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Constraints and Prospects of Temperate Fruit Production in India

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Indian Himalayan region offers vast opportunities for cultivation of temperate fruits predominant amongst these are apple, pear, peach, plum apricot, cherry, almond and walnut. The average productivity of temperate fruits is quite low due to lack of superior genetic material, irrigation facilities, non-availability of critical inputs, inadequate adoption of plant protection measures, scattered small and marginal land holdings and above all non adoption of advanced modern production technology. Hence, the developmental strategies should be focus on diversification, production of quality genetic material, integrated farming approach, strengthening post-harvest infrastructure and organized export oriented marketing. In the diversification of horticulture, high value cash crops like nut fruits, soft fruits and other less important indigenous and exotic minor fruit species need to be incorporated. The Indian Himalayas spread over in an area about 5 lakh km^2 and lies between latitudes 26^o 20' and 35^o 40' N and between longitudes 74^o 50' and 95^o 40' E starting from foot-hills in the south (Siwaliks) towards the region extends to Tibetan plateau in the north (trans-Himalaya) comprising about 95 districts of the country. The fragile mountains contribute about 16.2% of India's total geographical area, and most of the area is covered by snow-clad peaks, glaciers of higher Himalaya, dense forest cover of mid-Himalaya. Temperate fruits growing in India are spread over in major Himalayan region in 18 states of India (Chadha, 1992). Amongst these, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh occupy the major share in production of temperate fruit. With relative advantage in the region due to climate, a large number of temperate fruits are grown. The commercially grown temperate fruits are apple, peach, plum, apricot, cherry, almond and walnut. Amongst these, maximum area has been occupied by apple and pear followed by stone fruits (peach, plum apricot, cherry & almond). The low productivity of temperate fruit industry in Himalayas are attributed to low pollination, fruit drop, poor fruit set, high biotic pressure and the use of old degenerated varieties as well as lack of elite planting material and proper orchard management technology. Keeping in view of the current scenario of temperate fruit production, crop diversification is one of most popular strategy suggested to ensure food security and to make judicious use of land, water and other available resources in the region.
Temperate fruit produces higher biomass then field crop per unit area resulting in efficient utilization of natural resources. These are highly remunerative for replacing subsistence farming and thus eliminate poverty level. They have potential for development of wastelands through planned strategies and need comparatively less water than fruit crops.

They provide higher employment opportunity. These are environment friendly and are also important for nutritional security. These are the crops having high potential for foreign exchange earnings.

Major Temperate areas in India

- Jammu and Kashmir

- Himachal Pradesh
- Uttarakhand
- Arunachal Pradesh and other north eastern states

Constraints of temperate fruit production

Temperate deciduous trees respond to seasonal changes. During autumn tree stop growing, their leaf falls and they require a winter hardiness. The state of Dormancy is broken by winter chilling. The winter chilling requirement is relatively short for tree native to low latitude with warm winter and also for those native to high latitude with cold winter. Native of mild temperate regions with cold but at time fluctuating winter temperature has longest chilling requirements, as very low temperature do not meet chilling requirement until late winter and early spring, when temperature are favourable for chilling requirements. The extreme minimum temperature during the winter causes winter freeze injury in apple fruits, which results poor apple yield. Summer temperature and climate conditions also influence the size and quality of apples as the fruits develop during April to June. The high or low temperature during flowering phase reduce apple crop. Temperature impacts temperate fruit farming throughout the season from immediately after blooming period in the apple orchards to the fruit size at harvest.

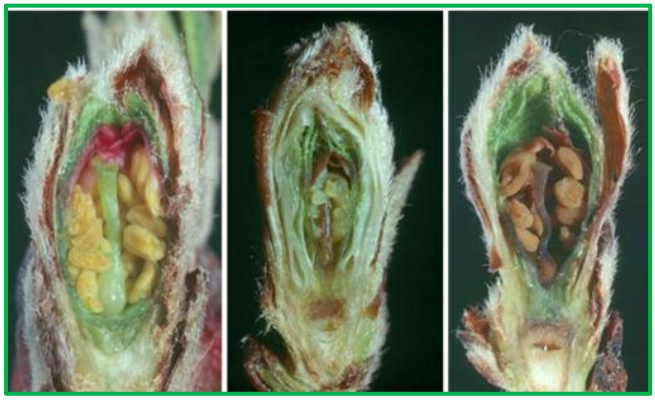
However, some of the low altitude zones under temperate fruit cultivation do not fulfil sufficient winter chilling due to rise in temperature. With deficiency in chilling hours, flower buds produce fewer fruit clusters resulting in delay in bloom period.

Chilling requirement of different fruit crops

Crop	Chilling hour
Apple	1000-1600
Pear	1200-1500
Peach	400-1000
European plum	800-1500
Japanese plum	700-1000
Cherry	2000-2700
Apricot	900-1500
Almond	800

Although light is required for anthocyanin production, to what degree light stimulates apple coloration is highly dependent on the apple cultivar and the stage of development For example, late harvested 'Mclntosh' apples required longer exposures to light to induce a certain amount of color development than apples harvested earlier.

Some researchers suggest that one of the ways that light increases anthocyanin production is by stimulating greater (phenylalanine ammonia-lyase) PAL activity in the apple.



Shading fruit from the sun, such as within a tree canopy, can reduce anthocyanin formation and color development. Flower buds are usually the most sensitive part of the tree to frost damage.

Buds may be damaged by frost once they have begun to open or by extremely cold temperatures while they are still dormant.

Agronomic constraints

Choice of variety: Most of the temperate fruit variety which are cultivated in India are introduced from different part of world. Very few genotype has been developed in India to meet the growing demand.

Although new variety has been developed but it is unable to reach the farmer. The cause may be poor extension system Well establishment of orchard with traditional variety, Low income of farmer in the newly planted orchard during gestation period of plant, High labour cost, High capital investment. Selection of cultivars of the temperate fruits to be grown under subtropical climate is one of the key requirements for their successful cultivation in the subtropical regions. Only those cultivars which have low chilling requirement and ability to tolerate high summer temperature should be selected.

Breeding programs have provided new cultivars selected for their short chilling requirements and tolerance to high temperature. One of the most successful cultivars is 'Anna' Apple, developed by A. Stein in Israel. This is now extensively grown in areas with limited chilling. The introduction and the selection of superior types have remained major research activities at various institutes, as a result of which cultivars like Sharbati peach, Titron and Kala Amritsari plum, Pathernakh, LeConte and Baghugosha pears became commercially popular in some parts of the subtropical India

Crop	Cultivar
Apple	Dorsett Golden (250), Anna (300), Tropic Mac (300), Tropic Sweet (300), 88-20 (375), Ein Scheimer (400), 60-39 (400), Tamma, Neomi, Tropic Beauty, Gallia Beauty, Winter Banana, Tame, Vered
Pear	Patharnakh, Gola, Leconte, Keiffer, Smith, Baghugosha, China Pear, Pineapple, Baldwin, Tenn, Flordahome, Ayers Hood, Orient, Carnea, Tsu Li, Ya Li, *P. calleryana* (rootstock requires 400 chilling hours)
Peach	Okinawa (50), Red Ceylon (50), UF Sun (100), Florda Grande (100), Flordabelle(110), Flordared (110), Flordawon (110), FlordaPrince (150), FlordaGlo (150),Tropic Beauty (150), UF Beauty (200), Sunred (210), Flordabest (250),
Nectarine	Sunbest (225), Sunraycer (250), UF Royal (250), UF Queen (250), Sunmist (275), Sundollar, (350), Suncoat (375), Sunred
Plum	Satluj Purple, Kala Amritsari, Jamuni Meeruti, Titron, Aloo Bokhara, Alucha Black, Titron Howe, Gulfruby, Gulfbeauty, Gulfblaze, Gulfrose
Apricot	New Castle, Early Shipley, St. Ambroise, Benazir, NJ-13
Almond	California, Papershell, Hybrid 15, Pathick.s Wonder, JKS-55, H-98, Achak (266),Desmayo Largueta (309), Ramillete (326), Marcona (435), Marta (478),Antoneta (514), Ferragnes (558)

Flowers produce a low amount of nectar, with a very low rate of sugar(10-15%). This makes the flowers of low attractiveness to pollinating insects. Dioecious nature of kiwi make it necessary to plant male variety in the orchard. Due to the frequent yearly variation of winter chilling the occurrence of non-coincidence of blooming between the target variety and its pollinizers is usual. Theoretically, a kiwifruit flower needs at least 50 pollen grains per style to produce a fruit with 1400 seeds, provided each stigma receives an equal amount of pollen.

Most cultivars of European pear (Pyrus communis L.) exhibit S-RNAse- based gametophytic Self-incompatibility (SI). In selfed flowers, most pollen tubes are arrested in the upper half of the style, although in a small proportion of the styles, a pollen tube can reach the base of the style and eventually effect fertilization. Orchard should be scientifically

managed and all the recommended package of practices should be followed from time to time.

Among the standard varieties there should be more proportion of regular bearing varieties than the Delicious varieties. Where adequate proportion of pollinizing varieties has not been provided, top working of the trees with pollinizing varieties should be done.

During flowering and fruit set, 2 bee hives/acre be provided for adequate cross pollination.

Orchard soil and canopy management practices should be given due attention for proper productivity. There is urgent need to go for high density plantation in different temperate fruit crops. Judicious use of insecticides/pesticides/fungicides should be done since their excessive use can increase tolerance and eradication of many natural enemies of these pest self-sterility in cherry (Prunus avium L.) is one of the most important problems in commercial cherry orchards.

The meadow orcharding is the most extreme version of High Density Planting. It is also called as Ultra high density planting, Super high density planting and Bed orchards. The meadow orchard originally developed by Hudson (1971), it was an ultra high density (about 1,00,000 trees/ha) full cover orchard for apple.

Canopy management of the fruit trees deals with the development and maintenance of the structure in relation to the size and shape, orientation of branches and light interception for the maximum productivity and quality. This are mostly done to make best use of the land and the solar radiations for increased productivity and avoidance of the build up of micro climate congenial for disease.

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