

Week - 12: Cultivation of strawberry

Objective:

In this lecture the students will be made familiar with area and production, climatic and soil requirements, varieties, propagation, planting, manure and fertilizers application, after care, irrigation, mulching. flowering, harvesting and post-harvest management of strawberry.

INTRODUCTION

Taxonomical classification

Order	=	Rosales
Family	=	Rosaceae
Sub-family	=	Rosoideae
Genus	=	Fragaria
Species	=	ananassa
Basic chromosome = 7		
Cultivated strawberry is octaploid having chromosome number 56		

INTRODUCTION

- The cultivated strawberry is one of the most important soft fruits of the world.
- Fruit is technically known as an accessory fruit in that the fleshy part is derived not from the ovaries (achenes) but from receptacle.
- It can be grown in different climate ranging from temperate to tropical.
- Strawberry is very nutritive fruit. It is a rich source of vitamins and minerals. Strawberry fruit contains about 0.5% pectin. The flavor of the fruit is due to presence of volatile esters.
- Most of the fruits are consumed fresh and some are processed into Jam, chutney, squash and other food stuffs.. It is used in large scale ice cream making. The fruits are canned and shipped in frozen conditions in western countries.

AREA AND PRODUCTION

- Strawberry is a native of temperate regions, but varieties are available which can be grown in subtropical areas
- The cultivated strawberry (*Fragaria x ananassa*) was first tried in Europe in the early 18th century and represents the accidental cross of *F. virginiana* from eastern North-America, which was noted for its fine flavor and *F. chiloensis* from Chile and noted for its large size.
- Strawberry industries in America was started in the beginning of 18th century, and today nearly 50% of worlds production is in Europe.
- The strawberry is commercially grown on large scale in Europe and North America. Among the European countries, France, Italy, Poland and Spain are the major producers. The other countries having a sizable production of strawberries are Russia, Japan and Turkey.
- The total world production of strawberry is 3822987 MT .
- In India strawberry is commercially grown in plains mainly for fruits and in hills for raising planting material production. The major strawberry growing states in India are Punjab, Haryana, Uttar Pradesh, Himachal Pradesh, Uttarakhand, Jammu and Kashmir and Maharashtra (Mahabaleshwar).

Morphological description

Plate 1. Strawberry plant

- Strawberry is perennial herb, petiole mostly long and channeled above, stipules adnate at the base of petiole.
- Leaves 3-foliolate, leaflets sharply denate, but entire at the more or less wedge shaped base.
- Flowers polygamo-dioecious, rarely hermaphrodite, the male flowers larger, all 5-parted, central flower open first.
- Calyx lobe form flat hypanthium, stamens about 20 or less, filament mostly shorter than receptacle, anthers oblong, receptacles roundish or conic bearing numerous pistils with lateral styles.

Varieties

- Several varieties have been bred in different countries and evaluated under local condition. The varieties recommended for Indian conditions are : Chandler, Camarosa, Sweet Charlie, Ofran, Oso Grande, Gorella, Selva., Sanga Sangana, Belrubi, Shasta, Fern, Tioga and Pajaro

Plate 2. Chandler

Climate and Soil:-

- Strawberry can be grown in all types of climate, but thrives best in temperate climate. It is grown in temperate to sub tropical areas.
- Some cultivars (Gorella, Chandler, Senga Sengana) are adapted to septentrional culture i.e. short days in autumn and hard winter, or to meridional conditions i.e. long days in autumn and moderate winter (cv. Tioga).
- The day neutral cultivars (Selva and Fern) can be grown all around the year.
- Strawberry requires certain minimum amount of dark period (8 hours) for flower bud initiation, but better flowering and fruiting can be achieved if plants are chilled. Under normal conditions flowers are initiated in autumn.
- A temperature of about 22-30°C is considered optimum for plant growth. In cold climates, frost damage and winter injury are major constraints for strawberry cultivation. Blossoms of most June bearing cvs are damaged at -2°C.
- The optimum temperature for period between onset of flowering and onset of ripening should be 14 to 16°C.
- Strawberry thrives best in light soil as heavy soil inhibits root growth and development.
- Sandy loam soils rich in organic matter (4-5%) is best for strawberry cultivation.
- Most of the roots found in the top 15-20 cm of soil, therefore it is essential that top layer of soil should be porous and rich in humus.
- Strawberry is not very sensitive to soil reaction, yet it prefers a light acidic soils (pH 4.6 to 6.4).

PROPAGATION AND NUTRITION

Propagation:-

- Strawberry is commercially propagated by runners.
- Nowadays, tissue culture techniques has been adopted for mass multiplication.
- Propagation by seed is not suitable as the seedling do not come true to type.
- Runners produced from stolon of established plants are commonly used for propagation of strawberry. Although, propagation by runners perpetuates the character of the parent but viral diseases are also transmitted through runners from infected mother plants. Therefore, virus tested clonal material should be selected and planted at 1.2 x 1.2 to 1.8 x 1.8 m distance in land where strawberry had not been grown during past few years.
- For higher runner production, the inflorescence must be removed by hand in order to prevent fruiting.
- Application of GA3 at 50-100 ppm and N at 60-120 ppm increases runner production.

Planting:-

- Land to be used for strawberry cultivation should be prepared by repeated ploughing and removal of weeds and stubbles.
 - The roots of strawberry are confined in the top 40 cm of the soil, therefore 40 cm soil surface should be fertile and friable.
 - A good practice in preparing the soil for strawberry planting is to grow green manuring crops like clover, soyabean and plough them in the soil which helps to increase organic matter.
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- Manure and fertilizers should be mixed during land preparation. High level of phosphorus and potash are desirable for best fruit production.
- Strawberry can be planted on flat beds, in the form of hill rows or matted rows or can be planted on raised beds of 4x4 meters.
- Strawberry is planted at a spacing of 25-30 cm plant to plant and 45-50 cm apart in rows during September to mid of October.
- Plants are to be set with a crown at the soil surface. If the plant are set too shallow, roots tends to dry out and plant may die. Irrigation with sprinkler is given after planting.

Manures and fertilizers:-

- Strawberry requires both organic and inorganic fertilizers for growth and fruit production.
- Apply 50-60 tones/ha well rotten FYM at the time of preparation (pre planting) along with 40 kg P₂O₅ and 30 kg K₂O/ha. Apply 80 Kg of N/ha in two split doses. Half N should be applied after month of planting, and remaining half before blossoming.
- Foliar application of urea (0.5-1.0 %) and micronutrient formulation (0.3%) should be applied 3-4 times before flowering, fruit initiation and fruit enlargement.

Irrigation:-

- It is a shallow rooted plants and grown in sandy loam soil thus require more frequent light irrigations.
- Excessive irrigation is however detrimental which encouraged growth of leaves and stolons at the expense of flower and fruit and also increases incidence of Botrytis rot.
- Irrigation is applied in furrows below the rows.
- The use of sprinkler and drip method of irrigation are more convenient for irrigating strawberries. The results of various studies reveals that irrigation should be given at 100% ET with drip method.

Mulching:-

- After one month of planting, the plants are mulched with black polythene or grass mulch, which will protect the berries from the direct contact with the soil.
- Mulching of strawberries in fall has been found useful as it minimizes winter freezing injury to plants, and suppressing early spring growth, thereby reducing fruit bud frost injury.
- Mulching also suppresses weed growth and reduces soil erosion.
- Poly tunnels can also be used to protect the strawberry fruit from frost in winter.
- Wheat straw and paddy straw can also be used as mulch material.
- Black polythene mulch is very beneficial which is placed after planting by creating the holes at the point of plant.
- Alkahene mulch can also be used over the beds to maintain more favorable soil environment and to protect the plant from cold injury.

CULTURAL PRACTICES

Weed control:-

- Weed control is one of the most serious and expensive management practices in strawberry. The weeds pose a great problem and sometimes become unmanageable specially during rainy season.
- Both chemical and hand weeding is used to control the weeds.
- Application of venzar (lenacil) at 1.5-2.0 kg/ha as pre-planting gives good control of weeds.
- Use of mulches also help in controlling the weeds in strawberry plantations.
- Hand weeding should be done at regular intervals to keep field free from the weeds.

Flowering:-

- Flowering is controlled by photoperiod. Increasing the light intensity in greenhouse-forcing cvs, reduced time of flowering, increased number of inflorescence and fruit set.
- The everbearing cvs (Ozark Beauty, Geneva, Superfaction) initiate and produce flowers throughout the growing season.
- Day neutral strawberry (Tribute, Brighton, Hecker) have gained popularity in different geographical regions.
- Strawberry production may be limited by low temperature during autumn, winter or spring in many temperate regions. Low temperature during bloom, and in the fall and winter can destroy the flowers and buds.
- Flowering in short day cvs. can be induced in long days so long as the temperature is sufficiently low.
- Some cvs have specific temperature requirement for flower bud initiation
- Purner et al. (1984) studied the effects of photoperiods and temperature on day neutral, June bearer (Red chief and Guardian) and everbearer (Qurown and Ozark Beauty) strawberries, They were grown at constant temperature 21 oC 16 hour long days (LD) 9 hours short days (SD) or 9 hour with the dark period interrupted (NI) by 3 hours of low level incandescent radiation. Flowering in day neutral was unaffected by photoperiod, in June bearing flowering was inhibited with NI and LD compared with SD, flowering of ever bearer was promoted by LD compared with SD.

Pollination:-

- Most cultivars produced hermaphrodite flowers. However, imperfect, pistillate and strictly female cvs require cross pollination.
- The anthers open at the sides, sometimes under tension so that pollen is transferred onto pistils.
- Pollens are initially heavy and sticky but later become dry and are carried by wind. However, bees and flies are important agents in strawberry pollination.
- Incomplete pollination results in developing irregular and poorly shaped berries.
- Placement of 2 honeybees hives /hectare is recommended for effective pollination and good fruit set..

Harvesting:-

- Fruits are usually harvested when half to three quarters of skin develops colour.
- A delay in picking increases the percentage of overripe and rotten berries.
- It is conventional practice to harvest the strawberries every third day..

Pests and diseases

Pests:-

(i) Red spider mite (*Tetranychus urticae*):-

- They are red in colour, present on the under side of the leaves.
- They are controlled with the spray of Chlorpyrifos (1ml/L) and acaricide like dienochlor and amitraz.

(ii) Leaf roller :-

- *Eiphyas postvittana* and *Ctenopsestis obliquana* are common leaf roller, affecting strawberries.
- The cater pillars fold the leaves across the midrib.
- Two sprays of endosulfan (1ml/L) in August September controls the pest.

Diseases:-

Gray mold: (*Botrytis cinerea*)

- Light brown soft spot appear on fruits, the berries dry out and covered by a dusty fungus growth.
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