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Short Communication

Performance of grafted tomato (*Solanum lycopersicum*) in Chikmagalore district, Karnataka

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Vegetables have become an integral part of the daily human diet for all sections of the society. Tomato is the most widely grown solanaceous vegetable crop which is popular for its high pro-vitamin A, vitamin C, lycopene and other nutrients. Tomato is a warm season crop, it requires warm and cool climate for fruit setting and development. The plants cannot withstand frost and high humidity. Also light intensity affects pigmentation, fruit colour, fruit set. The plant is highly affected by adverse climatic conditions. It requires different climatic range for seed germination, seedling growth, flower and fruit set, and fruit quality. Temperature below 10 °C and above 38 °C adversely affects plant tissues thereby slow down physiological activities. It thrives well in temperature 10-30 °C with optimum range of temperature of 21-24 °C. The mean temperature below 16 °C and above 27 °C is not desirable. The plants require low to medium rainfall and do well under average monthly temperature of 21-23 °C. Avoid water stress and long dry period as it causes cracking of fruits. Bright sunshine at the time of fruit set helps to develop dark red colored fruits. Tomato is the second most important vegetable crop grown in India, next only to potato. It is grown in about 5.94 lakh hectare in India. It is mainly grown in Karnataka, Andhra Pradesh, Tamilnadu, Kerala, West Bengal, Northern Plains, and Hills of Himachal Pradesh and UP, Assam, Maharashtra, and Gujarat etc. However, the productivity is very low in India at 16.6 t/ha. Our survey has shown that farmers are spraying more than 30 times for one crop of tomato in certain pockets near Bangalore and in spite of this borer incidence is always above 10% (George *et al*. 2012). Soil borne diseases especially bacterial wilt is a serious problem in growing vegetables in Karnataka state. Bacterial wilt caused by *Ralstonia solanacearum* is a soil borne bacteria. This bacterium causes severe losses worldwide due to its wide geographic distribution and an unusually broad host range, including more than 50 plant families (Kelman 1998), which enters the plants through root injuries. Inside the plant the bacteria multiplies and blocks the vascular bundles the chief conducting system of water and nutrients thereby causing sudden wilting of plants. Bacterial wilt is very common in solanaceous vegetables like brinjal, chillies and tomato. Agricultural Universities in India has released bacterial wilt resistant varieties, but wilt resistant varieties generally do not have the yield potential or fruit size of commercial F1 hybrids of tomato grown widely by farmers. Grafting of commercial F1 hybrids/varieties suitable for cultivation and resistant root stocks is a viable option to tackle this problem. Grafted vegetable seedlings are commercially grown in all western countries to solve various soil related problems. Use of grafting has been proposed as a major component of an integrated management strategy for managing soil borne disease and increasing crop productivity. The technology for grafting (Oda 1999, Oda 1995) tomato seedlings on to resistant *Solanum torvum* root stocks has been standardized at Agricultural Research Station, Kerala Agricultural University, Mannuthy, Trisur, Kerala. *Solanum torvum* besides being resistant to bacterial wilt is also immune to nematodes. Hence present study was carried out to study the performance of grafted tomato (*Solanum lycopersicum*) in Chikmagalore district, Karnataka.

Study was conducted during Rabi season of 2014-15 in the farmer field of Mr. Praveen S/o Mahaswarappa P, Survey No 945, Pillenahally Village, Lakya Hobli, Chikmagalore, Karnataka, which is situated in central dry zone, south-western part of Karnataka, lies between 12° 54' and 13° 53' North latitude and 75° 04' and 76° 21' East longitudes, receives annual rainfall of about 1925 mm with maximum temperature of 35 °C and minimum of 14 °C. Planting materials used was tomato Lakshmi F1 developed by Nunhems Pvt. Ltd. (Control treatment),

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and same F1 grafted on root stock of *Solanum torvum* seedlings (Grafted treatment). Later was treated as control treatment. The seed of *Solanum torvum* was procured from Agricultural Research Station, Kerala Agricultural University, Mannuthy, Trisur, Kerala. The experiment was laid out with four replications of grafted and non-grafted treatments. Data collected on shoot length and number of compound leaves at 30, 40, 50, 60 and 70 days after transplanting, and tender fruits, matured fruits on the sampled plants were recorded at three different stages of plant growth i.e. 50, 60 and 70 Days after transplanting from five plants randomly selected in each replication.

The analysis of variance for main shoot length measured at 30, 40, 50, 60 and 70 days after transplanting revealed non-significant differences among the grafted and non-grafted tomato seedlings after 40,50,60 and 70 days after transplanting. As evident from the mean values of both the grafted and non grafted seedlings (Table1) the maximum plant height was recorded only at 30 days after transplanting in non-grafting whereas it was low in grafted tomato.

Table 1: Plant height (cm) at different stages of growth

Treatment	30 DAT	40 DAT	50DAT	60 DAT	70 DAT
Grafted	36.70	39.10	48.90	58.90	63.80
Control	37.40	39.45	48.95	58.95	63.60

It is evident from the Table 2 that the number of leaves per plant at different stages of growth recorded and which were more in non grafted tomato seedlings at 30 days after transplanting and low in grafted tomato seedlings, and after 40, 50.60 and 70 days after transplanting number of leaves per plant maximum in grafted tomato seedlings compare to low in non grafted tomato seedlings.

Table 2: Number of compound leaves per plant at different stages of growth

Treatment	30 DAT	40 DAT	50DAT	60 DAT	70 DAT
Grafted	34.20	55.33	70.10	90.50	102.2
Control	35.00	53.30	68.70	88.00	101.1

Total numbers of developing tender fruits on the sampled plants were recorded at three different stages of plant growth 50, 60 and 70 Days after transplanting. The results (Table 3) indicated non-significant variation among the grafted and non grafted tomato seedlings and matured fruits were maximum in grafted tomato seedlings compare to non grafted tomato seedlings.

Table 03; Number of tender and mature fruits per plant at different stages of growth

Treatment	50 DAT	60 DAT	70DAT	Matured fruits
Grafted	30.67	33.89	38.95	28.50
Control	30.68	33.90	38.75	27.75

The results (Table 4) indicated that grafted tomato seedlings were tolerance to bacterial wilt / blight and only 1.2 % of the tomato seedlings were damaged 98.80 % of tomato seedlings yielded fruits and increased the length of the harvest (Besri 2005), where as in non-grafted tomato seedlings 17% of the tomato seedlings were affected by bacterial wilt/blight and 83 % of tomato seedlings yielded tomato fruits.

Table 04; Fruit yield characteristics of grafted and non grafted tomato

Treatments	No. of tomato seedlings Transplanted	No. of seedlings affected by bacterial blight / Wilt	No. of seedlings survived and yielded fruit	Fruit weight in gm	Average Fruit yield/plant (kg)	Fruit yield /ha (tons)
Grafted	13125	157.50	12967.50	65.00	4.09	53.04
Control	13125	2232.50	10892.50	64.50	3.86	42.10

Fruit yield calculated on per plant and per hectare basis the fruit yield per plant ranged from 3.98 kg to 4.20 kg in Grafted tomato and in non-grafted, it ranged from 3.73 kg to 3.99 kg. Similarly, fruit yield per hectare ranged from 51.61 tonne to 54.46 tonne, 40.62 tonne to 43.46 tonne in grafted and non grafted tomato, respectively.

Table 5: Economic improvement in tomato cultivation through grafting techniques

Particulars	Control (Non-grafted)	Grafted
No. of pesticides sprays	0	3
Cost of seedlings (Rs Lakh/ha)	0.08	0.49
Cost of plant protection chemicals (Rs Lakh/ha)	0.50	0.39
Rate of tomato fruits (Rs per kg)	7	8
Yield (t/ha)	42.10	53.04
Total Revenue (Rs Lakh/ha)	2.94	4.24
Total cost (Rs Lakh/ha)	1.70	2.00
Net profit (Rs Lakh/ha)	1.24	2.24
Benefit-cost ratio	1.72	2.12

It is implied from Table 5 that, total cost including seedlings, fertilizers, pesticides, and others was Rs 1.7 Lakh/ha, where seedlings cost was only Rs 0.65 per plant and Rs 2.00 Lakh/ha, where seedlings cost Rs 3.80 per plant in non-grafted and grafted tomato seedlings cultivation respectively. In grafted tomato, 3 pesticides sprays reduced and saved the 22 % of the chemical cost and brought the benefit cost ratio from Rs 1.72 to Rs 2.12.

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