STUDY ON GRAFTING ASSAY AND FIELD SCREENING OF GRAFTED COMBINATIONS OF *Solanum torvum* WITH F1 HYBRID 704 BRINJAL AGAINST BACTERIAL WILT CAUSED BY *Ralstonia solanaearum*

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Introduction

Brinjal (*Solanum melongena* L.) is a major vegetable crop grown in Sri Lanka. Even though the brinjal is a hardy plant, Bacterial wilt, caused by *Ralstonia solanacearum*, is a major destructive disease affecting brinjal production in the region of dry zone of Sri Lanka. Bacterial wilt is characterized by rapid wilting, stunting and eventual plant death due to colonization and blockage of the xylem by the pathogen [1]. Upon the environmental conditions such as high soil moisture, warm temperature [25 °C - 35 °C], and heavy, poorly-drained soils are favorable, brinjal yield loss can go up to 70% [2]. Management is difficult, because the causal agent persists in soil and water and can survive associated with weeds and plant debris [3]. Chemical control is unreliable as it is a xylem dwelling bacteria, therefore, screening of resistant sources would be the ideal solution. All the current brinjal breeding programs are focusing on developing eggplant varieties or hybrids possessing disease and pest resistance [3]. Grafting of promising hybrid varieties with resistant root stock can be a viable means to mitigate this destructive disease. Therefore, the primary objective of this research was to assess disease resistance of grafted hybrid brinjal variety with *Solanum torvum* as root stock.

Materials and Methods

The investigations were conducted at net houses at the farm unit Faculty of Agriculture and at the farmer field at Thiruvaiyaru, Kilinochchi (9°20'28.8"N 80°25'36.1"E), belonging to the low country dry zone. The mean annual rainfall is around 1325 mm and the mean annual average temperature is around 29.4 °C (Department of Meteorology, 2025).

Pot planting of brinjal varieties and grafting with S. torvum

Wild Solanum species fruits were collected in and around the dry zones of Sri Lanka and seedlings were raised in pots in net houses at the farm unit Faculty of Agriculture. Traditional brinjal varieties such as *Madduvil muddy*, *erukku vellai*, and commercial types like *Thinnaveli* purple, Jaffna special, *hybrid 704* and *plastic* were selected for planting. Due to the poor germination and slow growth, selected brinjal variety's seeds were planted 21 days later from the sowing of Wild *Solanum* spp to coincide

with the maturity to do successful grafting. Recommended nursery bed related agronomic practices like fertilizer application, watering, weeding was done in regular intervals.

When scion reached an average thickness of 2.5 mm, all the leaves were removed and left only the apical portion alone. Scion was cut like slant by using a clean sterilized knife. All the rootstock leaves were removed. Rootstock was cut at 5 cm height from the color region (Figure 1). The rootstock stem was cut at the center as two-half. Both Rootstock and scion thickness were maintained almost in same thickness for facilitating high success grafting rate. Scion was placed in between the rootstock and clipped by a soft grafting clip. For each entry, 16 scions were grafted with rootstocks. Those were protected in the incubator at the net house. Watering was done at regular intervals without touching the graft union. On inspection of success After 10 days clips were removed.

Figure 1. Pot planting of brinjal varieties and grafting with *Solanum torvum*

Field planting and disease assessment

To assess the disease resistance, farmer preferred 140 F1 hybrid 704 plants were planted in the well-prepared pre-infected bacterial wilt field as 35 plants per row with the inter row and intra raw spacing of 90 x 90 cm. All the standard agronomic practices were performed at regular intervals as recommended by the Department of Agriculture. When the plants were dead or completely wilted due to bacterial wilt, dead plants were replaced by grafted seedlings of *S. torvum* with F1 704 brinjal plants and observation continued for two months.

Data collection and Statistical analysis

The data on root stock -scion grafting success rate at the green house and weekly observation of wilted plants were recorded. Data on number of days for disease-free period disease incidence, disease severity were calculated as reported by [5]. Disease incident and severity percentage were determined and compared with grafted. Complete Randomized Design (CRD) for green house studies and Complete randomized Block design (RCBD) were used to perform analysis of variance (ANOVA) and DMRT test was administered to identify the best treatment at $P < 0.05$ using SAS 9.1 (SAS Institute Inc., Cary, NC, USA)

Results and Discussion

The experimental results show that the success rate among the varieties compared were significantly different at P <0.05 (Table 1). The highest success rate of 75 ± 0.25 perfect match of rootstock and scion was observed in the F1 hybrid Jaffna special. Whereas, poor success rate of 31 ± 0.75 was recorded in local variety *Erukku vellai*.

Table 1. Mean grafting success rate of perfect match of rootstock and scion

Variety	Mean Success Rate (%)
Thinnaveli purple	62 ± 0.75 [ab]
Erukku vellai	31 ± 0.75[c]
Plastic	68 ± 1.25 [a]
Hybrid 704	61 ± 2.25[b]
Jaffna special	75 ± 0.25 [a]
Madduvil muddy	68 ± 1.75[a]

Within the values in the column showing similar alphabets are statistically not significant according to the DMRT at α = 0.05.

Among the varieties grafted, high yielding brinjal variety 'Hybrid 704' with the grafting success rate of 61 ± 2.25 was shown in the figure 1D was selected for preliminary field-based disease screening against bacterial wilt pathogen *R. solanacearum*

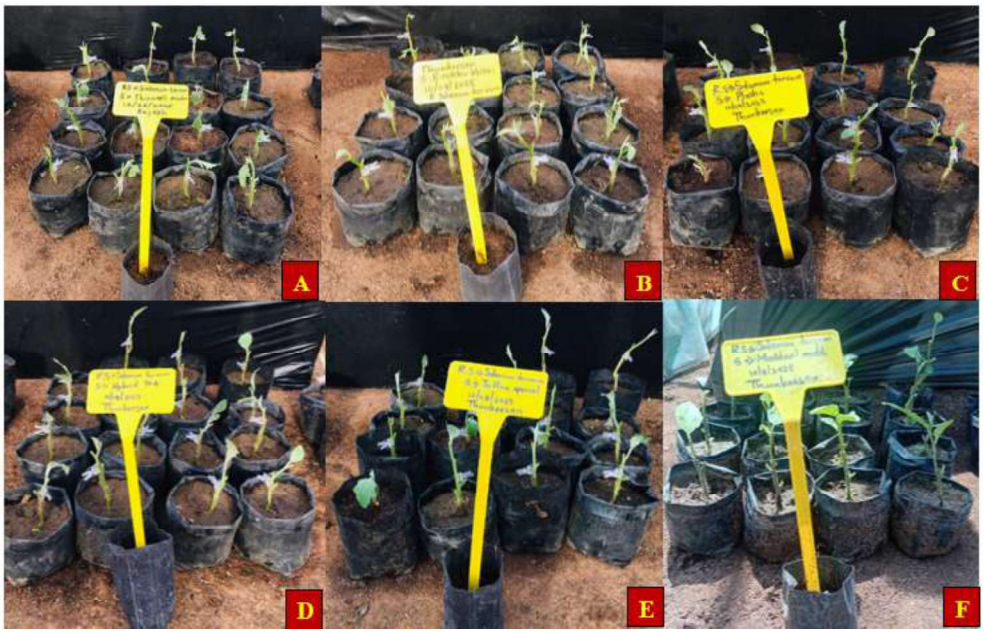

Figure 2. Successfully grafted A) Thinnaveli purple; B) Erukku vellai; C) plastic; D) hybrid 704; E) Jaffna special; and F) Madduvil muddy

Bacterial disease incidence percentage showing increasing tendency every week. At the end of the eight week the bacterial wilt disease incidence was 73.57(Figure 2)

In the comparative study trial, the results show significantly less disease incidence grafted hybrid brinjal 704 variety with *S. torvum* as root stock at P <0.01 (Figure 3). In the grafted plant replaced field 95 % of the pants are surviving and flowering and yield related parameters assessment is in progress.

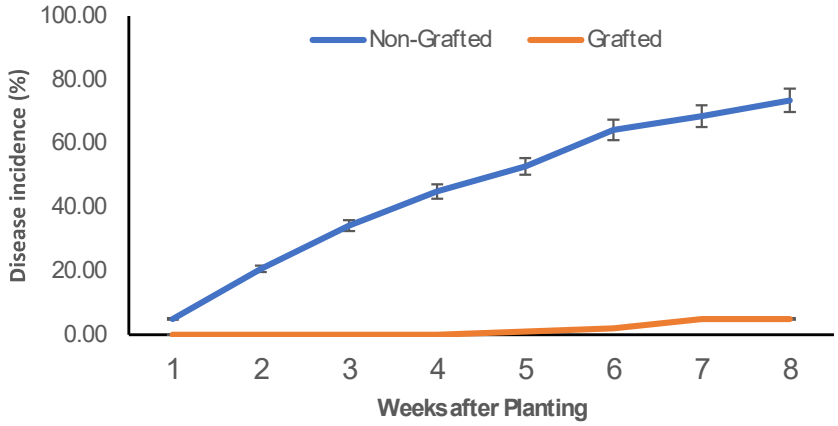

Figure 3. Comparison of weekly disease incidence progress in Hybrid 704 brinjal variety and grafted hybrid brinjal variety with *Solanum torvum* as root stock

Success of the grafting depends on the perfect matching of rootstock and scion. But rootstock can alter the scion phenotypes [6]. Current studies confirm the successful matching of rootstock and scion union. Screening of genetically diversified wild resistance relatives are essential for breeders to breed high yielding brinjal varieties with multiple resistance [4]. But, grafting with resistance root-stock is ideal to manage wilt causing vascular pathogens. Screening of the local germplasm showing resistance and grafting with the high yielding variety would be an easy and long-lasting solution for bacterial wilt [7]. Current investigation confirms the disease resistance, however, physiological influence of *S. torvum* on commercial hybrids is important for full-scale exploitation.

Conclusions and Recommendations

Grafted assay assessment concludes that Jaffna special showing highest level of successful union of rootstock and scion. Initial screening of grafted hybrid 704 with *S. torvum* showing highest resistance to bacterial wilt. Complete study of yield parameters of all the grafted varieties is essential for recommendation for the best.

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