GERMINATION AND GRAFT COMPATIBILTY STUDY OF WILD *SOLANUM SPP* AND BRINJAL ROOT STOCKS WITH TOMATO SCIONS

Abstract

The experiment was conducted at Central Horticultural Experiment Station, ICAR- IIHR, Aiginia, Bhubaneswar, Odisha, India during *kharif* seasons of 2018 in collaboration with Odisha University of Agriculture and Technology, Bhubaneswar, to study the seed germination, days taken to reach grafting stage and grafting success (percentage) of rootstock and scion seeds used for grafting. The cultivated and wild species of brinjal and tomato were used as rootstocks with tomato Arka Rakshak F_1 hybrid as scion. The experiment was conducted with 13 root stocks following statistical design CRD with three replications in pro trays to find out better root stock for grafting. A significant difference was recorded for the rootstock and scion parameters. Utkal Anushree had taken minimum number of days (6.67 days) for germination and the wild *Solanum torvum* had taken maximum number of days (16.67 days) to germinate, On the other hand, Arka Rakshak took least number of days (34.33 days) to reach grafting stage while the wild *Solanum torvum* reached to grafting stage within 56 days. The grafting success percentage ranged from 74.67 to 96 percent. Maximum grafting success (%) was recorded in *Solanum torvum* whereas minimum grafting success (%) was observed in *S. sisymbriifolium* wild *solanum spp*. root stock.

Keywords : Grafting, Rootstock, Scion, *Solanum torvum*

1.Introduction

Tomato (*Solanum lycopersicum* L.), is an important Solanaceous vegetable crop grown throughout the world with its origin at Peru and Mexico region. Its cultivation spread throughout the world during 20th century. Tomato is rich in minerals, vitamins, organic acids, and it contains potassium 268 mg, phosphorus 27 mg, ascorbic acid of 16.0-65.0 mg, 94.1 g of water, 1.0 g of protein, 0.3 g of fat, 4.0 g of carbohydrates, 0.6 g of fibres, vitamin A of 1100 I.U, vitamin B 0.20 mg, vitamin C 23 mg and total sugar content of 2.5 per cent in 100 g ripe fruit. Several processed items like paste, sauce, puree, syrup, juice, ketch up, drinks etc. are prepared on large scale from Tomato. Now a days it is an important vegetable globally due to its nutraceutical values and known as “Poor Man’s Orange”. Lycopene a powerful antioxidant present in Tomato lowers the cholesterol level and gives resistance to cancer (Watzman, 2000).

In India, tomato is grown in an area of 0.805 million hectare with a production of 19.69 million tonnes and productivity is 24.4t/ha. The area and production of Tomato in Odisha is 0.091 million hectare and 1.311 million tonnes respectively with a productivity of 14.4t/ha (Horticultural Statistics at a Glance 2017). Lower productivity of tomato in Odisha is mostly encountered by poor management practices and major biotic and abiotic stresses. To tackle these, constant efforts are being made by researchers to develop tomato cultivars with the ability to perform optimally under constraint conditions through breeding and biotechnological tools, which are more time consuming. This led to the development of grafting techniques in vegetables as one alternative approach to quickly enhance the efficiency of high-yielding genotypes for wider adaptability and resistance to different stresses (Kumar *et al.*, 2017). A crucial step in successful production of grafted vegetables is relied on the selection of the compatible and economically viable rootstock and scion cultivars which should be selected based on days taken for seed germination, days taken to

reach grafting stage and grafting success (Bie *et al.,* 2017). Considering these factors an experiment was designed with objective to identify best rootstocks.

2. Materials and methods:

The experiment was conducted at Central Horticultural Experiment Station, ICAR- IIHR, Aiginia, Bhubaneswar, Odisha, India during *kharif* seasons of 2018 in collaboration with OUAT, Bhubaneswar. The site is located at 20015' N latitude, 85053' E longitude and 25.5 m above mean sea level. The experiment was conducted with 13 root stocks following statistical design CRD with three replications in pro trays to find out better root stock. The 13 treatments were T_1-BRS-1, T_2-BRS-2, T_3-Utkal Keshari, T_4-*S.torvum*, T_5-CARI-1, T_6-BRS-4, T_7-*S.sisymbriifolium*, T_8-*S. gillo*, T_9-*S. aethiopicum*, T_{10}-Utkal Anushree,T_{11}-Arka Neelachal Shyama, T_{12}-BRS-3 ,and T_{13}-Arka Rakshak (self-grafted) with tomato as scion and wild *solanum spp* and brinjal as root stocks. Cleft method of grafting was followed for this experiment. Data were recorded on days taken for seed germination, days taken to reach grafting stage and grafting success (percentage). The statistical analyses was done following the procedure described by Panse and Sukhatme (1989).

3.Results and discussion:

3.1 Days taken for seed germination

Days taken for seed germination showed a significant difference in the experiment where wild *solanum spp*., and brinjal were used as root stocks and tomato was used as scion (Table No. 1). A minimum number of days required for seed germination ranged from 6. 67 to 16.67 days. Utkal Anushree (T_{10}) had taken minimum number of days (6.67 days) for germination and was statistically at par with T_2-BRS-2, T_3-Utkal Keshari, T_5-CARI-1, T_6-BRS-4, T_{11}-Arka Neelachal Shyama and T_{13}-Arka Rakshak and the wild *Solanum torvum* (T_4) took maximum days (16.67 days) to germinate. From this result it was observed that, cultivated brinjal and tomato varieties take less number of days to germinate, when compared with wild species. It may be due to their vigour and soft seeded character. It was seen that the seeds of wild root stocks were dormant in nature and took maximum days to germinate. Similar results were also found by Dhivya *et al.,* (2013) and Barik *et al.* (2021). According to Praveen (2019) and Sudesh (2019), wild *Solanum torvum* had taken maximum number of days to germinate as compared to cultivated brinjal and tomato varieties. The stem girth of the rootstock and scion material affects grafted plants' success. In order to match the stem girth of the rootstock and scion during grafting, it is necessary to evaluate the number of days required for seed germination in the scion and rootstock seeds. Therefore, the planting date of the seeds can be altered to achieve improved graft success.

3.2 Days taken to reach grafting stage

The data regarding days taken to reach the grafting stage of wild *solanum* spp. ,brinjal and tomato used as root stocks and scions in the present study showed a significant result those are presented in Table No.1.Arka Rakshak (T_{13}) had taken a minimum number of days (34.33 days) to reach grafting stage and it was statistically at par with T_{10}(Utkal Anushree),T_5(CARI-1),T_3(Utkal Keshari),T_{11}(Arka Neelachal Shyama) and T_{12}(BRS-3) while the wild *Solanum torvum* (T_4) has taken a maximum number of days (56 days) to reach grafting stage. These results revealed that, among the 13 treatments Arka Rakshak (T_{13}) tomato hybrids has taken least number of days to attain grafting stage. It may be due the better vigour of the hybrid seeds. In case of brinjal root stocks, T_{10} (Utkal Anushree), has taken minimum number of days to reach

grafting stage whereas wild *solanum spp*. rootstocks have taken the maximum number of days to reach grafting stage because of their dormant seed nature, late germination and slow growth rate. The findings here correspond with those reported by Sudesh (2019) and Praveen (2019).

3.3 Grafting success (%)

A significant difference in Graft success (%) was observed (Table No.1) where wild *solanum spp*. and brinjal were used as root stocks and tomato as scion. The grafting success (%) ranged from 74.67 to 96 percent. Maximum grafting success (%) was recorded in *Solanum torvum* (T_4) whereas minimum grafting success (%) was observed in T_7 *S. sisymbriifolium* wild *solanum spp*. root stocks. This is presumed from the fact that *Solanum torvum* species would have better adaptability to the prevailing climatic condition with cleft grafting which led to more success. Mohammed *et al.* (2009) also reported that the success percentage of grafting tomato Cecilla scion on Syrian root stock was 98 %. Similar results of higher grafting success in rootstocks were observed by Sudesh (2019).

4.Conclusion

The wild *solanum spp*. *Solanum torvum* takes maximum number of days to seed germination, days taken to reach grafting stage but recorded maximum grafting success (%). Utkal Anushree has taken minimum number of days to seed germination and grafting success (%) was also highest after *Solanum torvum* root stocks (Fig.1). This led to the conclusion that Utkal Anushree can be used as a good root stock for tomato. However, the yield performance and reaction to root knot nematode and bacterial wilt incidence and quality parameters are to be assessed.

Table No. 1 Germination studies of seeds in different rootstocks of wild *solanum* spp. and brinjal and its effect on days taken for seed germination, days taken to reach grafting stage and grafting success.

Treatments	Days taken for seed germination	Days taken to reach grafting stage	Grafting success (%)
T1-BRS-1	8.33	39.33	80.67
T2-BRS-2	7.67	37.33	82.67
T3-Utkal Keshari	7.00	36.33	84.00
T4-*S.torvum*	16.67	56.00	96.00
T5-CARI-1	7.00	36.00	93.33
T6-BRS-4	7.67	37.33	76.67
T7-*S.sisymbriifolium*	11.00	47.33	74.67
T8-*S. gillo*	12.67	49.00	90.00
T9-*S. aethiopicum*	12.33	48.67	86.00
T10-Utkal Anushree	6.67	35.00	94.00
T11-Arka Neelachal Shyama	7.33	36.33	82.00

T12-BRS-3	8.00	36.67	81.33
T13-Arka Rakshak	7.00	34.33	80.67
SE (m) ±	0.34	0.91	1.97
C.D (0.05)	1.00	2.67	5.75

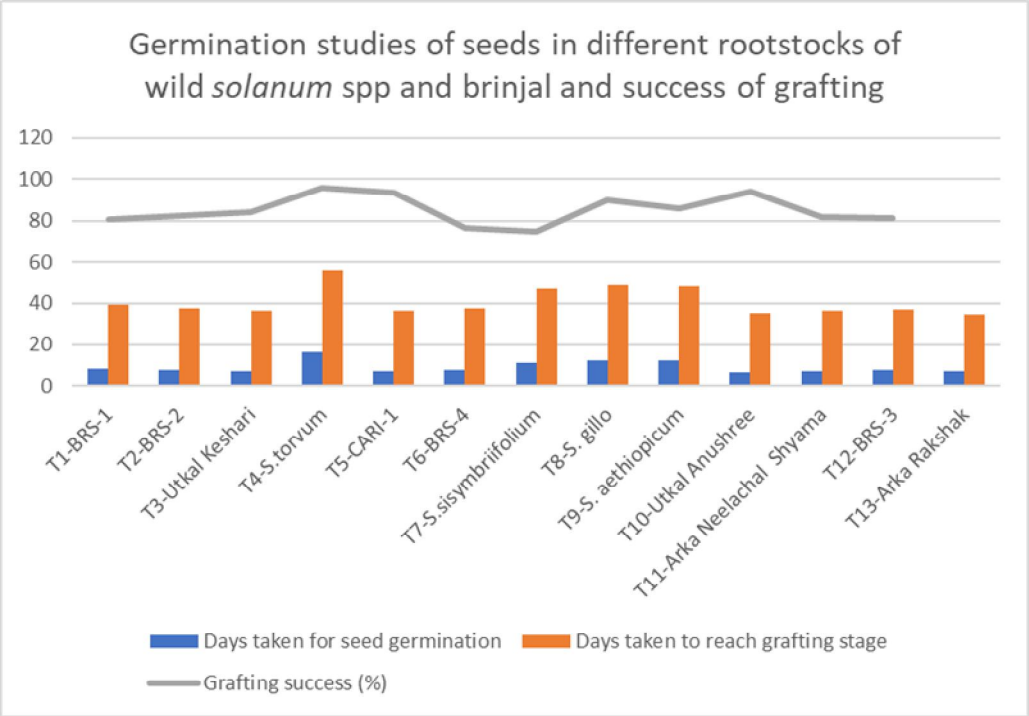

Fig.1 Germination studies of seeds in different rootstocks of wild *solanum* spp and brinjal and success of grafting.

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