

Brimato: One plant, dual benefits

In view of ever-increasing demand for fresh produce in cities, peri-urban and urban farming may be promoted to reduce the dependency upon rural areas for supply of vegetables. In this direction, the dual grafting of brinjal and tomato on a single brinjal plant, termed as 'Brimato' (Brinjal + Tomato) has been developed first time and successfully demonstrated at ICAR-IIVR, Varanasi. This is an innovative grafting technology wherein both brinjal and tomato could be harvested from a single plant. Brimato has immense potential for large-scale adoption for production of homegrown fresh vegetables in urban and peri-urban areas, where space has always been a constraint.

PRESENTLY, about 35% of Indian population lives in urban areas, and it has been speculated that the phenomenon of urbanization will increase with a faster pace in near future. According a report of U.N. by 2035, the percentage of population in India residing in urban area will be 43.2%. Further, it is predicted that India's overall food demand will expand at 2-3% until 2025 and demand will outdo supply by 2035 even if Indian productivity increases. Increasing fresh vegetable demand in the urban areas due to growing population along with ever decreasing cultivable lands around the periphery of urban areas will pose great challenges to food security. The settling of population in peri-urban areas (or areas in the periphery of the urban area) lead to reduced farm activities and land use patterns. Encouraging farming within the limited space available in urban establishments could be a pragmatic approach to cater the need of ever-growing urban population for fresh vegetables. In this direction, the dual grafting of brinjal and tomato on a single brinjal plant, termed as 'Brimato' (Brinjal + Tomato) is an innovative grafting technology wherein both brinjal and tomato could be harvested from a single plant.

Grafted brimato production

At ICAR-IIVR, Varanasi, brimato plants are prepared by using IC 111056 brinjal as rootstock (bestowed with vigorous root system and water-logging tolerant) and Kashi Sandesh (round brinjal hybrid) and Kashi Aman (an improved cultivar of tomato) as scion. Seeds of rootstock are sown in small plastic glasses filled with soil, sand, vermicompost and cocopeat (2:1:1:1), whereas scions are grown either in nursery bed or small earthen pots (10 inch). The grafting operation is performed when rootstock seedlings are 25-35 days and scions are 20-25 days old. The thickness of both rootstocks and scion should be 2.5-3.0 mm thick. On rootstock, brinjal scion

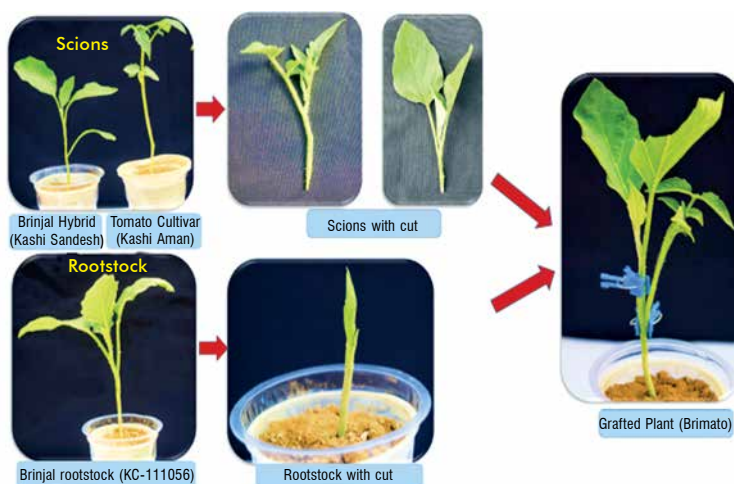


Fig. 1. Illustration of grafting process for Brimato

is grafted just below cotyledonary leaf by splice or cleft grafting, whereas tomato scion is grafted just above the cotyledonary leaf either by apical wedge or splice grafting method. In rootstock, 5-7 mm of cleft is made to accommodate brinjal scion, whereas similar length slanting cuts is made at 45° angle for tomato scion (Fig. 1). After performing grafting operation, grafting clips are used at grafting union to secure scions. A trained person can prepare around 40 grafted brimato plants per hour. Grafted plants should be shifted immediately inside the grafting chamber for 4-5 days, wherein the maximum temperature of 25-30°C and relative humidity more than 85% are maintained. The light interception in the grafting chamber should not be more than 25% of the total incoming radiation. To maintain appropriate temperatures and humidity, misting is done 2-3 times daily. Thereafter, the healed grafted brimato plants are kept in partial shade for 7-10 days with relatively less humidity and higher temperatures for seedling acclimatization. Before transplanting to the field, the grafted plants are exposed in full sunlight for another 5-7 days for hardening. In this

Brimato production at a glance (one hectare area)

Rootstock	IC 111056 (brinjal)
Scions	Scion 1: Kashi Sandesh (Brinjal hybrid) Scion 2: Kashi Aman (Tomato-determinate)
Method of grafting	Side/splice grafting for tomato and side or cleft grafting for brinjal scion
Time of transplanting	Mid-September to mid-October
Spacing	90 × 60 cm (row-to-row and plant-to-plant), total grafted seedlings - 19000
Manures and fertilizers	FYM 20 tones, N:P:K- 150:80:100 kg/ha
Weeding / hoeing	2 [(first 30-45 and second 60-70 days after planting (DAT))]
Irrigation	7-10 irrigations at 12-20 days intervals
Training and staking	Training single scion of brinjal and tomato till 60 DAT, thereafter 2-3 branches of each in tomato and brinjal are allowed. Staking over 6 ft iron pole with 3 vertical iron wire (2 mm) stretched over row
Major insects-pests and diseases	White fly, jassids, fruit and shoot borer, wilts, collar rot, little leaf, Phomopsis blight, etc.
Harvesting	Starts 70 DAT both in tomato and brinjal, total 5-6 harvests till mid-March
Marketable yield	Brinjal: 35.7 tonnes Tomato: 37.3 tonnes
Economics*	Total cost of production: ₹ 3.38 lakh Gross income: ₹ 9.83 lakh Net income: ₹ 6.44 lakh Benefit-cost ratio: 1.91

*Selling price of brinjal is ₹1500/q and tomato ₹ 1200/q.



Fig. 2. (a) Brimato plants ready for transplanting, (b) Brinjal and tomato fruits ready for harvesting in field

way, approximately 20-25 days required after performing grafting operation before transplanting to the field.

Agronomic practices for production of Brimato

Grafted brimato plants are transplanted in the field in the month of September-October at 90 × 60 cm spacing. The cultural practices are same as adopted for the production of tomato and brinjal, however the nutrient requirement is about 25% higher than that of the tomato. It has been observed that NPK @ 150:80:100 kg/ha should be applied apart from 20 tonnes of FYM. After the establishment of the plants (30-45 days after transplanting, DAT), initially single shoot of scion is allowed to grow. Later on, 2-3 well developed and appropriately oriented 2-3 branches of brinjal and tomato are allowed to develop. During the early growth stage, precaution should also be taken for maintaining balanced growth both in brinjal and tomato scions. Also suckers, if any, arising below the grafting union should be removed immediately. To obtain potential yields, two hand weeding and hoeing are performed at 30-45 and 60-70 DAT. Plant staking is also essential to harvest good yields with better quality fruits. To maintain sufficient soil moisture, field

should not be allowed to deplete more than 20% available soil moisture. Brimato plant is attacked by pests and diseases of both brinjal and tomato, which need to be managed timely. Grafted brimato plants starts fruiting 15-20 days earlier than the non-grafted plants. About 5-6 harvestings are performed both in tomato and brinjal starting from 60-70 DAT.

Harvesting, yields and economics

Two years experiment on brimato revealed that about 7-10 fruits of brinjal and 40-50 fruits of tomato can be harvested from single brimato plant. An average yield of 2.56 kg of brinjal and 2.68 kg of tomato fruits have been harvested from each brimato plant. As far as marketable fruit yield is concerned, 35.7 tonnes of brinjal hybrid and 37.3 tonnes of tomato could be obtained from one hectare area. Cultivation of brimato is very economical as a net profit of ₹ 6.44 lakhs can be achieved per hectare with a B:C ratio of 1.91. Dual grafting of brinjal and tomato would be very useful for the urban and sub-urban areas, where limited spaces are available for accommodating vegetables in terraces or kitchen garden. Presently, research is underway in the direction of commercialization of grafted brimato at ICAR-IIVR, Varanasi so as to make more farmers beneficiary of this technology. Brimato holds massive promise for large-scale adoption for production of homegrown fresh vegetables in urban and peri-urban areas and is an important step towards self-sufficiency for catering rising vegetables demands in cities.

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