A New Rootstock for Temperate Stone Fruits

K.K. Pramanick[1], A.K.Shukla[2], Santosh Watpade[3], Madhu Patial[4] and Jitendra Kumar[5]
Indian Agricultural Research Institute, Regional Station
(Cereals & Hoticultural Crops)
Amartara Cottage, Cart Road , Shimla

Corresponding author : kallolpramanick@gmail.com

INTRODUCTION

The choice of rootstocks depends mostly on climatic and soil conditions, which are usually more unsatisfactory in north-western Himalayan region. The length of the vegetation period, sum of temperatures and rain precipitations have significant effects on the rootstock performance. Over the last so many years many Prunus species and hybrids have been tested as potential dwarfing and semi dwarfing rootstocks for stone fruits particularly. The most promising selections so far tested at IARI Research Farm, Dhanda, Shimla have been *Prunus persica* Japan (ornamental peach). This rootstock has shown high yield efficiency, precocity, graft compatibility and smaller in size than the standard rootstock. Based on the performance of this rootstock on plant architecture (dwarfing), graft / budding compatibility, precocity, productivity, fruit size, fruit colour and quality, abiotic stress resistance (cold), it has been recommended to use this promising dwarfing rootstock for stone fruits cultivation in high density orcharding and low chilling areas. Even it can be grown in pots, kitchen garden where little space is available for any kind of cultivation.

Economic viability of a fruit production enterprise is linked directly to orchard productivity and management efficiency. To increase productivity and efficiency requires tree survival, managed vigor and increased marketable yields over the expected life span of the orchard. Several surveys have been undertaken to determine the relative importance of the various "problems" facing stone fruit industries around the world. The different problems associated with the rootstocks of stone fruits are soils having high bulk density, parasitic nematodes, root rot fungal pathogens, other edaphic or replant but the major being incompatibility of the rootstock with the scion. In India, the restrictions for the cultivation of stone fruits are mainly due to lack of compatible rootstocks. The major production of stone fruits in India is in the North-Western Indian States of Jammu and Kashmir (J&K), Himachal Pradesh (H.P.), Uttrakhand hills and to some extent in the North-Eastern Hills region.

Different rootstocks have been reported for different problems in stone fruits. Additionally, many "problem" sites have more than one limitation and require that a new rootstock incorporate resistance to multiple problems for successful adaptation. In many cases, new rootstocks are probably best suited for regional or prescription/niche planting rather than broad use over a large industry. Regional testing is the only way to determine each rootstock's best adaptation. Priorities vary from one stone fruit crop to another. Several studies have shown that the rootstock requirement for apricots (*P. armeniaca*) and plum (*P. domestica, P. salicina)* are similar to the rootstock requirement of peach. For sweet cherry (*P. avium*), the first and

foremost need in rootstocks is for size reduction followed by increased scion precocity and compatibility so sour cherry (*P. cerasus*), which has low inherent vigor (compared to sweet cherry) can be used as a rootstock for sweet cheery. Fortunately, many stone fruit species can be budded onto other Prunus species. As a result peaches, plums, apricots and almonds (*P. amygdalus*) often can be budded onto rootstocks developed for each other. Not all stone fruit scions are compatible with available *Prunus* rootstocks namely: *P. cerasifera*, *P. cerasifera* x *P. munsoniana*, *P. domestica*, *P. insititia*, *P. americana*, *P. pumila*, *P. besseyi*, *P. spinosa*, *P. dulcis*, *P. amygdalus* x *P. persica*, *P. insititia* x *P. domestica*, *P. armeniaca*, *P. salicina*, *P. persica* x *P. davidiana* and *P. amygdalus* x *P. nemared* (*P. persica* x *P. davidiana*) used as rootstocks for peach, plum, apricot and almond in different countries.

Major portion of the total stone fruits production in Himachal Pradesh is confined mainly to the mid hill region falling in the altitude range of 1000 – 1700 meters above mean sea level where the summer is moderately hot (31.8°C to 34.8°C) during May-June and winters are cold (2.4°C to 3.7°C) during December–January. The average annual rainfall ranges from 100-130 cm, 90% of which is limited to two months of the monsoon (July–August) and during the rest of the year plants remain under water stress. Most of the orchards are on sloppy land where irrigation is difficult to practice and due to scarcity of water and uneven distribution of rainfall throughout the growing season drought conditions are commonly prevalent, which results in poor fruit set, heavy fruit drop and sometimes even cause the death of the plants. Like majority of fruit crops, stone fruits are also multiplied clonally by grafting the scion cultivar on the desired rootstock and beneficial effects of rootstock on the grafted plant. Wild relatives of the stone fruits e.g., wild peach (Kateru), wild apricot (Chulli) and Behmi have remained the first choice as rootstock in case of stone fruits on commercial level and have adapted in this region for ages.

Thus, in India the productivity of peach, plum and apricot is 8.10 tonnes/hac, 5.7 tonnes/hac and 4.17 tonnes/hac respectively which is considerably low as compared to other countries where these fruits are grown commercially. Non-availability of good rootstocks suitable for the local climatic conditions for mid hills of Himachal Pradesh is one of the major reasons for the low productivity of these crops. Since there are huge variations available in form of wild peach (kateru), wild apricot (Chulli) and Behmi from which suitable clonal rootstock could be evolved which are suitable for the local climatic conditions and benefit the orcharding enterprise to a larger extent.

The new prospective

A new rootstock from ornamental peach, *Prunus persica* Japan (syn. *Prunus japonica*) which is compatible with all the stone fruits have been studied at the IARI, Regional station, Shimla and successful results have been recorded. It is mainly cultivated for ornamental use (figure 1). It is a shrub species in the genus *Prunus*. The shrub reaches 1.5 m by 1.5 m. Its flowers are hermaphrodite and are pollinated by insects. The plant blossoms in May. Its fruit reaches about 14 mm in size and has an agreeably sweet flavor.

All the stone fruits like Peach, Plum, Apricot, Prune, Almond, Nectarine, and Cherry of genus *Prunus* have been successfully grafted on *Prunus persica* Japan (ornamental peach). These have shown complete graft compatibility, precocity and fruit set. The rootstock is very dwarfing in nature thus can be successfully used for high density plantation. Based on the performance of this rootstock on plant architecture (dwarfing), graft/budding

compatibility, productivity, fruit size, fruit colour and quality, abiotic stress resistance (cold), it has been recommended to use this promising rootstock for stone fruit cultivation in high density orcharding and low chilling areas. Even it can be grown in pots, kitchen garden where little space is available for any kind of cultivation.

Conclusion:

All the temperate stone fruits like Peach, Plum, Apricot, Prune, Almond, Nectarine, and Cherry of genus *Prunus* have been successfully grafted on *Prunus persica* Japan (ornamental peach). These have shown complete graft compatibility, precocity and fruit set. The rootstock is very dwarfing in nature thus can be successfully used for high density plantation. Based on the performance of this rootstock on plant architecture (dwarfing), graft/budding compatibility, productivity, fruit size, fruit colour and quality, abiotic stress resistance (cold), it has been recommended to use this promising rootstock for stone fruit cultivation in high density orcharding and low chilling areas. Even it can be grown in pots, kitchen garden where little space is available for any kind of cultivation.

❖❖