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Field performance of Tomato cultivars in relation to Early blight disease in East and South East coastal plain zone of Odisha

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Field experiments were conducted for three consecutive seasons of *Rabi* 2010-11, 2011-12 and 2012-13 in the farmer's field of Jagatsinghpur district of Odisha in order to study the performance of eighteen cultivars of tomato such as BT-106, BT-317, BMZ-21, LE-626, LE 1-2, Megha tomato-2, Utkal Pallavi, Utkal Dipti, BT-218, H-62, H-63, LE-66, Swarna Lalima, LE-474, CO-3, Utkal Raja, Utkal Shravani and BT-17 in relation to early blight disease in coastal zone of Odisha. The trial was laid out in Randomized Block Design and three replications with individual plot size of 8.1 m² (3.0 x 2.7m). The planting was made with a spacing of 60cm x 40cm with recommended dose of fertilizer such as 125:60:100 Kg N₂:P₂O₅:K₂O/ha. Among the 18 varieties of tomato screened against Early blight incidence, yield potential and ancillary yield attributing characters in tomato; none of the varieties were found to be immune to the disease. Maximum fruit yield was obtained from the variety BT-17 (450.3 q/ha) followed by Utkal Shravani (436.2q/ha), Utkal Raja (412.8q/ha), BT 218 (408.9q/ha), Utkal Pallavi (400.4q/ha) and Utkal Dipti (398.5 q/ha). Utkal Pallavi, Utkal Shravani and BT-17 recorded moderate incidence of 12.4, 18.6 and 21.5 per cent disease incidence respectively in an increasing rate. Keeping in view the disease incidence, yield and ancillary characters like plant height, number of branches, fruit length, fruit girth and net fruit weight; varieties like Utkal Pallavi, Utkal Dipti, BT-218, Utkal Raja, BT-17, Utkal Shravani, Megha tomato-2 and BMZ-21 were found promising under the East and South East Coastal Plain Zone of Odisha.

Key words: *Alternaria solani*, Tomato cultivars, PDI, yield parameters, screening

Tomato (*Lycopersicon esculentum* Mill.) belongs to the family Solanaceae and is one of the most remunerable and widely grown vegetables in the world acreage and ranks first among the processed crops (FAOSTAT, 2010). Out of total area 9205.19 thousand ha under vegetable cultivation, tomato occupies an area of 879.63 thousand ha with an annual production of 18226.64 thousand mt. with productivity of 20.72 tons/ha in India. It occupies an area of 96.55 thousand ha with production of 1382.78 thousand mt. with productivity of 14.32 tons/ha. In Odisha, tomato is subjected to ravages of different fungal diseases like Damping off, Early

blight, Late blight, Leaf mould, Fusarium wilt, Leaf spots, Powdery mildew, Root rot and Sclerotial wilt etc besides several other microbial diseases of bacteria, virus and nematodes. Screening of tomato genotypes against Early blight pathogen is a chief and important aspect so far as the management is concerned. However, effective disease management is only possible by introducing resistant or moderately resistant varieties having good cultural practices. To ascertain variability in pathogenic behaviour of the fungus, present study on varietal screening was taken to identify the sources of resistance available in new tomato genotypes.

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Field trials were conducted for three consecutive

crop seasons during *Rabi* 2011-12, 2012-13 and 2013-14 to test the reaction of cultivars against Early blight disease caused by *Alternaria solani*. Seeds collected from various sources were sown in farmer's field at Tirtol of Jagatsinghpur district, Odisha. The experiment was laid out in Randomized Block Design and three replications with individual plot size of 8.1 m² (3.0 x 2.7m). The planting was made with a spacing of 60cm x 40cm with recommended dose of fertilizer such as 125:60:100 Kg N:P₂O₅:K₂O/ha. With all agronomical practices as generally recommended were followed. The plants were artificially inoculated on 30th day after planting with spore suspension (5 x 10⁵ spores/ml) of *A. solani* in order to build up high inoculum density in the field. Observation on disease incidence were recorded on 10th day after artificial inoculation and repeated at 7 days interval for 10 times on 0-5 scale as mentioned earlier. The PDI was calculated as per the formulae.

$$\text{Percent Disease Index (PDI)} = \frac{\text{Sum of individual ratings}}{\text{No of leaves examined} \times \text{Maximum disease scale}} \times 100$$

Some other ancillary parameters such as plant height (cm), branches/plant (no), Fruit length (cm), Fruit girth (cm) and average fruit weight (gm) were studied on different cultivars. The fruits were harvested at appropriate maturity and observations taken to find out the plot yield for each variety and converted to yield/ha. Seeds of different varieties/cultivars available from different sources like AICRP on vegetables, OUAT Bhubaneswar, IHR, Hisarghat, Bangalore and IIVR, Varanasi, Uttar Pradesh were used during the present study

The reaction of 18 cultivars of tomato against Early blight disease was studied under field condition revealed that, no cultivar was found to be immune to early blight disease (Table 1 and Fig 1). The least incidence of 5.8% was recorded from Utkal Dipti followed by BT-218 (6.4%) and Utkal Raja (6.5%). These 3 varieties were found statistically at par and significantly different from rest of the varieties with respect to PDI. The maximum fruit yield of 450.3q/ha was recorded from BT-17 followed by Utkal Shravani (436.2q/ha), Utkal Raja (412.8q/ha). BT-218 (408.9q/ha), Utkal Pallavi (400.4 q/ha) and Utkal Dipti (398.5 q/ha). Utkal Pallavi, Utkal Shravani and BT-17 recorded moderate incidence of 12.4%, 18.6% and 21.5% respectively in an increasing rate. With respect to plant height, H-62 recorded 78.9cm followed by

Megha tomato-2 (79.6cm) and BT-106 (77.1 cm). Most of the varieties were not statistically significant with respect to number of branches per plant. However BMZ-21 (6.0), Megha tomato-2 (5.9) and LE-66 (5.9) were found comparatively short height. The maximum fruit length was recorded from BMZ-21 (6.1cm) followed by Utkal Pallavi (5.5cm), BT-

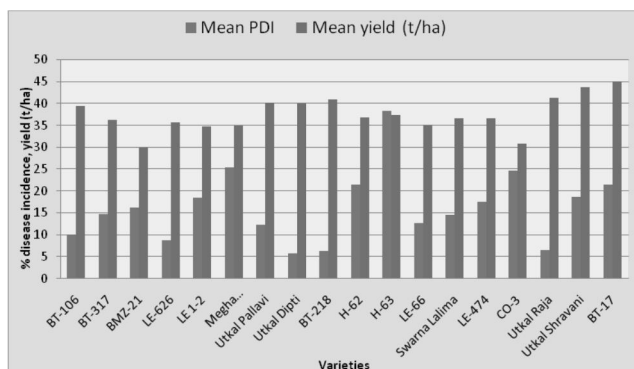


Fig. 1 : Varietal resistance against % disease incidence and yield potential (t/ha)

17 (5.2cm) and Utkal Shravani (5.0cm). As high as 16.9cm of fruit girth was recorded from BT-17 followed by Utkal Shravani (16.5cm), Megha tomato-2 (16.4cm) and Utkal Raja (16.3cm). With respect to net fruit weight H-63 recorded maximum weight (66.6g) followed by BT-218 (60.89g), BT-317 (57.8g) and BMZ-21 (55.2g). Parthasarathy and Aswastha (2002) conducted screening of 23 tomato genotypes in Meghalay and found considerable diversity among genotypes for 8 morphological characters. Plant height contributed to divergence which also supports the present findings. Kamble *et al.* (2007) took up screening of 21 advanced lines and 5 varieties of tomato under field condition. The 5 advanced lines such as DPL-T-14, SUN-7610, SUN-7511, DPL-T-4, and BTH-9 were moderately resistant. However LE-415, BT-105, BL-333-3 and Swarna Naveen were found moderately susceptible. EC-251709, EC 251717, EC 164295 and LE-15 found to be highly resistant, LE-44 resistant as reported by Lohit *et al.* (2009) out of 52 genotypes they screened. The findings of Singh *et al.* (2013) showed that the cultivar Panjab Chhuara, RCMT-2 and Pant-T-8 were reported completely resistant under Jammu and Kashmir condition. Co-3 and S-22 were found susceptible against early blight pathogen. However keeping in view the disease incidence, yield and ancillary characters, the varieties like Utkal Pallavi, Utkal Dipti, BT-218, Utkal Raja, BT-17, Utkal Shravani, Megha tomato-2 and BMZ-21 were found

Table 1 : Performance of Tomato cultivars in relation to Early blight disease, yield and yield attributing characters

| Varieties | Per cent disease incidence | Fruit yield (q/ha) | Plant height (cm) | Number of branches | Fruit length (cm) | Fruit girth (cm) | Net fruit weight (g) |
|----------------|----------------------------|--------------------|-------------------|--------------------|-------------------|------------------|----------------------|
| BT-106 | 10.0 (18.32) | 393.0 | 77.1 | 6.5 | 4.7 | 15.3 | 57.0 |
| BT-317 | 14.8 (22.50) | 362.2 | 62.4 | 6.4 | 4.9 | 15.3 | 57.8 |
| BMZ-21 | 16.3 (23.73) | 298.4 | 64.1 | 6.0 | 6.1 | 14.2 | 55.2 |
| LE-626 | 8.7 (17.12) | 356.0 | 62.2 | 6.2 | 4.0 | 14.6 | 53.0 |
| LE 1-2 | 18.5(25.42) | 346.1 | 72.3 | 6.1 | 4.6 | 14.6 | 56.0 |
| Megha tomato-2 | 25.3(30.18) | 348.5 | 79.6 | 5.9 | 4.3 | 16.4 | 53.0 |
| Utkal Pallavi | 12.4(20.48) | 400.4 | 52.3 | 6.3 | 5.5 | 15.3 | 43.8 |
| Utkal Dipti | 5.8(13.78) | 398.5 | 64.6 | 6.8 | 4.7 | 14.5 | 52.3 |
| BT-218 | 6.4(14.47) | 408.9 | 66.8 | 6.6 | 4.5 | 15.2 | 60.8 |
| H-62 | 21.4(27.45) | 368.0 | 78.9 | 6.7 | 4.6 | 14.8 | 52.8 |
| H-63 | 38.3(38.21) | 374.0 | 72.8 | 6.6 | 4.6 | 14.7 | 66.6 |
| LE-66 | 12.6(20.60) | 350.6 | 65.5 | 5.9 | 4.4 | 15.1 | 46.3 |
| Swarna Lalima | 14.5(22.29) | 366.0 | 70.7 | 6.1 | 4.9 | 16.4 | 48.4 |
| LE-474 | 17.6(24.73) | 365.7 | 64.3 | 6.8 | 4.6 | 16.3 | 43.5 |
| CO-3 | 24.6(29.67) | 307.4 | 62.8 | 6.4 | 4.3 | 15.4 | 51.1 |
| Utkal Raja | 6.5(14.60) | 412.8 | 65.3 | 6.3 | 4.8 | 16.3 | 50.4 |
| Utkal Shravani | 18.6(25.48) | 436.2 | 71.4 | 6.9 | 5.0 | 16.5 | 52.4 |
| BT-17 | 21.5(27.57) | 450.3 | 69.8 | 6.7 | 5.2 | 16.9 | 48.4 |
| SE(m) ± | 0.95 | 1.28 | 1.14 | 0.30 | 0.14 | 0.21 | 1.98 |
| CD (0.05) | 2.73 | 3.69 | 3.27 | 0.86 | 0.39 | 0.60 | 5.68 |
| CV% | 7.11 | 0.59 | 2.90 | 8.05 | 4.90 | 2.33 | 6.51 |

Figures in parenthesis are angular transformed values and statistics applied to them

promising under East and South East Coastal plain zone of Odisha. Therefore the varieties may be popularised among the farmers for wide cultivation and may be used as donors to evolve suitable cultivars possessing disease resistance with desirable agronomic characters.

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