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Potential and prospects of Kiwifruit production in the state Arunachal Pradesh

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Abstract
In north-eastern states in general and Arunachal Pradesh in particular, kiwifruit has a bright prospects. Kiwifruit has been assessed as one of the important future profitable fruit crops in mid hills of Himalayas. Since it provides a high return per unit area and the farmers can earn about Rs. 4 to 5 lakhs per hectare annually. As per the economic Survey of Arunachal Pradesh 2016-17 reports, 3379 ha of land under kiwi producing 6047 tons of fresh fruit production. Arunachal Pradesh contributes more than 50% to the total kiwi production in the country. Despite having huge potential of kiwifruit in the region, the various limitations faced by the farmer are the non-availability of quality planting material, skilled labours, lack of awareness regarding its cultural practices and management especially training and pruning as well as pollination management. Consequently, the kiwifruit produced in Arunachal Pradesh is of small size with inferior quality and thus is not able to compete with the kiwi imported from New Zealand, Australia, Italy, and other countries. Marketing is also the main obstacle due to the non-availability of cold storage and processing unit and other infrastructure for the promotion of the kiwifruit in the region.

Keywords: kiwifruit, North East, Arunachal Pradesh, limitation, prospects

Introduction
The kiwifruit or Chinese's gooseberry (*Actinidia deliciosa* Chev.) is a deciduous fruit native to Yangtze River valley of south and central China. Kiwi is known as “China's miracle fruit” and “Horticulture wonder of New Zealand”. The actual Origin of fruit is China, but its full commercial potential has been exploited by the New Zealanders, which accounts for 70 percent of the world trade. Nevertheless, in other countries, the cultivation of kiwifruit picked up momentum from 1960 onwards, and now its production is commercialized on large scale in the USA, Italy, China, Japan, France, Germany, and Australia. Fruit of kiwi is rusty brown with a hairy surface; the flesh is light green with a decorative pattern of lighter coloured rays radiating from the center and embedded with many small, soft, and dark seeds. The fruit has a refreshing, delicate flavor and delightful aroma. It has tremendous nutritive and medicinal value, is a magnificent source of Vitamin C and E (twice that of orange and more than Guava, Tomato, and Avocado), and is low in calories. It has higher potassium content than banana or citrus fruits. Kiwi is locally known as ‘anteri’ though being introduced very lately in the year 2000, is gaining popularity in the mid-hill parts of Arunachal Pradesh. In recent years, Kiwi fruit has shown enormous potential in Arunachal Pradesh and has gained huge popularity and preference among the growers as well as consumers due to its favourable attributes for easy maintenance besides its high nutritional and medicinal values. It has attained commercial identity not only in the local markets but also in national markets. The cultivation of kiwifruit has a significant benefit over other fruits that it comes in the market from October to December when practically no other fresh fruit is available to compete with it. What makes the land of Arunachal Pradesh ideal for the production of Kiwi is its altitude which is about 1500-2000 meters high in some parts of the state including the Ziro valley along with the cool climate of the become state which experiences winters for more than 8-9 months of the year.
Lower Subansiri district of Arunachal Pradesh is the first in the country to obtain an Organic Certification for Kiwi under Mission Organic Value Chain Development Programme for North East Region (MOVCDP-NER). The state has immense potential for the development of the horticulture sector.

Area and Production

The total area under kiwifruit in India is 4000 Ha and production is 12000 MT (NHB, 2018). Kiwi is one of the most important fruit crops that are grown in Arunachal Pradesh. Approximately, 56.5% of the total 6.47 thousand tons of the kiwifruit produced in the country comes from the state of Arunachal Pradesh. The State is the largest producer of in India of the total production, followed by Nagaland (2400 tons), Mizoram (1030 tons), Himachal Pradesh (260 tons), and parts of Sikkim, Manipur and Jammu Kashmir. Despite being the largest Kiwi-producing State, the overall productivity of Kiwi in Arunachal Pradesh is quite low (1.2 mt/ha) compared to other States such as 12mt/ha in Nagaland, 3.4mt/ha in Mizoram, and 2.2 mt/ha in Himachal Pradesh. Tawang, West Kameng and Ziro districts of Arunachal Pradesh are the major production hubs of Kiwi in the State. While Ziro Valley accounts for a major chunk of production, the fruit is also found in West Kameng district, Lower Dibang Valley district, Si-Yomi district, Kamle district, Papum Pare district, and Pakke Kessang districts of the state.

Varieties

Since it is a dioecious plant, it bears pistillate and staminate flowers separately hence both male and female plants are required for successful cultivation. Numerous varieties are grown in India viz. Allison, Abbott, Bruno, Hayward, Monty, and Tamuri, among which four major varieties are generally grown in Arunachal Pradesh, namely Allison, Bruno, Hayward, and Monty. Among the cultivars, the female cultivars are Abbott, Allison, Bruno, Hayward, and Monty. Whereas the cultivars which are mostly used as male are Tamuri and Allison (Male). The Hayward variety has tremendous demand and is considered to be the most liked variety due to its large size, uniform shape, and colour. However, In terms of taste, there is not much difference among the varieties.

Soil and Climate

A well-drained sandy loam soil having pH 5-6.5 is ideal for Kiwifruit cultivation. It is grown at mid-hills of Arunachal Pradesh ranging from 800-1500 m above MSL with an annual rainfall of about 1500 mm. For higher yield and quality fruits, it requires 600-800 chilling hours below 7 ^{o}C to break its rest period. The summer temperature should not go beyond 35^{o} otherwise the fruits are injured by sunburn

Propagation

Kiwifruit can be propagated by seed, cutting, grafting and budding.

Seed propagation

Seeds are first stratified by keeping them at low temperature 3-4.4 °C for 4 weeks in the moist sand to break the dormancy. Then they are sown 10 cm apart and 1-2 cm deep during late winter. Germination starts 15-20 days after sowing. Then after one year, it is transplanted in the field during the month of Feb-Mar. As the plant is cross pollinated, the seedlings are highly heterozygous and undesirable for commercial fruit production, however, these are commercially used as a rootstock on which commercial cultivars are grafted and budded.

Vegetative propagation

Cuttings

Different types of cuttings, such as hardwood, semi-hardwood, and softwood are used for the propagation of nursery plants of kiwifruit. Both hardwood and semi-hardwood cuttings are generally preferred as they give better rooting. The ideal cutting is of thickness 0.5 to 1.0 cm with relatively short internodes i.e., 15-20 cm in length having at least 3-4 buds. The cutting should be obtained from the middle portion of current season's growth during July for semi-hardwood cuttings and a one-year-old shoot during January-February for hardwood cuttings. Before planting, cuttings are treated with 5000 ppm IBA (rooting hormone) solution for 15-20 seconds and then planted in the mist chamber for rooting.

Grafting and budding

Kiwifruit is commercially propagated through grafting and budding on a seedling rootstock. The seedling becomes ready for grafting and budding normally at the end of the first growing season when the stem diameter is about 8-10 mm. The scion wood is obtained from the one-year-old shoot for dormant season grafting, whereas current seasons growth for summer budding. Among the different methods of grafting, tongue grafting has been found the most suitable as it gave up to 95% success.

Planting and pollination

Flowering begins after 2-3 years of planting but sizeable crops are borne only after 4-5 years. Planting is done with a spacing of 4m to 5m between rows and 5m to 6m between plants in the month of December- January. Since Kiwifruit is a dioecious plant, interplanting of the male plant is essential for fruit production. One male is planted for every nine female plants for proper pollination. Insect pollination is, therefore, necessary for the production of marketable fruits.

Training and Pruning

Kiwifruit vine requires skeletal support for commercial production. Supporting frames should be established immediately after planting or even before planting. Numerous training structures like Kniffin, T-bar trellis, and Pergola systems are used for training a vine, but the most popular and commonly used training systems are T-bar and pergola. Pruning is done to maintain excessive vegetative growth and obtain a high yield. Pruning is done twice a year during the summer and winter seasons to maintain a balance between vine growth and fruit production.

Thinning

Thinning is beneficial to maintain the size of the fruit. Generally, 8-10 fruits are kept per bunch.

Fertilizer requirement

The a healthy crop 20 Kg FYM and 850-900 g Nitrogen, 500-600g Phosphorus, 800-900g Potash should be for a full-grown vine after five years of planting. Two third of Nitrogen should be applied in the January-February and remaining after fruit set in April-May.

Maturity and Harvesting

For obtaining optimum quality and maximum storage life the fruit should be harvested when they have attained at least 6.2 T.SS and are still hard. The delay in harvesting also deteriorates storability. Kiwi vine starts bearing from 4-5, years while commercial production starts only after 7-8 years. The harvesting season starts from October and continues till

mid-December, the peak being November to mid-December.

Yield

A well-managed plant can give an average fruit yield of 25-80/90 kg/vine with an average of about 50-60 Kg/ vine.

Pests and Diseases

In kiwifruit, no serious pests and diseases attack have been observed, thus it has a better scope to become commercial eco-friendly fruit crop of the country. Due to hard nature of the fruit with hairy skin surface, the fruits are not damaged by any bird and even not by the monkeys. It has a longer shelf-life and can be stored for one month in open at room temperature and for 4-6 months in cold storage.

Post-harvest handling

Post-harvest management practices play a very crucial role in deciding the economic value of the product in the market. The harvested fruits are sorted, graded and packed at farm level. As mentioned earlier, the graded produce is designated as A+, A, B, C and D based on weight. It has a longer shelf-life and can be stored for one month in open at room temperature and for 4-6 months in cold storage.

Packing

There is no standard package for kiwi fruits. Cardboard boxes of 3-4 kg. Capacity is generally used for packing. Polythene liners inside storage cases uses which are very effective in maintaining high humidity and can be used to maintain fruits in good condition for a longer period.

Processing and value addition

Kiwifruits are mostly eaten as fresh, although some kiwifruits are also processed into juices, fortified drinks, purees, candies, frozen, dehydrated and lyophilized products, kiwifruit leathers, wines, distilled spirits, kiwifruit preserved in syrups and candies etc. In Arunachal Pradesh, two kiwifruit wineries have been established at Ziro in Lower Subansiri district and Dirang in West Kameng district. Once these are fully operational would create more demand for kiwifruit. In fact, with present level of kiwi production in the state, these are unable to utilize their established capacity.

Constrains of kiwi cultivation

Kiwifruit Cultivation has not gained momentum; in Arunachal Pradesh due to;

- Lack of awareness about its Improved Package of practices.
- Lack of Availability of good quality planting material to the farmers of the region.
- Lack of packaging facilities, Storage and marketing network for farmers.

Fig 1: Kiwifruit Cultivation

Conclusion

India is currently importing 4,000 tones of kiwis from New Zealand. Despite huge potential, congenial climatic and soil conditions the kiwi cultivation in the region has not picked up so to a great extent. The state Government should take initiatives to provide incentives to the farmers for the promotion of kiwifruit production in the area which includes development of certified Nurseries for the production of quality planting material for area expansion. Besides improved production practices feasible for the region should be developed to increase the productivity and quality, besides availability CA storage facilities should be developed for better profitability and processing industries should be setup near the production areas for utilizing the inferior quality fruit that will surely give impetus to the production of kiwi fruit in the state.

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