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Short Communication

Survival of loquat under the subtropical conditions of Punjab

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Loquat (*Eriobotrya japonica)* is the subtropical fruit tree belongs to the family *Rosaceae* and is grown commercially as a major fruit in several countries, *like* Japan, China, Italy, Spain, Turkey, Florida Brazil, Pakistan *etc*. Loquat fruits, also known as Japanese plums, are bright orange ovals. The tree can grow to 5–10 metres tall, but is often smaller, about 3–4 metres having fruit size about 1-2 inches long (Davidse *et al.,* 2014). The loquat is easy to grow in the subtropical to mild temperate climates. China is the biggest producer of loquat in the world, more than 5 times the production of the 2nd biggest producer Spain, followed by Pakistan and Turkey (Caballero and Zamudio, 2003). In India, loquat is grown as a minor fruit crop on very a small-scale covering some parts of Uttar Pradesh, Kangra in Himachal Pradesh and to a small extent in Assam, Maharashtra, Nandi hills in Tamil Nadu and Mysore. In Punjab conditions, it is a highly preferred fruit for the kitchen garden and recommended for cultivation in the sub-mountous zone in Punjab which includes Gurdaspur, Hoshiarpur, Pathankot, SAS Nagar, Chandigarh districts (Anonymous, 2021).

The fruit begins to ripen during spring to summer, depending on the temperature in the area and usually mature 90 days after the bloom. Loquat fruits are harvested from the end of March to mid April and fetch a good price on market. Loquat is an excellent source of carotenoids or vitamin A. The fruit is also a good source of natural antioxidants like polyphenols, vitamin C, cartenoids, flavonoids and also a good source of potassium (about 210mg/100g pulp) (Bons and Bal, 2018). The reason behind the limited adoption of loquat fruit on a large scale is non- availability of true-type plants from commercial nurseries. Several workers from different countries have reported various degrees of success using different methods of vegetative propagation of loquat. However, no such studies on vegetative propagation of loquat have been conducted under Indian conditions. The survival of plants is basically depending on several meteorological parameters. Brar *et al.,* (2021) reported that low temperatures during the pre-sprouting period (February and March) greatly delayed the phenological clock's start in both rainy and winter season guava crops, resulting in severe fruit loss. Vaidya *et al.,* (2019) also investigated how changes in mechanical and physiological activities affect fruit plants when external ideal circumstances in terms of rainfall and temperature are deviated. So, keeping in view, the importance of weather parameters on survival of plants an experiment was planned to standardize the appropriate vegetative propagation method with suitable time environment to procure true-type plants.

The field trials were conducted for two consecutive years during 2019 and 2020 at Fruit Research Farm, Department of Fruit Science, Punjab Agricultural University, Ludhiana (30° 53' 41" N, 75° 48' 26" E). One year old Loquat seedlings grown in the open field conditions were used as rootstock. Loquat plants were propagated by four different vegetative techniques *i.e.* Cleft grafting, Tongue grafting, patch budding and T-budding on different dates *i.e.* 1st July, 15th July, 1st August and 15th August. One year old, uniformly raised 25 loquat seedlings of pencil thickness (12-15cm long) were selected for budding and grafting operation. Each treatment was replicated thrice on selected loquat seedlings. The observations were recorded for various parameters *viz*., days taken for bud sprouting, shoot length (cm), shoot diameter (mm), number of leaves per graft and success per cent of graft after 80 days, 120 days and 180 days of budding or grafting during both years. Survival of budded/grafted plants was recorded 180 days after at termination of the experiment and survival percentage was calculated by using formula:

$$Graft\ survival\ (\%) = \frac{Number\ of\ survived\ budded\ /\ grafted\ plants}{Total\ bud\ take} X\ 100$$

The weather parameters *like* maximum and minimum temperature (°C), rainfall (mm), relative humidity (%) and bright sunshine (hours) was recorded by agrometeorological observatory of Punjab Agricultural University, Ludhiana. The soil of this zone

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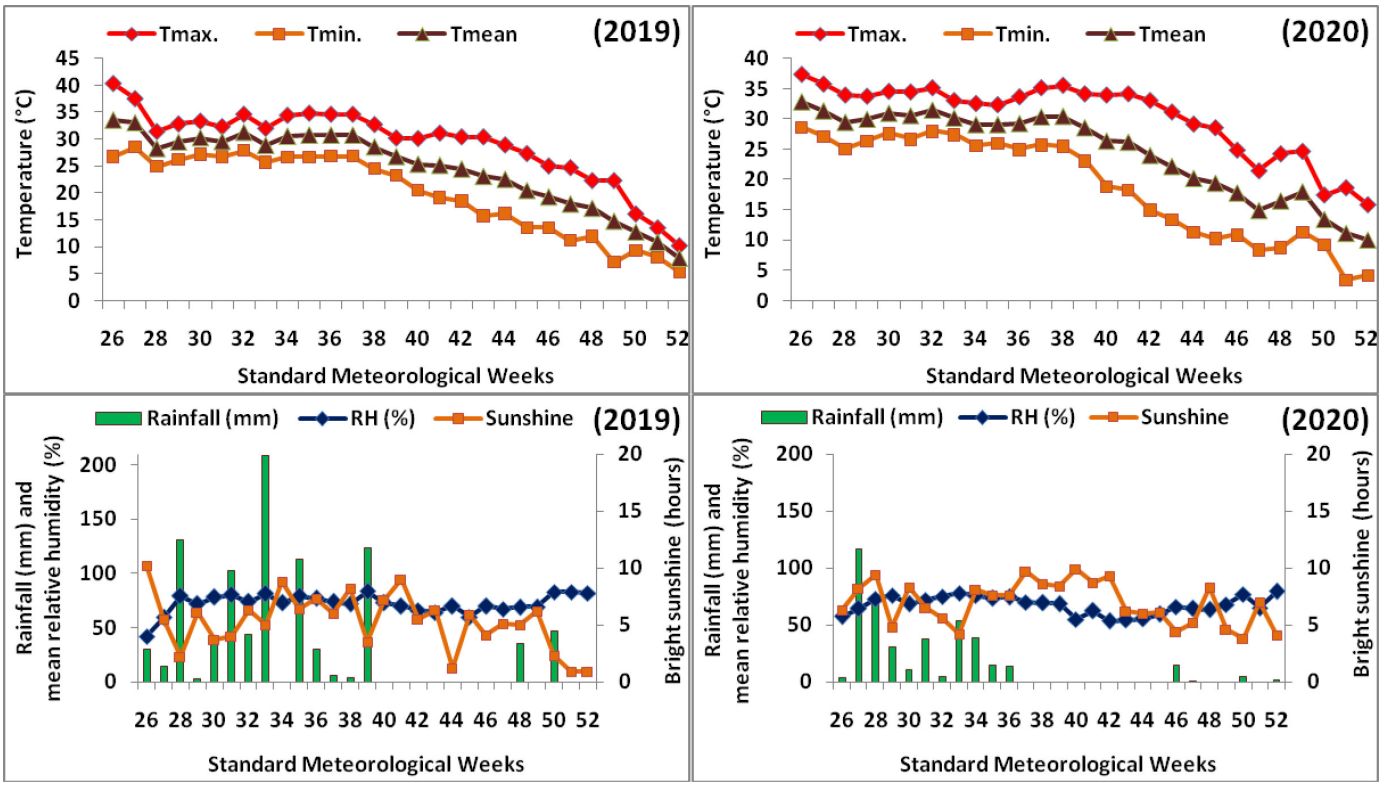

Fig. 1: Weather conditions as weekly maximum temperature (°C), minimum temperature (°C), mean temperature (°C), rainfall (mm), relative humidity (%) and bright sunshine (hours) for the two consecutive study years of 2019 and 2020 at Ludhiana.

has developed under semi-arid condition. The soil is sandy loam to clayey with normal reaction (pH from 7.8 to 8.5). During the study period from July to December, 2019 and 2020, total 926.5 mm and 416.6 mm cumulative rainfall was recorded having 29 and 24 rainy days respectively. During the study period of 2019, highest weekly rainfall was recorded in the 33rd SMW (standard meteorological week) (208.0 mm) followed by the 39th SMW (123.8 mm), while in 2020 the highest weekly rainfall was recorded in the 27th SMW (116.6 mm) followed by the 28th SMW (71.6 mm). The average minimum temperature during the study period was 20.0°C and 18.9°C, while, the average maximum temperature was 29.3°C and 30.3°C during 2019 and 2020, respectively. The average bright sunshine in Ludhiana was 5.3 hours and 6.9 hours during 2019 and 2020, respectively. The average relative humidity was around 72% and 67% during 2019 and 2020, respectively (Fig. 1).

Results revealed that, among different methods of propagation, plants are propagated by patch budding and cleft grafting only survived to the end of the experiment. T-budded and tongue grafted plants of loquat did not sprout or die for 15 days or a month.

Phenology of loquat as influenced by propagation methods and weather parameters

Among propagation methods, patch budding took fewer days to sprout as compared to cleft grafting. Minimum days (35) taken for bud sprout were reported in patch budding done on 15th July 2020, which was at par with patch budding done on 01st July 2019 (37) and statistically superior to cleft grafting during both years (Fig. 2). Similarly, maximum sprout length which was recorded in cleft grafting done on 1st July after 80 days of grafting but sprout length was at par in both methods when budded /grafted on 15th July. Sprout length was at par in both methods as well as both dates of propagation after 120 days. After 180 days, sprout length was a significantly maximum in patch budding as compare to cleft grafting propagated on 1st July but in the case of 15th July shoot length was at par in both the methods of propagation (Fig. 2). This could be due to early bud sprouting, optimum temperature and relative humidity required for a good growth of shoots leading to more intermodal length and contributing for the maximum sprout length. Higher sunshine hours as well as temperature may also speed up social activity leading to better growth with maximum shoot length. These results are in agreement with earlier findings of Jalal *et al.,* (2019) who also reported statistically higher shoot length in patch budding as compared to T-budding in the case of aonla. Moreover, significantly maximum number of leaves was observed in cleft grafting after 80 days, 120 days and 180 days when budding/ grafting was performed on 1st July which may be due to more number of buds available on scion wood used for cleft grafting. On the other hand, number of leaves were recorded significantly maximum in patch budding than cleft grafting (Fig. 2).

Graft survival as affected by propagation techniques and weather parameters

Fig. 3 indicated that, days taken for bud sprouting was lesser in patch budding, in both years of study as compared to cleft grafting techniques of propagation. Similarly, as compare for budding/grafting done on July 1, lesser number of days was taken for bud sprouting on July 15. Moreover, higher survival percent was

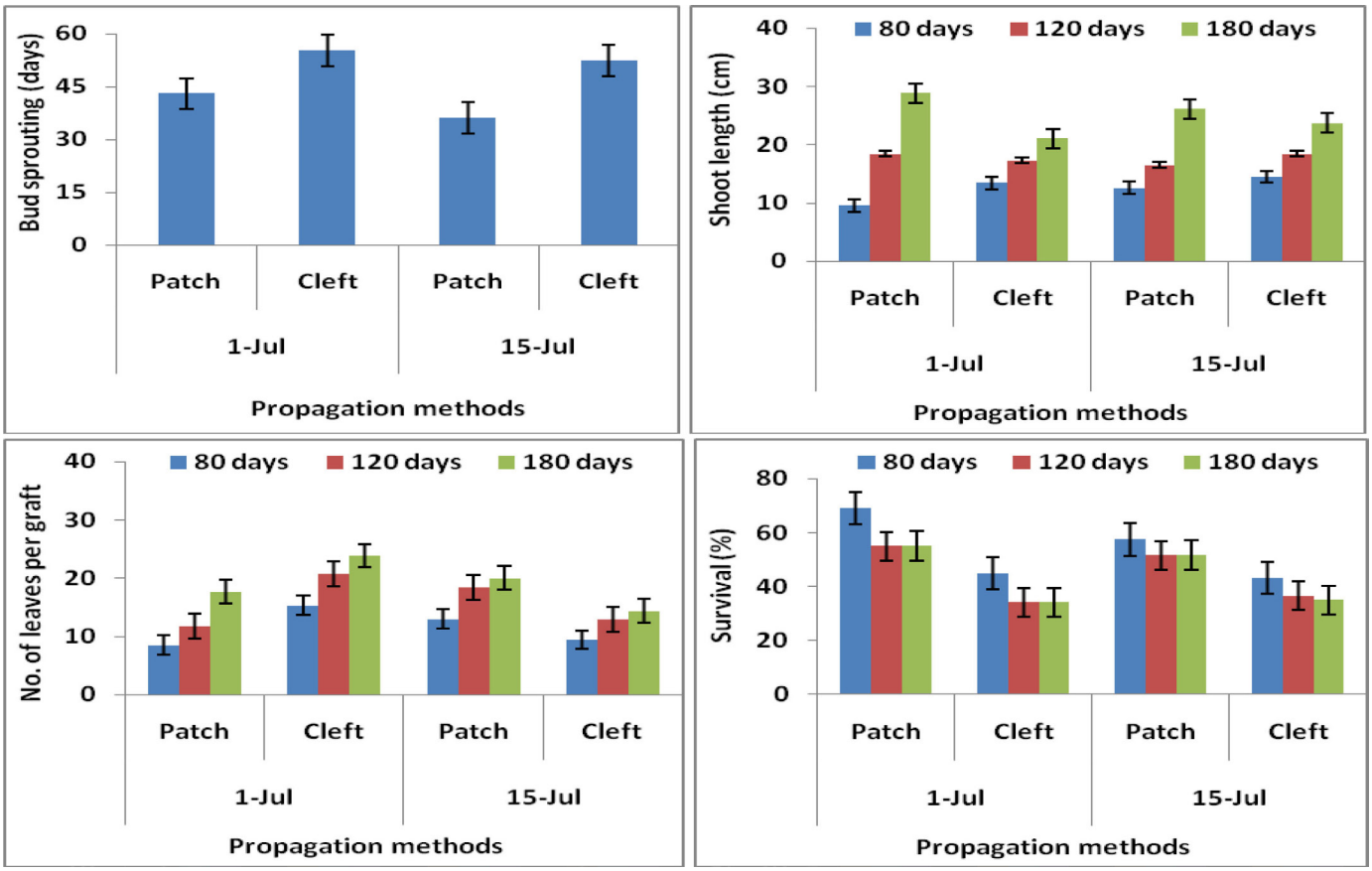

Fig. 2: Variations in growth parameters i.e. bud sprouting (days), shoot length (cm), no. of leaves per graft and graft survival (%) in respect to time intervals as well as propagation methods in Loquat (mean of two consecutive years of 2019 and 2020) along with error bars with standard error.

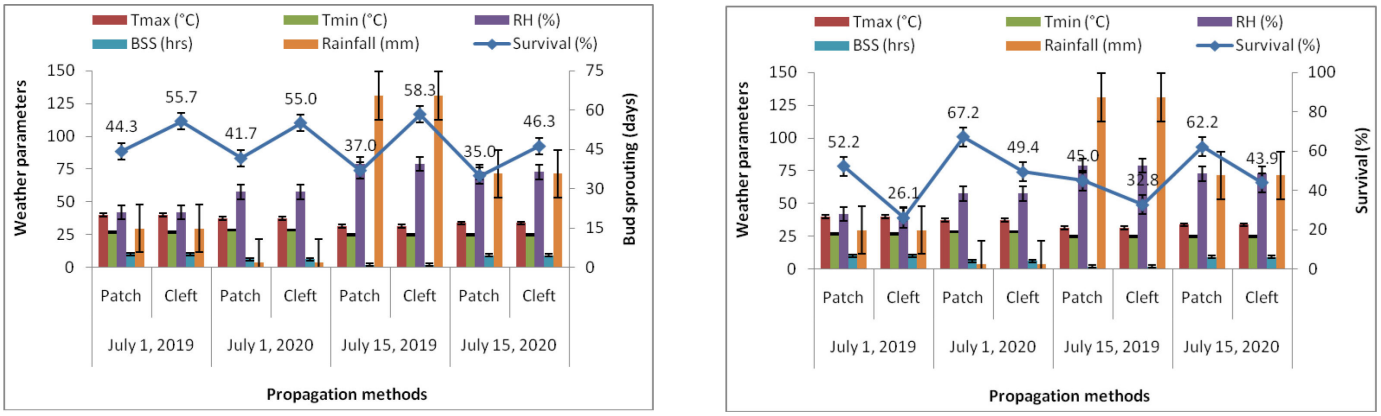

Fig. 3: Bud sprouting (days) and survival (%), of Loquat as affected by propagation methods and weather parameters along with error bars with standard error.

also achieved with the patch budding technique than cleft grafting and also with 15th July budding/grafting followed by 1st July. Graft survival percentage which was decreased by 69.17 % to 55.00% in patch budding and by 45.00 to 34.17% in cleft when budded / grafted on 1st July between from 80 to 180 days. Whereas, survival percentage was 51.67% in patch budding showing no change in trend but graft survival showed decreasing trend in cleft grafting *i.e.* 38.33% to 35.00% between 80 days to 180 days when budded / grafted on 15th July. The higher success rate of budding/grafting in July months may be attributed to higher relative humidity (76-80%) coupled with minimum fluctuation between the mean maximum (28°C) and minimum temperatures (24°C) congenial to increased cell activity resulting in maximum plant survival. Moreover, due to proper distribution of rainfall and favorable temperature and bright sunshine, the survival was found more when budded /grafted on 01st July. These results are in agreement with those reported by Rani *et al.,* (2015) in guava. Among methods of propagation, patch budding was statistically superior to cleft grafting during both years of investigation. It is possible to larger areas of bark and cambium tissues in the case of patch budding which can easily unite after

budding operation. These results are also in confirmation with Jalal *et al.,* (2019) who also found patch budding the most successful among all other methods of propagation practiced during the rainy season under *tarai* conditions.

It is concluded that patch budding was found the most effective method of propagation in loquat with higher graft survival as well as early bud sprout. However, due to warm weather as well as higher relative humidity, success of bud sprouting as well as its survival was higher when budding/grafting was done in mid-July. So, in Punjab conditions patch budding done on 01st July is recommended for loquat.

Conflict of Interest Statement: The author (s) declares (s) that there is no conflict of interest.

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