

Strawberry

General information

Botanical Name – *Fragaria × ananassa*

Family – Rosaceae

Origin – France

Chromosome no - $2n = 8x=56$

Ploidy level – Octaploid

Artificial man made hybrid – *Fragaria chilonensis* × *Fragaria virginiana*(diploid sp.)

Mode of pollination – Both self and cross pollination

Major pollinator – Honey bees

Inflorescence – Dichotomic raceme

Fruit type – Etario of achens

Edible portion – Succulent thalamus

Introduction:

Strawberry (*Fragaria* sp.) is a native of temperate regions, but varieties are available which can be cultivated in subtropical climate. In India it is generally cultivated in the hills. Its main center of cultivation are Nainital (district) and Dehradun in Uttar Pradesh, Mahabaleshwar (Maharashtra), Kashmir Valley, Bangalore and Kalimpong (West Bengal). In recent years, strawberry is being cultivated successfully in plains of Maharashtra around Pune, Nashik and Sangali towns. The strawberry is the most widely adapted of the small fruits. Strawberries are grown throughout Europe, in every state of the United States, as well as in Canada and South America. The wide variation in climates within these regions

and the wide adaptation of the strawberry plant permit harvesting and marketing, the fruit during greater part of the year.

Strawberry is a delicious fruit taken fresh in several ways. It also makes excellent ice cream and Jam on account of its rich aroma, and is also a good source of vitamin C. It is a soft and a highly perishable fruit, often shipped in frozen condition in Western countries.

Climate and Soil:

Strawberry thrives best in temperate climate. It is a short day plant, which requires exposure to about 10 days of less than 8 hours sunshine for initiation of flowering. In winter, the plants do not make any growth and remain dormant. The exposure to low temperature during this period helps in breaking dormancy of the plant. In spring when the days become longer and the temperature rises. The plants resume growth and begin flowering. The varieties grown in milder subtropical climate do not require chilling and continue to make some growth during winter.

From the standpoint of response to length of the light period, strawberries are placed in two groups: (1) varieties that develop flower buds during both long and short light periods, the overbearing varieties and (2) varieties that develop flower buds during the short light periods only, most commercial varieties.

Strawberry requires a well-drained medium loam soil, rich in organic matter. The soil should be slightly acidic with pH from 5.7 to 6.5. At higher pH root formation is poor. The presence of excessive calcium in the soil causes yellowing of the leaves. In light soils and in those rich in organic matter, runner formation is better. Strawberry should not be cultivated in the same land for a number of years. It is preferable to plant it in green manured field. Alkaline soils and soils infected with nematodes should be avoided.

VARIETIES

All the cultivated varieties of strawberry are octaploid. A number of cultivars have been introduced and evaluated from time to time. The promising ones are:

Chandler

Fruits is of exceptionally high desert quality with outstanding colour and flavour. Plants are tolerant to viruses. Fruits are large, flesh and skin firm and flavour excellent it is suitable for fresh market and processing.

Tioga

An early maturing cultivar, it is tolerant to viruses, fruits very large, flesh and skin firm, dessert and processing quality good, TSS 12.2% acidity 0.98% and sugar 6.2%. average berry weight about 9gm.

Torrey

Tolerant to viruses, it produces numerous runners. Fruits large, flesh and skin medium firm, dessert quality excellent, processing quality good, TSS12.0%, acidity 0.97% and sugars 6.1%. average berry weighs 6.9gm.

Selva

A day neutral cultivar, it has the capacity to produce off season fruits. It is different from day neutral or ever bearing types. Fruits large, flesh and skin firm, dessert quality good. TSS 11%, acidity 1.0% and sugar 5.5%. average berry weighs 15-18gm.

Belrubi

Fruits large, conical(necked fruit), skin bright red, flesh attractive red, somewhat firm, less hollow at core, high quality, sweet and berry weighs 15gm, TSS 11.8%, acidity 0.98%, sugars 6%.

Fern

It si day neutral, early ripening and over bearing cultivar. Fruits large medium, firm, suitable for fresh market and processing. Average berry weighs 20-25gm, TSS 11.2%, acidity and sugars 0.88 and 6.1% respectively.

Pajaro

It is very successful under summer system. Plants tolerant to viruses. Fruits has good dessert and processing quality. Average berry weighs 7.6gm TSS 12.2%, acidity and sugars 0.9% and 5.5% resp.

Besides, premier, red coat, Local Jeolikot, Dilpasand, Bangalore, Florida 90, Pusa early dwarf and Blackmore are also grown.

Propagation

Strawberry is commercially propagated by runners plants. Generally one plant produces 7-10 runners but under proper management, it can go upto 15 runners per plant. It can also be propagated through crowns (3-5plants /crown), but division of crowns of older plant is too tedious and expensive for cultivars producing runner plants readily. Runner formation can be stimulated with the application of IBA (100ppm) 10 days before flowering, and also with morphactin(50 ppm).

For large scale propagation of virus free plants, tissue culture is widely used. Under favourable conditions, one strawberry meristem can be multiplied to yield more than one million plants in a year. Plants can be regenerated from meristematic callus, anthers and immature embryos.

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, plantings on ridges is advised

Planting Season

The ideal time of planting runners or crowns in hilly areas is September-October. If the planting is done too early, plants lack vigour and result in low yield and quality of fruits. If planted very late, runners develop in March and crops are light.

Runners are uprooted from nursery, made into bundles and planted in the field. These can be kept in cold storage before transplanting. The soil should be frequently irrigated to reduce water stress in the leaf. Defoliation suppresses the plant growth, delays fruiting and reduces yield & quality.

Spacing

Planting distance varies according to variety & type of land. A spacing of 30 cm. x 60 cm. is usually followed. In the model scheme, a spacing of 30 cm. x 30 cm. with a population of 22,000 plants per acre has been considered which was commonly observed in areas covered during a field study.

Training

Four different types of training systems viz. matted row, spaced row, hill and plastic mulch are used to train the strawberry plants. Usually matted row system is followed in India.

Matted row system: This is simplest and least expensive method. The runners are usually planted at 90×45cm spacing. In himachal Pradesh, a spacing of 60×25cm for chandler is optimum. After the initial growth of the first year, runners are allowed to cover the vacant space all around the mother plants ultimately covering the whole vacant space and giving the appearance of mat. It is generally followed in heavy soils which are free from weeds. In this system, more numbers of plants can be accommodated /unit area which give higher yield under suitable conditions. The overcrowding may cause higher fruit rot. Thus care must be taken to maintain the optimum number of plants without overcrowding.

Nutrition

A fertilizer dose of 25-50 tonnes farmyard manure, 75-100 kg. N, 40-120 kg. P₂O₅, 40-80 kg. K₂O/ha. may be applied according to soil type and variety planted. The FYM should be mixed in the soil at the time of preparation of planting bed. Full dose of phosphorus and half dose of potash are placed in the planting rows at 15-20cm depth. Half N should be broadcast in inter row spaces a month after planting and remaining half N and K₂O should be applied at the time of flowering. Foliar spray of N (0.5%) and K₂O(0.2%), 4 times between August and February is also advised.

Irrigation

Strawberry being a shallow-rooted plant requires more frequent but less amount of water in 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. In case of trickle irrigation, 30% water and energy are saved.

Intercultural Operations

The field is kept weed free during the first season by harrowing & ploughing, applying herbicides or plastic sheet. Inter-cultural practices are continued till the straw mulch is applied.

Mulching : In cold climate the soil is covered with a mulch in winter to protect the roots from cold injury. The mulch keeps the fruits free from soil, reduces decay of fruits, conserves soil moisture, lowers soil temperature in hot weather, protects flowers from frost in mild climates and protects plants from freezing injury in cold climates. Several kinds of mulches are used, but the commonest one is straw mulch. Black alkathine mulch is also used to cover the soil. It saves irrigation water, prevents the growth of weeds and keep the soil temperature high.

Growth regulators

Application of GA₃ (50 ppm.) sprayed four days after flowering and maleic hydrazide (0.1-0.3%) sprayed after flowering increases the yield by 31-41%. Morphactin (@ 50 ppm.) improves the fruit size.

Harvesting and Yield

Strawberries are generally harvested when half to three fourths of skin develops colour. Depending on the weather conditions, picking is usually done on every

second or third day usually in the morning hours. Strawberries are harvested in small trays or baskets. They should be kept in a shady place to avoid damage due to excessive heat in the open field.

Plants start bearing in second year. An average yield of 45-100 q./ha. is obtained from a strawberry orchard. However, an average yield of 175-300 q./ha. may be taken from a well managed orchard.

POST HARVEST MANAGEMENT

Grading :Fruits are graded on the basis of their weight, size and colour.

Storage :Fruits can be stored in cold storage at 32⁰C upto 10 days. For distant marketing, strawberries should be pre-cooled at 4⁰C within 2 hrs. of harvesting and kept at the same temperature. After pre-cooling, they are shipped in refrigerated vans.

Packing, transportation and marketing

Packing is done according to the grades for long distance markets. Fruits of good quality are packed in perforated cardboard cartons with paper cuttings as cushioning material. Fruits of lower grades are packed in baskets.

Road transport by trucks/lorries is the most convenient mode of transport due to easy approach from orchards to the market.

Majority of the growers sell their produce either through trade agents at village level or commission agents at the market.

Physiological 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. It is probably caused by certain climatic conditions and extreme in nutrition.

Insect Pests

White grubs, cutworms and hairy caterpillars attack the crop. Areas where strawberries are to be planted should be free from white grubs and cutworms. Application of chlorpyrifos @2ml/litre or malathion (0.05%) on appearance of caterpillars has been found to be effective in most cases.

Diseases

Main diseases reported are leaf spot and grey mould. Application of [carbendazim@0.5g/lit](#) or [hexaconazole@0.5ml/lit](#) at 21 days interval has been found to be effective.