Impacts

The results have clearly shown that sources of resistance to the major pests and diseases are available in local and exotic eggplant varieties. Several of the eggplant varieties selected as resistant to FSB also possess resistance to some important insect pests, diseases and RKN. Moreover, the selected resistant varieties include two cultivated varieties which have potential to reduce FSB infestations and minimize insecticide use. Identification of these genetically resistant sources has enhanced the process of resistance breeding programs.

Project Highlights

Eleven eggplant varieties, selected as genetically resistant to fruit and shoot borer, have also some degree of resistance to jassids, aphid and white fly. Several of these selected materials also have resistance to bacterial wilt and root-knot nematode. Cultivation of two of the selected FSB-resistant varieties, Kazla and Uttara, has opened up opportunities for the farmers to produce relatively healthy crops with minimal or no pesticide use.

Demonstration and Pilot Production of Grafted Eggplant and Grafted Tomato and Training of Farmers

M. A. Rashid, Attaur Rahman (BARI), Bahauddin Ahmed (IPM CRSP/Virginia Tech), G. Luther (Virginia Tech), and L. Black (AVRDC)

Abstract

Grafting of cultivated eggplants or tomatoes was highly compatible producing more than 95% grafting success for both eggplants and tomatoes. Eggplant or tomato grafts suffered least mortalities from bacterial wilt or other diseases as compared to an overall 30% mortalities in the non-grafted ones. Pilot production of eggplant grafts in three locations was a tremendous success, producing about three times more yields and net income. Similarly, production of tomato grafts gave 145% increased yield and 140% more net income.

Objectives

To demonstrate and popularize eggplant and tomato grafting technology through pilot production; and

To disseminate eggplant grafting technology through training of farmers and nurserymen.

IPM Constraints

Bacterial wilt is a widespread serious disease of both eggplant and tomato in Bangladesh. In absence of any practical control methods, farmers use pesticides indiscriminately without any successful control of the disease. Grafting of cultivated eggplant and tomato varieties on BW-resistant eggplant rootstocks has been developed as a profitable alternative for production of healthy, pesticide-free eggplants and tomatoes.

Research Methods

Eggplant grafting:

About 15 thousand eggplant grafts were raised at BARI farm of Jessore and Gazipur for demonstration and pilot production at two intensive eggplant growing locations of Jessore (Gaidghat and Naodagram), and one location of Gazipur (Sripur). Two cultivated varieties (variety Chega for Jessore, and variety Singnath for Sripur), which are susceptible to BW, were grafted on two BW-resistant wild eggplant rootstocks (Solanum torvum and S. sisymbriifolium) using the cleft grafting method. For grafting, 3-4 leaf stage seedlings (about 3-week old) of both the scion and rootstocks were used. The grafted plants along with the non-grafted scion varieties were transplanted 3-4 weeks after grafting in 13 farmer fields of two locations in Jessore and in one farmer field in Sripur. Fields of farmer practice (without grafted eggplants) served as the control. Standard cultural practices and recommended fertilizer doses were applied. No pest control measure was taken. The field demonstrations were carried out both in summer and winter seasons. Regular observations were taken on disease incidence and wilting of the plants. Data were also collected on plant height, fruit numbers per plant, fruit length and breadth, and yield.

Tomato grafting:

BARI Tomato-2 and BARI Tomato-3, two BW-susceptible cultivated varieties, were used as scions for grafting on a BW-resistant wild eggplant rootstock (Solanum torvum). Several hundred tomato grafts were made using 35-day old seedlings of tomato scions and eggplant rootstocks. About 3-week old grafted tomato plants were transplanted along with the non-grafted tomato plants in a farmer field at Kashimpur site. Regular observations were made to record infections and mortalities from bacterial wilt disease. Data were
collected on plant mortalities, plant height, flowering and fruiting dates, fruit bearing rates and yields.

Results

Eggplant grafting:
Grafting compatibility of the cultivated eggplant varieties with the two wild eggplant rootstocks was excellent; grafting success averaged about 95%. The results of pilot production of eggplant grafts at Naodagagram and Gaidghat of Jessore and at Sripur of Gazipur were highly encouraging. Grafted eggplants cultivated in two locations of Jessore suffered only 7.5% to 10.5% mortalities as against 27.3% to 31.6% in the non-grafted (farmer practice) fields. The grafted plants died mainly due to stem rot infection rather than bacterial wilt, whereas the non-grafted ones died from both bacterial wilt and stem rot disease. Bacterial wilt incidence at Sripur location was very high and all the non-grafted (farmer practice) eggplants died from bacterial wilt as compared to 7.2% to 8.8% mortalities in the grafted eggplants. At Jessore sites, the harvest duration of the grafted eggplants was about one month longer bearing 185% to 287% more fruits than those of the non-grafted ones. Thus, yields of the grafted eggplants were 245% to 282% higher, fetching more than three times more income to the farmers. For the Sripur site, the gains from yields and incomes were absolute (Table 1).

Table 1. Pilot production of eggplant grafts in Farmer fields at Jessore and Gazipur sites, 2001-2002.

<table>
<thead>
<tr>
<th>Location</th>
<th>Grafts &amp; scion</th>
<th>Plant mortality (%)</th>
<th>Harvest duration (days)</th>
<th>Fruits/plant (No.)²</th>
<th>Yield (t/ha)²</th>
<th>Net income (US$/ha)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naodagagram , Jessore (7)</td>
<td>Sr + Chega</td>
<td>10.5 b</td>
<td>90 a</td>
<td>79b (254%)</td>
<td>32a (246%)</td>
<td>2177b (286%)</td>
</tr>
<tr>
<td></td>
<td>Sr + Chega</td>
<td>8.1 c</td>
<td>89 a</td>
<td>83a (287%)</td>
<td>33a (254%)</td>
<td>2271a (299%)</td>
</tr>
<tr>
<td></td>
<td>Chega</td>
<td>31.6 a</td>
<td>60 b</td>
<td>31c</td>
<td>13b</td>
<td>760c</td>
</tr>
<tr>
<td></td>
<td>CV (%)</td>
<td>7.1</td>
<td>2.4</td>
<td>3.1</td>
<td>6.6</td>
<td>10.3</td>
</tr>
<tr>
<td>Gaidghat, Jessore (6)</td>
<td>Sr + Chega</td>
<td>10.5 b</td>
<td>84a</td>
<td>61b (185%)</td>
<td>27b (245%)</td>
<td>1668b (327%)</td>
</tr>
<tr>
<td></td>
<td>Sr + Chega</td>
<td>7.5 c</td>
<td>77b</td>
<td>68a (206%)</td>
<td>31a (282%)</td>
<td>2032a (398%)</td>
</tr>
<tr>
<td></td>
<td>Chega</td>
<td>27.3 a</td>
<td>55c</td>
<td>33c</td>
<td>11c</td>
<td>510c</td>
</tr>
<tr>
<td></td>
<td>CV (%)</td>
<td>13.2</td>
<td>5.1</td>
<td>7.4</td>
<td>6.0</td>
<td>24.6</td>
</tr>
<tr>
<td>Sripur, Gazipur (1)</td>
<td>Sr + Singnath</td>
<td>7.2</td>
<td>86</td>
<td>23</td>
<td>1639</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sr + Singnath</td>
<td>8.8</td>
<td>80</td>
<td>26</td>
<td>1948</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Singnath</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

¹ Figures in parenthesis are the numbers of grafted eggplant fields, and ² are the percent increases over the non-grafted (farmer practice) eggplants. Sr= Solanum torvum; Ss= Solanum xxyabinetum. One US$ = Taka 58

Tomato grafting:
Grafting of tomato on cultivated or wild Solanum rootstocks was highly compatible and 95% grafting success was achieved. The non-grafted tomato plants suffered 29.2% to 31.8% mortalities from bacterial disease as against 0-2.4% in the grafted tomato plants. The grafted tomato plants took about 10 days more time for flowering and fruit maturity, but the fruit bearing per plant was about 175% higher than the non-grafted ones. As a result, yields of the grafted tomato plants were, on an average, 145% higher, bringing about 140% more income to the farmers (Table 2).

Table 2. Performance of grafted tomato plants in farmer field, Kashimpur, Gazipur, 2001-2002 winter season.

<table>
<thead>
<tr>
<th>Grafts &amp; scion</th>
<th>BW (%)</th>
<th>Days to flower</th>
<th>Days to fruit maturity</th>
<th>Plant ht. (cm)</th>
<th>Fruits/plant (No.)</th>
<th>Yield (t/ha)</th>
<th>Net income (US$/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sr + BARI Tomato-2</td>
<td>0.0</td>
<td>67</td>
<td>115</td>
<td>28</td>
<td>51 (177%)</td>
<td>30.0 (135%)</td>
<td>2306 (122%)</td>
</tr>
<tr>
<td>Sr + BARI Tomato-3</td>
<td>2.4</td>
<td>66</td>
<td>118</td>
<td>23</td>
<td>56 (175%)</td>
<td>36.5 (156%)</td>
<td>3200 (157%)</td>
</tr>
<tr>
<td>BARI Tomato-2</td>
<td>31.8</td>
<td>54</td>
<td>102</td>
<td>34</td>
<td>29</td>
<td>22.3</td>
<td>1891</td>
</tr>
<tr>
<td>BARI Tomato-3</td>
<td>29.2</td>
<td>55</td>
<td>98</td>
<td>32</td>
<td>32</td>
<td>23.4</td>
<td>2043</td>
</tr>
</tbody>
</table>

Sr= Solanum torvum (wild eggplant rootstock). Figures in parenthesis are the increases over the corresponding scions. One US$ = Taka 58.00

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Farmer training for eggplant grafting

A discussion meeting was held with 10 farmers including two nurserymen to orient them on eggplant grafting technology before taking up the plans of pilot production of eggplant grafts in Jessore site. Being convinced, the farmers grew eggplant grafts and were highly impressed with the performance of eggplant grafts in respect of high survival of plants and crop establishment, and high yields and increased income. In August, 2002, a one-day farmer training on vegetable IPM practices and eggplant graft preparation was conducted at BARI station, Jessore with 25 farmers including three women farmers and three nurserymen. The impact of the training was reflected in a tremendous response by the farmers in adopting IPM practices and eggplant grafting technology in their fields at Gaidighat of Jessore.

Impacts

Excellent performance of eggplant grafts in respect to minimum plant mortality from bacterial disease, excellent establishment of the crops, high yields and increased economic returns have created an impact upon the farmers for adopting this technology in larger areas. Production of tomato grafts has also produced a similar response. Farmer training has enhanced farmers' knowledge about vegetable IPM practices and their advantages.

Project Highlights

Eggplant and tomato grafts on *Solanum* rootstocks has proven to be a very effective and practical method for combating bacterial wilt disease and other pest problems. Farmers have gained high economic returns from using this technology. The technological and economic impacts have encouraged more farmers to adopt the practice in larger areas.

Development of Eggplant Hybrids Resistant to Bacterial Wilt, Fruit & Shoot Borer and Root-knot Nematode

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Abstract

The heterotic performance for three agronomic characters were estimated in 25 hybrids of eggplant (*Solanum melongena* L.) involving twelve parents. Five hybrids, Kazla x BL-081, BL-114 x BL-083, BL-083 x SLS2, BLS5 x Uttara, and BL-099 x BLS4 produced higher number of fruits and yield per plant than the other hybrids. They also showed higher percent of heterosis for the above characters over their mid-parents and better parents. An additional 36 hybrids have been developed in 2001-2002 through half-diallel crosses involving nine pest-resistant parents and these will be tested in 2002-2003 for selecting high yielding, pest-resistant hybrids.

To test new hybrid lines in the field to determine their heterotic performance.

IPM Constraints

The cultivated eggplant varieties in Bangladesh are susceptible to fruit and shoot borer, bacterial wilt disease, and root-knot nematode, which are the most important pests of eggplant. Farmers fail to protect their crops from these pests even after repeated use of pesticides. It is possible to transfer resistant/tolerant genes to these pests to cultivated varieties through hybridization and to develop F1 varieties possessing high yielding and pest-resistance traits for on-farm use.

Objective

To make hybrid lines through crosses of eggplant lines identified as resistant/tolerant to FSB, BW and RKN with selected cultivated varieties having desirable horticultural traits; and

Research Methods

In 2000-2001, twenty five hybrid lines were developed through half-diallel crosses using 12 selected eggplant varieties as parents. These were Uttara, Islampuri, Kazla, Mixture, BL-083, BL-081, BLS-114, BL-099, BLS4, BL-009, SLS2, and BLS5. Unfortunately, hybridization for all