words:** Bower system and non bower system, ridomil mz (metalaxyl 8 % + mancozeb 64%), alliete(fosetyl-al)

## INTRODUCTION

Cucurbits are among the important vegetable crops in India and in the world. Cucurbitaceae is one of the most important family of plants. It supplies edible fruit and valuable fibers. Though they are not nearly as important on a worldwide scale as the cereals and legumes, in the tropics, subtropics and milder portions of the temperate zones, their importance is extraordinary. Among the various cucurbitaceous vegetable bitter gourd ( *Momordica charantia* L.) is an important tropical and subtropical vegetable crop extensively grown throughout India. This vegetable is suffering from several economically important foliar diseases like Downy Mildew *(Pseudoperonospora cubensis*), which is posing a serious threat to the successful large-scale cultivation of this vegetable in India. Downy mildew of cucurbits has been reported for the first time in 1868 from Cuba, and even after 130 years it is considered as one of the serious problems. Initial symptoms can be easily recognized by the development of chlorotic lesions on the adaxial leaf surface, sometimes with necrotic centers, lesions can be restricted by the leaf vein ( Elizabeth *et al*; 2010). Major control measures include cultural practice and fungicidal application. Maximum control can be achieved with an integrated disease management approaches as reported by Zhang *et al.*,(2012). However, some workers have re-

ported chemical control measures and integrated disease management strategies in respect of Downy Mildew of cucurbits (Thind *et al*; 1991, Gupta *et al*; 1993 and Anand *et al*; 2007) .

## METERIALS AND METHODS

The experiment was carried out at Horticulture Instructional Farm, OUAT, Bhubaneswar under AICRP on Vegetable Crops ( latitude 20 $^0$ 15' and longitude 85 $^0$ 52') during *rabi* of 2007-08, 2008-09, 2009-10 and 2010-11. Popular local variety Nakhara local seeds were sown in plots, each measuring 3 m x 3 m with a spacing of 100 cm x100 cm in pit method. FYM (25 t/ ha) was incorporated during land preparation, while the recommended dose of fertilizer 50: 30: 30 kg /ha N:P:K was supplemented. The N is applied in three split doses 20% as basal and remaining 80% as top dressing in to two split doses, while full dose of $P_2O_5$ and $K_2O$ were applied as basal application. There were fourteen treatments viz; $T_1$ – seed treatment with ridomil mz 0.25% + one need based foliar spray within 40-50 days of ridomil mz ( 0.25%) , $T_2$ - seed treatment with ridomil mz 0.25% + one need based foliar spray within 40-50 days alliete 0.25% ,$T_3$ – seed treatment with ridomil mz 0.25% + up to three sprays of mancozeb 0.25 % ,$T_4$ – seed treatment with ridomil mz 0.25% + one need based foliar spray of salicyclic acid 25 ppm at 30 and 60 days after sowing, $T_5$ – seed treatment with ridomil mz 0.25% + three times removal of lower infected leaves in the morning and spray of mancozeb @ 0.25% in the afternoon ,$T_6$ – disease free seed from summer crop + need based spray of cowdung cow urine formulation ,$T_7$ – control ( un sprayed on surface) ,$T_8$ - $T_1$ on bower system, $T_9$ – $T_2$ on bower system , $T_{10}$ - $T_3$ on bower system, $T_{11}$ – $T_4$ on bower system ,$T_{12}$ – $T_5$ on bower system, $T_{13}$ – $T_6$ on bower system, $T_{14}$ - control on bower system (un sprayed). Each treatment was replicated thrice in a rendomized block design ( RBD) . Spray was done according to spray schedules. The disease severity of Downy Mildew was recorded following 0- 5 scale, 0= no infection, 1= 1-5% leaf area infected, 2= 6-10% leaf area infected, 3= 11-25% leaf area infected, 4= 26- 50% leaf area infected and 5= > 50% leaf area infected and Percentage of disease severity (PDI) was calculated. Finally the replicated data of different years were pooled and statistically analysed to find out the significance of variation among the treatments.

## RESULTS AND DISCUSSION

A study was conducted during the years 2007-08, 2008-09,2009-10 and 2010-11 to test the different integrated approaches for management of Downy Mildew of bitter gourd along with bower sys-

**Table 1 :** Effect of IDM components on the severity of downy mildew of bitter gourd

| Treatments | 2007-08 | 2008-09 | 2009-10 | 2010-11 | Pooled | % disease control |
|---|---|---|---|---|---|---|
| $T_1$ | 25.1(30.17) | 21.7(27.37) | 21.7(27.71) | 22.8(28.62) | 22.8(28.47) | 62.38 |
| $T_2$ | 23.5(29.00) | 18.4(25.39) | 19.1(25.91) | 19.7(26.38) | 20.0(26.67) | 66.67 |
| $T_3$ | 31.8(34.33) | 29.9(33.14) | 26.3(30.82) | 25.6(30.44) | 28.4(32.19) | 53.14 |
| $T_4$ | 35.7(36.69) | 36.3(37.03) | 34.0(35.65) | 32.5(34.80) | 34.6(36.04) | 42.90 |
| $T_5$ | 19.1(25.92) | 17.9(25.00) | 19.9(28.82) | 20.2(26.74) | 19.3(26.62) | 68.15 |
| $T_6$ | 37.3(37.64) | 39.1(38.74) | 34.8(35.70) | 32.4(34.75) | 35.9(36.71) | 40.76 |
| $T_7$ | 60.5(51.06) | 59.0(50.17) | 62.2(52.12) | 60.8(51.34) | 60.6(51.17) | - |
| $T_8$ | 13.1(21.22) | 13.0(21.15) | 14.4(22.21) | 12.0(20.32) | 13.1(21.23) | 78.38 |
| $T_9$ | 8.3(16.74) | 8.1(16.46) | 10.5(18.70) | 9.7(18.19) | 12.2(17.52) | 79.87 |
| $T_{10}$ | 14.5(22.38) | 13.0(21.07) | 14.3(22.04) | 15.2(22.98) | 14.2(22.12) | 76.57 |
| $T_{11}$ | 19.0(25.84) | 19.2(25.99) | 18.3(25.33) | 16.4(23.92) | 18.2(25.27) | 69.96 |
| $T_{12}$ | 4.4(12.11) | 5.3(13.15) | 5.0(12.70) | 4.1(11.71) | 4.7(12.42) | 92.24 |
| $T_{13}$ | 22.1(28.14) | 19.9(26.37) | 16.4(23.82) | 15.6(23.29) | 18.5(25.41) | 69.47 |
| $T_{14}$ | 48.1(43.91) | 42.65(40.73) | 45.5(42.40) | 50.3(45.24) | 46.6(43.07) | 23.10 |
| SEM(+ | 2.167 | 1.128 | 2.45 | 2.24 | 0.68 | - |
| CD(0.05) | 4.455 | 3.279 | 7.12 | 6.16 | 1.95 | - |

Figure in parenthesis represents angular transformation value

**Table 2 :** Effect of IDM components on fruit yield of bitter gourd (q/ha)

| Treatments | 2007-08 | 2008-09 | 2009-10 | 2010-11 | Pooled mean | Yield increase over control |
|---|---|---|---|---|---|---|
| $T_1$ | 60.9 | 59.7 | 57.1 | 58.3 | 59.0 | 76.12 |
| $T_2$ | 61.4 | 60.7 | 60.4 | 62.4 | 61.2 | 82.69 |
| $T_3$ | 44.5 | 46.3 | 45.0 | 44.8 | 45.2 | 34.92 |
| $T_4$ | 41.8 | 40.8 | 42.6 | 43.6 | 42.2 | 25.97 |
| $T_5$ | 70.2 | 69.8 | 71.1 | 70.5 | 70.4 | 110.15 |
| $T_6$ | 40.0 | 39.0 | 44.2 | 42.6 | 41.4 | 23.58 |
| $T_7$ | 38.5 | 35.7 | 30.8 | 28.9 | 33.5 | - |
| $T_8$ | 81.6 | 79.0 | 80.6 | 81.3 | 80.6 | 140.6 |
| $T_9$ | 84.4 | 83.7 | 83.3 | 84.0 | 63.9 | 90.75 |
| $T_{10}$ | 75.3 | 71.3 | 69.6 | 67.8 | 71.0 | 111.94 |
| $T_{11}$ | 70.7 | 68.1 | 66.6 | 64.4 | 67.5 | 101.49 |
| $T_{12}$ | 92.9 | 88.7 | 88.8 | 90.2 | 90.2 | 169.52 |
| $T_{13}$ | 65.4 | 59.5 | 59.0 | 60.3 | 61.1 | 82.39 |
| $T_{14}$ | 48.8 | 41.0 | 38.8 | 35.8 | 41.1 | 22.69 |
| Sem ± | 2.8 | 1.699 | 1.94 | 2.145 | 1.13 | - |
| C.D.(0.05) | 5.765 | 4.941 | 5.64 | 6.248 | 3.24 | - |

tem and non bower system of planting. Four years pooled data revealed that all the treatments of bower system of planting lowered the disease severity as compared to non bower system of planting as evident from the Table 1. Among the 14 (fourteen) treatments tested, integrated disease management components like seed treatment with "ridomil mz" (metalaxyl 8 % + mancozeb 64%) @ 0.25 % + 3 (three) times removal of lower infected leaves in the morning and spray of mancozeb 75 % @ 0.25 % in the afternoon on bower system recorded significantly lowest disease severity of Downy Mildew (4.7 %) with maximum fruit yield of 90.2 q /ha(Table 2). The same treatment also registered 92.24 % disease control over control plots followed by seed treatment with "ridomil mz" (metalaxyl 8 % + mancozeb 64%) @ 0.25 % along with one foliar spray of alliete (fosetyl-al) @ 0.25% on bower system of planting registered 79.87% disease control. However, the check plot recorded the maximum disease severity of 60.6 % and 46.6% with minimum green fruit yield of 33.5 q/ha and 41.1 q /ha in non bower and bower system of planting respectively.

Zhang *et al.*(2012) reported that integrated approaches including cultural practices like removal of lower infected leaves followed by application of protectant fungicide such as mancozeb must be alternatively applied with systemic fungicide in order to avoid resistant strains.

Gupta *et al.* (1993) reported that among different fungicides spray treatments, ridomil mz was highly effective and was able to combat the further development and spread of the disease. While curzate -50 alone and in combination with dithare M-45 was not as effective as ridomil mz and could reduce the disease index when applied in combination with dithane M -45. Present study also revealed that seed treatment with ridomil mz (metalaxyl 8 % + mancozeb 64%) @ 0.25 % + 3 (three) times removal of lower infected leaves in the morning and spray of mancozeb 75 % @ 0.25 % in the afternoon on bower system recorded significantly lowest disease severity of Downy Mildew (4.7 %) with maximum fruit yield of 90.2 q /ha.

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