

Potentials of Strawberry Cultivation for Farmers in Sirmour District of Himachal Pradesh

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Introduction:

The strawberry (*Fragaria × ananassa* Duch.) is an important fruit crop of India and its commercial production is possible in temperate and sub-tropical areas of the country. It belongs to family Rosaceae and sub family Rosoideae having chromosome number ($2n = 56$). Among the fruits strawberry gives the quickest returns in the shortest possible time. Strawberry is a short day, monoecious, low perennial herb and short duration crop. In India, it is cultivated in tropical and subtropical areas like Himachal Pradesh, Uttar Pradesh, Maharashtra, West Bengal, Nilgiri hills; Haryana, Punjab and Rajasthan. Owing to wide climatic and soil adaptation and high returns, it has tremendous potential in India. Its cultivation can be extended to other suitable areas having assured irrigation and transport facilities.

China is the largest producer of strawberry in world. In India strawberry fruits are cultivated in an area of about 6530 thousand hectares with production of 96754 thousand MT while state wise Haryana production shares 58%, Himachal Pradesh (0.93%). During the recent years, strawberry has gained popularity due to its pleasant taste and refreshing nature. Sirmour district having varied agro-climatic prevalent areas. Where different crops like apple, peach, litchi, apricot, mango, are cultivated in different area of Sirmour. But strawberry is not popular amongst farmer of district due to problem of weeds, fluctuating weather and poor shelf life. Now, the demand for strawberry production has increased due to upcoming industries in Sirmaur district, which is being done by farmers in open fields and protected conditions. Under protected conditions strawberry can be grown throughout the year following proper intercultural practices while in open conditions it can be grown once a year.

These days' some varieties are gaining popularity for both open and protected cultivation. The variety chandler is planted in most of the countries as it is phenotypically stable, have long harvest period, cold tolerant, early maturing, good flavour, brilliant red

colour and high yielding variety. The Camarosa variety is one of the most promising varieties of strawberry which was introduced from California that have best quality of firm flesh and even provide opportunities for the distant marketing. The third variety selected for the experiment was 'Winter Dawn' which is day neutral variety which produce fruits from March up to May when planted in last week of January or first week of October. Due to increase in demand of fruit there shelling price is increase that is 100-150 rupee/kg and due to which farmer income increases in many fold and standard income. So, we could say that strawberry become a potential crop for farmer in Sirmour district.

Importance:

Strawberry is one of the best natural sources of antioxidant, vitamin C, proteins and minerals like P, K, Ca, and Fe. It is a rich source of vitamins and minerals. It contain of 60mg ascorbic acid per 100g pulp, 5% total sugars, 0.9-0.8% acidity in terms of malic and citric acid, protein 0.7g, carbohydrates 8.4g, iron 1g, calcium 21mg, phosphorous 2mg and potassium 16 mg per 100g of fruit. The fruits are consumed mostly fresh. However, many products like jam, fruit juice, pies, syrup, candy, ice-cream, preserve etc. are prepared. The fruits of cultivated strawberry are considered for diarrhea, gout, stomachache, and kidney stones. The fruits are used as astringents, diuretics and mild laxatives. Strawberries contain high quantities of ellagic acid which inhibit cancer and HIV onto cells and HIV enzyme activity on DNA and function as antioxidants and free- radical scavengers.

Floral biology:

Strawberry bears many flowers in clusters and a definite order of flowering. Flowers are white in colour. Each flower contains five sepals, five petals, 60-600 pistils and 25-35 stamens. The inflorescence is raceme and has a dichotomic branching. Three types of flowers are found in octaploid species viz. Pistillate, staminate and hermaphrodite. Most of the recently bred cultivars are hermaphrodite. Strawberry cultivars have been categorized as short day (SD), long day (LD) and day neutrals (DN) on the basis of photoperiodic requirements for floral initiation.

Soil:

The strawberry can be grown on any type of soil-poor sand to heavy clay-provided proper moisture, organic matter and drainage is present. Strawberry ripens somewhat earlier on sandy soil than on clay soil. The ideal condition for strawberry cultivation is sandy loam

to loamy soil with pH 5.7-6.5 and a proper water drainage system. Strawberry is not much sensitive to soil reaction. However, it prefers a slight acidic soil. At higher pH, there is less root growth. There is sure cultivar adaptation to soils. Some grow better on heavier soils and others on light soils. Water should not stagnate in the field. Since most of its roots are found in the top 15 cm soil, this layer should be porous and rich in humus.

Climate:

Strawberry thrives best in temperate climate. It is a short day plant, which requires exposure to about 12 days of less than 8 hours sunshine for initiation of flowering. Each cultivar may have a different day length and temperature requirement. The strawberry plants are strongly affected by the environmental parameters like temperature, photoperiod and light intensity. Some cultivars are adapted to septentrional culture (short days in autumn and hard winter) or to meridional conditions (long days in autumn and moderate winter). It requires optimum day temperature of 16°C to 27°C and night temperature 7°C to 13°C. Strawberries want to flower and come to harvest in cool warmer weather around March- May in hilly regions.

Propagation:

Strawberry is propagated through runners that are formed after the blooming season. Although runner produces true to type plant, but viral diseases are quite often transmitted through runners only. Thus for runner production, a separate bed should be used. The site and soil where the strawberry had not been grown for at least 3 to 4 years should be selected. Propagation is done by means of runners that are formed after the blooming season. The plants may be allowed to set as many runners as possible but not allowed to set any fruits. All the plants with good root system should be utilized to set a new plantation. Given the best attention and care, a single plant usually produces 12 to 18 runners.

Land preparation and Planting:

The land for strawberry planting should be thoroughly prepared by deep ploughing followed by harrowing. Liberal quantities of organic manure should be incorporated in the soil before plating. Strawberry can be planted on flat beds, in the form of hill rows or matted rows, or it can be planted on raised beds. In irrigated areas, planting on ridges is advised. The planting distance should be 45 cm from plant to plant and 70 to 85 cm. from row to row. In the hills, Transplanting is done in March-April, September-October, but in the plains, the

months of January-February may be utilized for this purpose. The most popular method of growing strawberries is called the matted-row system. Strawberries are planted 18 to 30 inches apart in rows 3 to 4 feet apart. These new daughter plants are allowed to grow into a matted row up to about 2 feet wide. Plants growing beyond this boundary should be removed.

Irrigation:

Strawberry being a shallow-rooted plant requires more frequent but less amount of water for each irrigation. Excessive irrigation results in growth of leaves and stolons at the expense of fruits & flowers and also increases the incidence of Botrytis rot. Irrigation is applied in furrows between the rows. Trickle and sprinkler irrigation systems are becoming popular nowadays. Irrigation is a must and in humid regions, even short droughts reduce the yield, damaging the shallow root system. Since strawberry is a shallow-rooted plant, the plants require more frequent but less amount of water in each irrigation. Irrigation of newly-planted buds results in increased runner production and early rooting. Strawberry plants produce optimum growth when the soil moisture tension is maintained at less than 1.0 atmosphere. Excessive irrigation is, however, detrimental which encourages growth of leaves and stolons at the expense of fruits and flowers. Irrigation should be applied in furrows between the rows. Care should be taken that water should not wet the leaves and fruits as it may increase the incidence of fungal infection. To obtain better fruit size and quality, it should be irrigated judiciously during harvesting.

Mulching:

The commonly used mulch materials include paddy straw and black polythene gives good weed control, advances early cropping, increases total yield and save the fruit from rotting.

Harvesting:

Strawberries are normally harvested when half to three fourths of skin develops colour. Depending on the climate conditions, picking is regularly done on every second or third day generally in the morning hours berries are harvested. Delaying in picking generally increases the proportion of overripe and rotten berries. The picking duration differs from cultivar weather. Berries should be picked along with a small stem portion attached. Picking should be done in the morning. It facilitates better shelf basket. They should be kept in a

shady place to avoid damage due to excessive heat in the open field. Strawberries can be stored in cold storage up to 10 days. Subsequently they lose their fresh bright colour, showing some shrivelling and deterioration in flavour.

Post-Harvest Management:

Strawberries are highly perishable fruit and require careful handling and strict adherence to suitable postharvest management practices, in order to maintain optimum fruit quality after harvest. For maximum market life, strawberries require rapid removal of field heat coupled with low temperature storage (0 to 1° C) and maintenance of the cold chain during transport and distribution. With optimum postharvest care and the appropriate cultivar, strawberries have a 7 to 10 day market life.

Insect-Pests:

White grubs and Cut worms:

Cut the root and stem of young plants. Deep ploughing and Drench the soil with Chlorpyrifos @ 2ml/L water.

Root weevil:

Feed on the rootlets; make deep tunnels in the crown base and finally the plants collapse. The application of Carbofuran (6-10 kg/ha) and Parathion (0.017 %) around the plants can effectively control the insect.

Diseases:

Verticillium wilt:

The older leaves turn brown and shrivelled and finally plants may die. The proper crop rotation should follow besides soil fumigation with formalin (5000 L/ha) or Chloropicrin (210 L/ha).

Leaf spot complex:

Spot of different shapes and sizes appears on the leaves during rainy season, which results in drying and defoliation Give 2-3 sprays of Hexaconazole (100 ml/200 L water) or 5 sprays of Carbendazim (100g/200 L water) at 21 days intervals.

Viral diseases:

Stunting of plants and marginal yellowing and upwards curling of young leaves Use of virus free runners, isolation of infected plants and control of aphid vectors with systematic insecticides and use of virus vector tolerant cultivars reduces the problem.

Disorders:

Albinism (lack of fruit colour during ripening) is a physiological disorder in strawberry. It is probably caused by certain climatic conditions and extremes in nutrition. Fruits remain irregularly pink or even totally white and sometimes swollen. They have acid taste and become less firm. Albino fruits are often damaged during harvesting and are susceptible to Botrytis infection and decay during storage.

