LEC .29 APPLE - SOIL, CLIMATE, PLANTING, HIGH DENSITY PLANTING, VARIETIES, NUTRIENT AND WATER MANAGEMENT

APPLE

Malus pumila

[Syn: *M. commumis , Pyrus malus ;* Family : Rosaceae]

'An apple a day keeps the doctor away'. This is the old proverb which significe the nutritive importance of apple in human diet. Apple is a rich source of easily assimilable carbohydrate (13.4%) and it is also fairly rich in calcium (10mg/100g), phosphorus (14 mg/100g), and potassium (120mg/100g). it supplies vitamin B and C. apple has been under cultivation since time immemorial and today more than 80% of the world's supply is produced in Europe where the major producers are Italy, France, and Germany. Other countries which also produce apple are Hungary, USA, N.C.America, China, Old USSR, India, Spain, Switzerland, Iran and South America.

Climatic and soil requirements

Apple is essentially a temperate crop and grown in temperate region of the world. Under subtropical zone at an altitude of 1600 – 2500 M above MSL also, apple can be grown. Very low temperature during the bud rest favours better crop production. The typical temperate types require 1000 hours of uninterrupted chilling below 7^{o} C for winter rest. After the bud break, during the growth, long day hours with high light intensity, warm days (not hot days) viz., 12 – 15^{o} C and cool nights (not freezing nights) viz., 7 – 8^{o} C are favourable for production of quality fruits in large quantities. The freezing soil temperature can kill the trees. A well drained, slightly acidic (pH 6.5 – 6.7) loamy soil with good depth (45cm or more) is considered to be ideal for apple culture.

Propagation

Apple varieties are propagated by whip and tongue method of grafting. The root-stocks are either related species such as *Malus sylvestris* (crap apple), *M. prunifolia, M. sikkimensis* or their hybrid derivatives or seedling progenies of cultivated varieties. The main aims in

developing rootstocks are either to dwarf the trees, or to have resistance to below freezing soil temperature or high soil temperature, to wooly aphid, root knot nematodes etc. The East Malling Research Station in England developed Malling Stocks (M). John Innes Horticultural Institute, Jointly Merton and East Malling Research Station jointly developed rootstocks (MM) which, are clonally propagated by either cutting or stooling. Some of the important rootstocks developed for specific purposes are as follows:

M9, M – 27 : Dwarfing

M7, MM-106 : Tolerant to below freezing (-40^{o} C to – 35^{o} C) resistant to wooly aphids.

Northern spy : Resistant to wooly aphids (*Eriosoma lanigera*).

Robusta-5 : Developed at Ottawa. Canada as a selection of *Malus robusta* – Resistant to wooly aphid. Other rootstocks used are Merton 779, 793.

Varieties

In India at himachal Pradesh, varieties like king of Pippins, McIntosh, Golden Delicious, Red Gold, Starking Delicious, Yellow Newton and Granny Smith are grown. In Jammu and Kashmir, Irish Peach, Cox Orange Pippin, Kerry Pippin, Ambri, Lal Cider, Golden Delicious, Lal Ambri, Red Delicious, Sunehari and Razakwar are important varieties under cultivation. In utter Pradesh and Fanny, Cortland, Early Shanburry, Golden Delicious, McIntosh, Red Delicious and Buckingham are important varieties.

In the hills of tropical region where warm winter conditions exist, Parlin's Bearty and Tropical Beauty have been judged as the best performers. They require only less chilling for bud break and flowering.

Red Delicious

It is a midseason variety. Widely grown cultivar throughout the world. Evolved as a chance seedling in Iowa, USA. Fruits are large, oblong conical with 5knob like projections at calyx end. Smooth skin covered with red streaks on a plain background. Flesh creamy white, tender, crisp, fine grained, sweet and highly aromatic. A number of strains like Starking Delicious (Royal Delicious), Ruby Red, Red Spur, Red Chief, Richard Delicious have been developed from this cultivar.

Jonathan

It is also a mid season variety, fruits are round to conical in shape medium to small in size and reddish in colour.

Golden Delicious

It is a late variety with moderate vigour. Fruit medium to large, oblong, skin golden yellow with russetted prominent small dots scattered all over. Flesh creamy white, firm, crisp, sweet with a blend of acidity. It is a good pollinizer for all Delicious group.

McIntosh

It is a mid season variety. Trees are vigorous. Fruits are medium in size, oblate round, skin smooth, shining carmine colour on pale green background. Flesh White, develops red shade after storage, tender, crisp, sweet with a good acid blend, juicy and mild flavoured. But this cultivar is scab susceptible.

Bramely Seedling

It is an English cooking apple ideal for stewing especially baking. Skin deep green, waxy sometimes with a slight orange red blush.

Jona gold

(Triploid) Golden Delicious x Jonathan. Developed in New York. Fruits large with attractive red strips and have good storage life.

New Jona Gold

A virus free clone of Jona Gold at Japan with super grade having high red colour intensity.

Kent

A hybrid between (Diplod) Cox and Jonathan. Late maturing variety; fruit slightly conical with dark red colour on a green background. For this, Golden Delicious and Sparten are good pollinizers.

Chaubattia Anupam

Developed at Chaubattia from a cross Early Shanburry x Red Delicious. Fruits medium in size, skin smooth, thin shining yellow almost entirely flushed are striped red; flesh is firm, crisp, creamy white, juicy, sweet with distinctive aroma.

Shamrock

A cross between irradiated McIndosh x Starkspur strain of Golden Delicious. It is green apple identical in appearance and taste with Granny Smith but matures six weeks earlier.

Romus-2

Released from Romania, resistant to scab. Early maturing (mid july onwards). Fruits are medium sized (120g) red in colour with good flavour.

Kodaikanal-1

A clonal selection made from Parlin's Beauty at Horticultural Research Station, Kodaikanal in Tamil Nadu. Adapted very well to warm winter conditions prevailing in South Indian Hills. Fruits is medium weighing 150g, global in shape with crisp flesh which is moderately juice. Fully rips fruits are attractive yellow in colour with crimson drop.

Applethrope Summerdel

Cross between Delicious x Earliblaze, fruits medium in size 6.5 – 7.5 cm dia. Globose to flat globose. Flesh creamy white to yellow, medium coarse texture, firm, juicy and sweet. Developed at Granite Belt Horticultural Research Station, Queensland, Australia.

Richelien Apple

Developed at Canada Agricultural Research Station by a multiple cross involving Melba, McIntosh, Jonathan, Rome Beauty and *Malus floribunda*. Even after full ripening, it hangs on the tree for 10 days without loosing its firmness. It has good flavour.

Freedom

Developed at New York. Highly resistant to scab. Fruit is large in size and oblate in shape with firm moderately coarse flesh.

Planting

Pits of size 60 x 60 x 60 cm are dug at a spacing of 5 M x 5M. For effective fruit set (since self incompatibility exists in most cultivars) pollinating varieties are interplanted. Usually one in six or one in nine plants is used as pollenizer in self-unfruitful varieties. In intensive system, planting is done at 4M X 2.5 M or less. A complete row of pollenizer is used for every two rows of main variety.

High Density Planting (HDP) and Medium Density Planting (MDP)

For this dwarfing rootstocks like M9,M4,MM106 and M26 have to be used. The grafts are planted at a close spacing of 2M X 1M, so that 5000 plants/ha. Are accommodated. But in

comparison with M. D. P. where in the total number of plants accommodated was 1666 trees/ha (3 M X 2 M), the H. D. P. did not give much yield. An additional yield of 50% more than HDP can be obtained from MDP. The fruit colour and quality also better in MDP than HDP.

Training and pruning

Training is done to give a desired shape as well as to get a canopy for intercepting maximum sunlight so that all the portions of the tree get sunlight and become productive. The trees are trained as central leader, open centre, modified leader, cordon, dwarf pyramid, espalier, tatura trellis and Lincoln canopy.

The apple bear fruit buds in a past season growth called spur. In the established spur system, permanent fruit spurs are obtained on laterals by heading back the leader every year. The strong erect laterals near the central leader are removed leaving wide angled vigorous laterals for formation of spurs. In regulated syatems, the crowed weak and shaded branches are removed leaving leader and strong laterals are grow.

Manures and manuring

Apple trees require all the mineral elements. Depending on the soil type, rootstock, a quantity of 500g of N, 250g of P, 750g of K/ tree can be applied.

Deficiency of calcium will lead to physiological disorder in apple fruit called ‘bitter pit’ or ‘cork spot’. Bitter pits appear as slight indentation in the skin usually towards the calyx of the fruit. These areas turn brown and soft dried pits of collapsed tissues develop. In fruits, colour changes and cracks develop. Spraying 0.5 % calcium chloride during the later development of the fruit. 4 times at 14 days interval will help to reduce the deficiency symptom.

Boron deficiency also causes internal browning of fruit and corking spots on the flesh (internal cork) and sometimes as cork tissue in the skin (external cork). Sparying sodium borate @ 10g/ lit. 3 times during flowering and fruit set will help to correct the disorder.