

VARIETAL EVALUATION OF EXOTIC TOMATO VARIETIES IN MID COUNTRY WET ZONE

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INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) being one of the most essential vegetable crops in Sri Lanka, is preferred by farmers due to high economic returns, export potential and nutritional value. In Sri Lanka, tomato is cultivated in more than 7137 ha, producing nearly 73917 mt/year. However, the average productivity of 10.36 mt/ha (DOA, 2010) in Sri Lanka is contrastingly lower than the global average of 24 mt/ha (Ikeda, 1996). The recorded lower yields are attributed to multiple of factors inclusive of elevated and frequent incidences of pest and diseases and inadequate accessibility to quality seeds (Ceylon Chamber of Commerce, 2011).

At present producers are much concerned about the yield as well as the quality of fruits. Make use of exotic hybrids is one of the means available to meet ever increasing demand for quality and high yielding tomato. Consequently, the recent trend has been the cultivation of exotic hybrids. Exotic Tomato varieties are introduced by the private sector seed importers and are currently becoming popular among the farmers. Even though such varieties are attractive to farmers, they could have a severe impact on local cultivars. If an exotic tomato variety grown extensively in the country becomes highly susceptible to a particular pest or/and disease, the entire tomato cultivation could be at a high risk (Gahanihe *et al.*, 2004). Therefore, these varieties should be screened for local pests and diseases prior to the introduction of them to the local farmers.

Accordingly, this study was conducted to screen the suitability of exotic tomato varieties, imported by the private sector, for local production.

METHODOLOGY

The study was conducted during *Yala* 2011, at the research field of Horticultural Crop Research and Development Institute (HORDI), Gannoruwa located in the Mid Country Wet Zone of Sri Lanka. Sixteen exotic varieties of tomato comprise of Nine recently introduced by private seed importing companies (*BSS 908, Rashmi 8005, G.W.G. 305, G.W.G. 502, Balady, BigStrike, Rijuta, Maganda, Rajshri*) and Seven exotic varieties selected during Maha season (*O8T 420, O8T 906, O8T 917, Rohit-2, Monaco NP-12, Malan, Hero*). For comparison, four local check varieties namely *Bathiya, Maheshi, Rajitha, and Thilina* were evaluated. The experimental layout was a randomized complete block design (RCBD) with two replicates. The plot size was 2.4m X 3.5m with 3 rows/plot and 21 plants/ plot. The spacing was 80 cm between rows and 50 cm between plants. Fertilizer application and irrigation were followed as per recommendations of the Department of Agriculture (DOA). Mean values of disease incidence parameters [disease incidence of bacterial wilt, virus and blight (measured as the percentage of disease infected plants) and AUDPC (area under disease progressive curve) value for blight], agronomic characteristics [seedling vigour (using 5-point Likert Scale), days to 50% flowering, plant height at first harvest, plant survived at 50% flowering, first harvest and 3rd harvest] and yield parameters [fruits/plant, marketable yield, non-marketable yield (due to cracking, injuries, diseases and differences in size & shape), Average fruit weight] were compared using Duncan's New Multiple Range Test (DNMRT). SAS (Statistical Analysis Software) package was used to analyze the data.

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RESULTS AND DISCUSSION

Assessment of the disease resistance:

No incidence of bacterial wilt disease was observed in the four local check varieties (Table 1). The resistance to bacterial wilt disease in exotic varieties *G.W.G. 502*, *G.W.G. 305 Rohit 2*, *Hero*, *Maganda*, *O8T 420*, *O8T 906*, *O8T 917* and *Monaco- NP-12* were comparable to that of the check varieties. Results revealed that exotic varieties *Rijuta*, *Malan*, *Balady*, *Rajshri*, *BigStrike* and *Rashmi 8005* are susceptible to the bacterial wilt.

Much lower incidence of virus diseases was observed (less than 25% of canopy affected) in all the varieties (Table 1). The high resistance to virus diseases in all the varieties might be due to the protection measures had already been taken place to control the virus diseases by the DOA.

The results of blight severity revealed that the disease severities of varieties *Rijuta*, *Rajshri*, *BigStrike*, *Balady*, *Rashmi 8005*, *BSS 908*, *Maganda*, *O8T 420*, *Monaco NP-12*, *O8T 917* and *Rohit 2* were significantly higher compared to that of the local varieties (Table 1). Varieties *O8T 906*, *G.W.G. 305*, *G.W.G. 502* and *Hero* showed more resistance compared to the check varieties. Even though check varieties showed comparatively lower AUDPC values for blight, there was no significant difference between check and exotic varieties.

Evaluation of agronomical characteristics:

Even though seedling vigour of the tested varieties varied significantly (Table 1) there is no statistically significant difference between check varieties and of the exotic varieties. Variety *Hero* exhibited the strongest seedling vigour with a mean score of 5 while varieties *Rajshri*, *BSS 908* and *Big Strike* scoring the lowest seedling vigour of 3. Plants with high seedling vigour have good crop performances and even high yield under different conditions (Perry, 1972). However, plant survivability was much lower for few exotic varieties namely *Balady*, *Big Strike*, *Rijuta*, *Rajshri* and *Monaco NP 12* (Table 1). Higher seedling vigour and plant survivability of most of the exotic varieties may be attributed to their better adaptability to local conditions.

Evaluation of yield characteristics:

Significant variations (at $P < 0.05$) were observed in number of fruits per plant among cultivars (Table 1). The highest number of fruits of 57.9 per plant was produced by the check variety *Bathiya*, whereas the lowest were recorded in exotic varieties *Rijuta* (0.0), *Balady* (0.0), *BigStrike* (0.3) and *Malan* (1.0). Only the varieties *G.W. G 502*, *Rohit 2*, *O8T 906*, *O8T 917* and *BSS 908* produced fruits comparable to the check varieties. The results of the present study are in agreement with the findings of Khokhar *et al.* (1988) who also reported about a lot of difference in fruit number per plant in different tomato cultivars.

The check varieties *Maheshi* and *Bathiya* gave the highest Marketable yield (Table 1). Exotic varieties- *Rohit 2*, *G.W.G.502*, *O8T 906*, *O8T 420*, and *O8T 917* gave marketable yields comparable to the check varieties. Variety *Hero* recorded the highest nonmarketable yield of 5.11 t/ha which is significantly different from other varieties.

Evaluation of food quality characteristics:

This study also examined the fruit quality characteristics such as color, shape, firmness, brix value and p^H . The study found that all varieties had orange red colour except variety *O8T 917* which showed a pale orange. Fruits were on the shapes of round to slightly flattened to lengthy cylindrical. Varieties *Thilina*, *Bathiya*, *Hero*, *G.W.G. 305*, *Rohit 2* and *O8T 906* had solid fruits and variety *Malan* had soft fruits while others had fruits of medium firmness. In contrast thickest pericarp was observed in fruits of *Monaco NP-12* and comparable

thicknesses to check varieties were also observed in *O8T 420*, *O8T 906*, *O8T 917*, *Rohit 2*, *BSS 908*, *Rashmi 8005*, *G.W.G. 305*, *G.W.G. 502*, *Maganda*, *Hero* and *Rajshri*. Brix values of fruits were varied from 4.0 to 9.5 whereas fruit pH of the tested varieties ranged from 4.00-4.54.

CONCLUSIONS

It could be concluded that except for *G.W.G. 305*, *G.W.G. 502* and *O8T 906*, the other exotic varieties are susceptible to either blight or both blight and bacterial wilt. Among the tested exotic varieties *BSS 908*, *G.W.G. 305*, *G.W.G. 502*, *O8T 420*, *O8T 906*, *O8T 917*, *Rohit 2*, *Manaco NP 2*, and *Hero* are superior in relation to their agronomical characteristics, yield and fruit quality attributes. Varieties *G. W. G. 305*, *O8T 906*, and *Rohit 2* are excellent for table purposes as they possess acceptable shape, colour, high pericarp thickness and the solid fruits. Varieties *G.W.G. 305*, *G.W.G. 502* and *O8T 906* can be recommended for cultivation in Mid-Country Wet Zone. Yet the varieties *G.W.G. 305* and *G.W.G. 502* are to be tested in a *Maha* season.

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Table1: Comparison of disease response, agronomical characteristics and yield parameters of the tested varieties

| Variety | Susceptibility to Diseases at 50% flowering | | | | Agronomic Characteristics | | | Yield Parameters | |
|--|---|------------------|------------------|-------------------------|---------------------------|-----------------------|---|------------------|-------------------------|
| | B.W for DI (%) | DI for Virus (%) | DI Blight (%) | AUDPC for Blight ('000) | Seedling Vigour | Days to 50% flowering | Plant Survived at 3 rd Harvest (%) | Fruits/plant | Marketable yield (t/ha) |
| Exotic varieties recently introduced | | | | | | | | | |
| BSS 908 | 33 ^{bc} | 3 ^{ab} | 66 ^d | 3.3 ^{cdef} | 3.0 ^c | 25.5 ^{fg} | 83 ^{ab} | 30 ^{cd} | 32 ^{cdg} |
| Rashmi8005 | 45 ^b | 14 ^{ab} | 86 ^b | 3.9 ^{bcde} | 4.5 ^{ab} | 26.0 ^{fg} | 57 ^a | 18 ^c | 19 ^h |
| G.W.G.305 | 9 ^{cd} | 25 ^a | 37 ^{hi} | 2.4 ^{efgh} | 4.0 ^{abc} | 30.0 ^{cde} | 91 ^a | 18 ^e | 22 ^{gh} |
| G.W.G.502 | 7 ^d | 17 ^{ab} | 32 ⁱ | 1.6 ^{gh} | 4.0 ^{abc} | 30.5 ^{bcde} | 98 ^a | 46 ^b | 46 ^{bcd} |
| Balady | 95 ^a | 0 ^b | 100 ^a | 5.3 ^{ab} | 3.5 ^{bc} | 28.0 ^{efg} | 5 ^c | 0.0 ^f | 0.0 ⁱ |
| BigStrike | 86 ^a | 0 ^b | 100 ^a | 5.1 ^{ab} | 3.0 ^c | 34.0 ^a | 12 ^c | 0.2 ^f | 0.2 ⁱ |
| Rijuta | 100 ^a | - | 100 ^a | 6.4 ^a | 4.0 ^{abc} | - | 0 ^c | 0.0 ^f | 0.0 ⁱ |
| Maganda | 23 ^{bcd} | 10 ^{ab} | 67 ^d | 3.4 ^{cdef} | 3.5 ^{bc} | 33.5 ^{ab} | 79 ^a | 19 ^c | 19 ^h |
| Rajshri | 88 ^a | 3 ^{ab} | 96 ^a | 3.9 ^{bcd} | 3.0 ^c | 34.0 ^a | 21 ^c | 0.3 ^f | 0.5 ⁱ |
| Exotic varieties selected during Maha 2010/11 | | | | | | | | | |
| O8T 420 | 21 ^{cd} | 5 ^{ab} | 61 ^{de} | 2.9 ^{cdefg} | 4.5 ^{ab} | 28.0 ^{efg} | 88 ^a | 24 ^{de} | 36 ^{def} |
| O8T 906 | 17 ^{cd} | 3 ^{ab} | 37 ^{hi} | 1.6 ^{gh} | 3.5 ^{bc} | 27.5 ^{efg} | 86 ^{ab} | 43 ^b | 54 ^{abc} |
| O8T 917 | 12 ^{cd} | 5 ^{ab} | 64 ^d | 2.9 ^{cdefg} | 4.5 ^{ab} | 28.0 ^{efg} | 91 ^a | 39 ^{bc} | 40 ^{de} |
| Rohit 2 | 7 ^d | 10 ^{ab} | 56 ^{ef} | 2.7 ^{defg} | 4.0 ^{abc} | 27.5 ^{efg} | 100 ^a | 44 ^b | 56 ^{ab} |
| Monaco NP 12 | 14 ^{cd} | 2 ^{ab} | 74 ^c | 3.9 ^{bcd} | 4.5 ^{ab} | 22.0 ^h | 88 ^{ab} | 14 ^e | 27 ^{fgh} |
| Malan | 98 ^a | 0 ^b | 83 ^b | 4.3 ^{bc} | 4.0 ^{abc} | 25.0 ^g | 8 ^c | 1 ^f | 0.1 ⁱ |
| Hero | 5 ^d | 17 ^{ab} | 50 ^{fg} | 2.4 ^{efgh} | 5.0 ^a | 28.5 ^{def} | 95 ^a | 14 ^e | 20 ^h |
| Local varieties | | | | | | | | | |
| Bathiya | 0 ^d | 9 ^{ab} | 44 ^{gh} | 2.0 ^{fgh} | 4.0 ^{abc} | 31.5 ^{abcd} | 81 ^b | 58 ^a | 63 ^a |
| Maheshi | 0 ^d | 11 ^{ab} | 32 ⁱ | 1.5 ^{gh} | 4.0 ^{abc} | 27.5 ^{efg} | 90 ^a | 39 ^{bc} | 63 ^a |
| Rajitha | 0 ^d | 7 ^{ab} | 21 ^j | 0.9 ^h | 4.0 ^{abc} | 28.0 ^{efg} | 98 ^a | 43 ^b | 54 ^{abc} |
| Thilina | 0 ^d | 5 ^{ab} | 38 ^{hi} | 1.7 ^{gh} | 4.0 ^{abc} | 33.0 ^{abc} | 95 ^a | 35 ^{bc} | 44 ^{cd} |
| Mean | 34 | 8 | 60 | 2.9 | 3.9 | 28.6 | 67.7 | 19 | 30 |

Means followed by the same letter in a column are not significantly different at p = 0.05.