# Evaluations of brinjal germplasm for resistance to fusarium wilt disease

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**Abstract:**

Fifty two lines of brinjalgermplas were screened against the in a sick plot for fuarium wilt resistance at Develeela life science Pvt. Ltd., Raipur Chhattisgarh. six lines, viz., AB-2, AB-6, AB-8 , AB-24, AB-35, AB-50 showed highly resistant reaction, with no wilting of plants; five lines, viz., Ab-26, AB-25, AB-52, AB-44 and AB-13, showed resistance reaction per cent wilt 3.33 -10.0. Two line, viz., AB-33 and AB-20, showed moderately resistant reaction, with 11.0 and 12.0 per cent wilt incidence, respectively; while, 25lines were 'moderately susceptible to highly susceptible',with wilt incidence ranging from 25.45 to 100.0%.

**Key words:** Brinjal, Fusarium wilt, resistance screening

## INTRODUCTION

Brinjal (*Solanum melongena* L.) belongs to the family Solanaceae and is the most important and widely-consumed vegetable in India. It is grown in 691,000 hectares with production of eight to nine million tonnes (equivalent to one quarter of global production), which makes India the second largest producer of brinjal in the world. Fusarium wilt, caused by *Fusarium oxysporum*, is a major constraint in brinjal production in India. The disease is widely distributed in tropical, subtropical and some warm temperate regions of the world. The pathogen is difficult to control since it is soil-borne and has a wide host-range, including several hundred species representing 44 families of plants. Infection is through root-to-root transmission, movement of soil and dissemination by farm implements, and insect transmission. A combination of high temperature and poor drainage favour development of the disease which causes 75 to 81% yield loss during summer in India (Das and Chattopadhyay, 1953; Rai *et al*, 1975; Rao *et al*, 1976).Fusarium wilt in brinjal is being managed by application of bactericides, copper fungicides and by crop rotation, with no adequate control. Once the disease develops and wilt symptoms appear in the field, application of bactericides and copper fungicides has no effect on the bacterium. Crop rotation is not a viable control method, as; the bacteria can persist indefinitely in infested fields (Jaworski and Morton, 1964; Sonoda, 1978). In the absence of effective chemicals and bactericides for managing this disease, emphasis is laid on developing brinjal (brinjal) cultivars with resistance to *Fusarium oxysporum*. Though resistance to fusarium wilt has been studied in several crops, especially tomato, there is little published work on fusarium wilt resistance in brinjal (Chaudhary and Sharma, 2000; Zakir Hussain *et al*, 2005; Monda*et al*, 2013).

## MATERIAL AND METHODS

A total of fifty twobrinjal lines, including resistant and susceptible checks (Table 1), were evaluated during the year 2015-2016 in fusarium-wilt sick plot at Develeela life science Pvt. Ltd., Raipur Chhattisgarh. 35 day old brinjal seedlings of these accessions raised in pro-trays were transplanted to wilt-sick soil which had a pathogen population of 1.0 x 10 cfu/gm soil. Infested soil was used because it permits assessment of field resistance by allowing the infection process to take place under natural conditions, with realistic doses of naturally-produced inoculum. Recommended package of practices for growingbrinjal crop were followed from transplanting up to harvest.The fugal, *Fusarium oxysporum*, was isolated from freshlywilted brinjal on Triphenyl Tetrazolium Chloride agarmedium (TTC) (Kelman, 1954) and multiplied on 523enriched medium (Kado and Haskett, 1970). Fusariumsuspension from 523 medium was diluted in sterile distilledwater and its concentration adjusted to 0.3 OD at 600nm(1.0 x 10cfu/ml) using a spectrophotometer. To ensureinfection, the plants were also inoculated with fusariumsuspension (1066cfu/ml) by axil-puncture method at 15 and30 day after transplanting(Winstead and Kelman, 1952;Rashmi *et al*, 2012). All the 41 accessions were replicatedthrice, with 30 plants in each replication, in RandomizedBlock Design. Periodical, observations were recorded on incubation period and per cent fusarium-wilt incidence. Tassess length of the incubation period, an average of 10.0per cent of wilted plants from each accession was taken(Atabug and Juan, 1981) and fusarium infectivity wasconfirmed by

the ooze test, as also by isolating the bacteriumon TTC medium. Wilt symptoms and number of wilted plants per accession were recorded and graded on 0-5 scale, as per Winstead and Kelman (1952) and Zakir Hussain *et al* (2005), with some modification. The modified rating scale is given below: 0 - Highly Resistant (HR) with no wilt symptom; 1 Resistant (R), with 1 - 10% wilted plants; 2 – Moderately Resistant (MR) with 11 -20% wilted plants; 3 - Moderately Susceptible (MS), with 21-30% wilted plants; 4 – Susceptible (S) with 31- 40% wilted plants, and, 5 - Highly Susceptible (HS) with > 40% wilted plants. The experimental data were statistically analyzed. Data on per cent incidence of wilt were transformed into arc sine, and analysis of variance was carried out with transformed values. The means were compared for statistical significance using Duncan multiple range test (Panse and Sukhatme, 1989). The accessions were categorized as highly resistant to highly susceptible, depending on the percentage of wilted plants.

## RESULTS AND DISCUSSION

Results presented in Table 1 showed thatsix lines, viz., AB-2, AB-6, AB-8 , AB-24, AB-35, AB-50 showed highly resistant reaction, with no wilting of plants; five lines, viz., AB-26, AB-25, AB-52, AB-44 and AB-13, showed resistance reaction per cent wilt 3.33 -10.0. (Fig. 1), Two line, viz., AB3-3 and AB-20, showed moderately resistant reaction, with 11.0 and 12.0 per cent wilt incidence, respectively; while, 25 lines (Table 1) were 'moderately susceptible to highly susceptible', with wilt incidence ranging from 25.45 to 100.0%.. The resistant check varieties, ArkaKeshav and Arka Nidhi, showed no fusarium wilt incidence, and, the susceptible check, ArkaShirish showed 100% wilt incidence. Similar observation was also made by Chaudhary and Sharma (2000), who found that genotype SM 6-6 to be resistant to fusarium wilt, with ArkaKeshav, ArkaNeelkanth and Arka Nidhi as the resistant checks. Mondal *et al* (2013) found that out of eight lines of local brinjal germplasm screened in fusarium-wilt sick soil, 'Midnapur Local' and 'Bhangar' were tolerant to the disease. Normally, under field conditions, wilt symptom appears at the time of flowering, which is approximately 30 to 40 days after transplanting. In the highly-susceptible variety ArkaShirish, the first symptom of wilt appeared after six days from the first inoculation (20.0% wilt), which was 21 days after transplanting and extended for 35 days (100.0% wilt); whereas, in the resistant accession (RES-5 and RES6) which showed wilt incidence of 3.33 to 10.0%, the initial Symptom was noticed 14 days after the first inoculation, and had a longer incubation period of 60 days. Similar observation was made by Rahman *et al* (2011) on incubation of the pathogen in resistant cultivar Katabegun, which showed 30.0% fusarium wilt incidence after 55 days of transplanting to wilt-sick soil. Thus, the present results indicate that resistant accessions had longer incubation period compared to the susceptible ones. Similarly, Rahman (1997) reported in chilli that resistant accessions had a longer incubation period and took a longer time to produce disease symptoms, than the susceptible accessions. Accessions found to be highly resistant in the present study are being further used in breeding programmes for developing fusarium wilt resistant brinjal hybrids.


Fig.1 Fusarium wilt susceptible()A and B and resistance lines of brinjal(C)

## ACKNOWLEDGEMENT

The authors are thankful to Director, DevleelaLifesciencePvt. Ltd., Raipur, Chhattisgarh and co- guide Rakesh Kumar Meena, for providing facilities.

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**Table 1:- Evaluation of eggplant accessions for Fuasrium wilt resistance**

| S. No | Name of lines | Wilt incidence Mean* (%) | Reaction | S. No | Name of lines | Wilt incidence Mean* (%) | Reaction |
|---|---|---|---|---|---|---|---|
| 1 | AB-1 | 54.44 (47.53) | HS | 27 | AB-27 | 100.00 (89.96) | HS |
| 2 | AB-2 | 00.00 (0.00) | HR | 28 | AB-28 | 100.00 (89.96) | HS |
| 3 | AB-3 | 60.00 (50.76) | HS | 29 | AB-29 | 100.00 (89.96) | HS |
| 4 | AB-4 | 33.33 (35.23) | MS | 30 | AB-30 | 100.00 (89.96) | HS |
| 5 | AB-5 | 44.33 (40.48) | HS | 31 | AB-31 | 100.00 (89.96) | HS |
| 6 | AB-6 | 00.00 (0.00) | HR | 32 | AB-32 | 100.00 (89.96) | HS |
| 7 | AB-7 | 96.66 (79.94) | HS | 33 | AB-33 | 12.00 (20.96) | MS |
| 8 | AB-8 | 00.00 (0.00) | R | 34 | AB-34 | 75.00 (60.00) | HS |
| 9 | AB-9 | 75.00 (60.00) | HS | 35 | AB-35 | 00.00 (0.00) | HR |
| 10 | AB-10 | 96.66 (79.94) | HS | 36 | AB-36 | 100.00 (89.96) | HS |
| 11 | AB-11 | 86.55(65.23) | HS | 37 | AB-37 | 100.00 (89.96) | HS |
| 12 | AB-12 | 92.23(75.45) | HS | 38 | AB-38 | 100.00 (89.96) | HS |
| 13 | AB-13 | 05.00 (12.88) | R | 39 | AB-39 | 100.00 (89.96) | HS |
| 14 | AB-14 | 100.00 (89.96) | HS | 40 | AB-40 | 100.00 (89.96) | HS |
| 15 | AB-15 | 100.00 (89.96) | HS | 41 | AB-41 | 100.00 (89.96) | HS |
| 16 | AB-16 | 100.00 (89.96) | HS | 42 | AB-42 | 100.00 (89.96) | HS |
| 17 | AB-17 | 100.00 (89.96) | HS | 43 | AB-43 | 100.00 (89.96) | HS |
| 18 | AB-18 | 100.00 (89.96) | HS | 44 | AB-44 | 10.00 (18.42) | R |
| 19 | AB-19 | 100.00 (89.96) | HS | 45 | AB-45 | 75.00 (60.00) | HS |
| 20 | AB-20 | 11.00 (19.32) | MS | 46 | AB-46 | 65.45 (26.85) | HS |
| 21 | AB-21 | 100.00 (89.96) | HS | 47 | AB-47 | 100.00 (89.96) | HS |
| 22 | AB-22 | 100.00 (89.96) | HS | 48 | AB-48 | 100.00 (89.96) | HS |
| 23 | AB-23 | 100.00 (89.96) | HS | 49 | AB-49 | 00.00 (0.00) | HS |
| 24 | AB-24 | 00.00 (0.00) | HR | 50 | AB-50 | 00.00 (0.00) | HR |
| 25 | AB-25 | 10.00 (18.42) | R | 51 | AB-51 | 96.66 (79.94) | HS |
| 26 | AB-26 | 9.00 (17.32) | R | 52 | AB-52 | 03.33 (10.48) | R |