MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Sc. (Hons.) Agriculture

Semester	:	I	**Academic Year**	:	2018-19
Course No.	:	HORT-243(New)	**Title**	:	Production Technology for Fruit and Plantation Crops
Credits	:	2 (1+1)	**Total Marks**	:	40
Day & Date	:		**Time**	:	
Note:	1. Solve ANY EIGHT questions from **SECTION "A".** 2. All questions from **SECTION "B"** are compulsory. 3. All questions carry equal marks. 4. Draw neat diagrams wherever necessary.				

MODEL ANSWERS

SECTION "A"

Q.1 Discuss importance of fruit and plantation crops in India.

Importance

- Rich source of minerals & vitamins (protective food)
- More yield than agronomical crop in unit area
- More energy in less area (0.6 ha Wheat = 0.02 Ha Mango)
- Full utilization of land , water & labour round the year
- Can be grown in rainfed condition (87% in Maharashtra)
- Financial stability to farmers (continuous flow of money)
- Ability of earning foreign exchange
- Mixed, multi-storey, intercropping, crop diversification
- Raw material to various industries
- Employment generation
- Fruit crops maintain ecological balance
- Fruit trees helps to reduce soil erosion
- Fruit trees reduces family budget

(The brief information may please be given with suitable examples where ever requites)

Q.2 Write short notes on

a) i. High density planting

b) ii. Propping & wrapping in banana

a) **i. High density planting:** - High density planting means to increase the plant population per unit area called as high density planting. The benefits of high density planting are it helps to increase the yield per unit area, to harvest export quality fruits, it helps for maintenance of the fruit crops with minimum cost. This concept now becoming popular amongst the fruit growers. But the life span of the fruit crops are reduces as compared to traditional system of planting as well as high density crops requires regular pruning to maintain the canopy of fruit. E.g. Mango regular spacing 10 x 10 m, high density spacing

5 x 5 m

ii.Propping: - It is an essential cultural practice to give proper support to the banana plants with bamboos. It is done to avoid falling down of plants due to high winds.

Wrapping: - To protect banana fruits from sunburn, hot wind and dust the bunch is covered with polythene sheet or gunny bag. Wrapping is also done to improve the colour of the fruit.

Q.3 Write cultivation of Mango on the following points

1. Soil & climate
2. Propagation & planting
3. Manuring & Irrigation
4. Harvesting and yield

i. **Soil:** Lateritic, Alluvial, Sand loam & sand, slightly acidic and well drained, one meter in depth, rich in organic matter, pH 7.5. **Climate:** Tropical and sub-tropical crop, Temp. 24-27 ^{0}C and in summer 45 ^{0}C average rainfall 750-1000mm.

ii. Propagation & planting material: Soft wood, stone & approach grafting. Planting in high rainfall area at the end of monsoon and low rainfall area it to be done in early part of the monsoon planted at the spacing of 10 x 10 m and in close planting it is to be done at 5 x 5 m.

iii. Manuring & Irrigation: 1st year of planting the manures and fertilizer should be given as 10 kg FYM, 150 gm N, 150 gm P_2O_5 and 100 gm K_2O per plant. This increased up to 9 years and 10 years and above 100 kg FYM, 1.5 kg N, 1.5 kg P_2O_5 and 1 kg K_2O in the form of SOP/Plant. It is given in two split doses one June – July and Second in Oct. Irrigation in winter 6-7 days interval, in summer 2-3 days interval for young plants. For full grown trees 14-15 days interval in winter and 10-12 days interval in summer.

iv. Harvesting and yield: When colour of fruit change green to yellowish and one or two ripe fruits fall from the plant naturally then it should be harvested with help of mango harvester. Yield varies from 300 to 1000 fruits per plant. 5 to 15 t/ha.

Q.4 Write cultivation of Banana on the following points

1. Soil & climate
2. Improved varieties
3. Propagation & planting
4. Harvesting and yield

i.Soil: All most all types of soil. Banana is a heavy feeder crop. Therefore, fertility of soil is very important. Rich, well drained, fertile, free working soils with plenty of organic matter are best suited for cultivation. The optimum range of pH of soil should be 6 to 8. **Climate:** Being a tropical crop, banana requires warm, humid and rainy climate. The optimum temperature range is 10 to 40^{0}C and the relative humidity is 90% or above. It is highly susceptible to frost and cannot tolerate arid conditions. Strong desiccating winds cause considerable reduction in the growth of the plant and yield and quality of fruits.[MSL to 1200 m]

ii. Varieties: Following are the major banana varieties grown in India

Poovan: It is the most important commercial variety in Tamil Nadu, Andhra Pradesh and West Bengal. It is also known as Lal velchi in Maharashtra. It is resistant to Panama wilt,

Dwarf Cavendish or Basarai: It is a dwarf variety. It is resistant to Panama disease. It is a high yielding variety with fruits large and of good quality.

Robusta or Harisal: Fruit colour remains green when ripe. It is best variety for the export purpose.

Rasthali or Mutheli: It is a good variety but susceptible to Panama disease

Rajeli or Nendran, Sonakela, Safed Velchi.

iii. **Propagation & planting :**

Sucker – Daughter plant

- Water sucker with large leaves (yield early, low yield)
- Sword sucker with thin leaves (yield late, bunches large & heavy yield)
- Sword suckers along with the bulbous base from parent rhizome – Ideal
- Sword sucker below 3ft height, 3 to 4 months age & minimum weight 500- 800 g.
- Commercially kept for 3 years

Tissue Culture

- Disease free planting material
- Uniform flowering & fruiting
- Early, high & quality yields

Planting: Planting is done by two methods viz. Pit method and furrow method. Planting is done from February to May whereas in North India, it is done during July-August. In South India, it can be done any time of year except summer. Tall varieties should be planted at 3 x 3 m where as dwarf ones at 2 x 2 m apart.(Pit size 1x1x1 ft)

iv.Harvesting and yield: Harvesting of banana is done 12 to 15 months after planting in dwarf and 15 to 18 months after planting in tall varieties. Signs of maturity of banana fruits are, fruit becomes plumpy and angles are filled in completely, when tapped gives metallic sound, drying off of top leaves and change in colour of fruits from deep green to light green. Tall varieties like Poovan yield 15-25 tones/ha, while Dwarf Cavendish yield 25-50 tones/ha. It can be stored at temperature slightly above 55^0F and relative humidity of about 85-95% for about three weeks.

Q.5 Discuss different physiological disorders and their control in citrus.

Fruit drop: In spite of very high initial flowering and fruiting in mandarins, the ultimate yield is often low primarily owing to heavy fruit drop. However, all fruits that fail to mature do not drop at one time but at different times. There are more or less definite periods or stages when extensive dropping occurs. In mandarins, the shedding of flowers and fruits come in more or less in 3 distinct waves. The first wave occurs soon after fruit setting, second during May–June known as June drop and third one known as pre-harvest drop, i.e. the drop of mature fruits before harvesting. Fluctuating temperature, low atmospheric humidity, imbalance of soil moisture, lack of proper nutrition, hormonal imbalance, incidence of insect-pests and diseases are some factors causing fruit drop. Accordingly, maintenance of appropriate soil moisture level during fruit development and application of growth regulators 2, 4-D (10ppm), NAA (5ppm), 2, 4, 5-T (5ppm) check fruit drop quite effectively. Further, application of Aureofungin @ 20 ppm helps in better retention of fruits through control of fungal diseases.

Granulation: It is a physiological disorder of juice sacs of citrus including mandarins wherein they become comparatively hard, assume a greyish colour and become somewhat enlarged. The concentration of pectic substances increases, whereas there is reduction in juice content, TSS and acid content. Because of low sugar and acid content, the granulated vesicles become rather tasteless and colourless. Young, vigourous trees are

more likely to develop granulated fruits than older ones. Similarly, large fruits have more granulation than small ones. In addition, granulation increases as the picking season advances. The incidence of granulation is highly specific to the type of the mandarin being cultivated. It is favoured by high relative humidity and temperature during spring.

Spraying of lime reduces the extent of granulation. Reduction in irrigation also lessens its incidence. The applications of 2, 4-D (12ppm), zinc and copper reduces the incidence of granulation considerably.

Decline: After fruitful production for about 15 years, mandarin orchards start bearing little crop and become uneconomical. They show symptoms of ill health and decline. The affected trees do not die completely but remain in state of decadence and unproductiveness for a number of years. Initially, only a few limbs of the plants are involved but later whole tree is affected. Plants show sparse foliage, stunted growth, sickly appearance and in leaves, mid-rib, lateral veins and inter-veinal area show diffused yellow colour leading to ultimate shedding of leaves. As a result of dieback, twigs become short and bear only a few narrow leaves at their basal ends. Such plants are also characterized through excessive flowering and very poor fruit set. Unfavourable soil conditions (presence of hard pan, high pH, poor drainage and high salts), malnutrition, poor orchard management, indiscriminate use of fertilizers, intercropping, incidence of insect-pests and diseases are major factors contributing to it.

Good cultural practices, improvement in soil fertility and drainage, control of insect-pests, nematodes and diseases may be useful to minimize its incidence. Use of resistant and compatible rootstocks and certified bud wood for propagation are strongly recommended for a healthy and productive mandarin orchard.

Q 6 Write short notes on (Any two)

c) **i. Varieties of apple – Varieties:** Apple varieties fall into two categories; diploids and triploids. Diploids have plenty of good pollen and are self-fruitful. Triploids are self-unfruitful and become productive only when pollinated by using suitable pollenizer varieties. Even self-fruitful varieties have to be interplanted to get commercial crops through cross-pollination. Varieties selected for interplanting should sufficiently overlap in their blossoming periods. Important varieties are listed below;

Himachal Pradesh: Red Delicious, Golden Delicious, Worester Pearmain, Newton Wonder (all diploids) Cox's Orange Pippin (triploid), King of Pippins (No. 13), Starking (Royal) Delicious and Richard.

Kashmir valley: Red Delicious , Baldwin (triploids), Ambri Kashmiri, White Dotted Red and Blood Red.

Simla hills: Beauty of Bath (triploid), Red Delicious, Jonathan, Rome Beauty (all diploids), Early Shanburry, Red Astrachan, Red Sudeley, Stayman Winesap, Winter Banana and Yellow Newton.

b) ~~ii.~~ **Maturity indices, harvesting and yield of papaya –**

After transplanting the trees will flower about 6 months later and the fruits will mature in about 4-5 months. Normally a yield of 100 fruits per tree can be expected. The fruits can

be harvested for about 1 ½ to 2 years after which they can be topped to produce secondary branches for more fruits. The yield of papaya is very variable depending mainly on variety, soil and climate, plant density and crop management. The fruits are harvested when they are of full size, light green with yellow tinge at epical end. On ripening certain varieties turn yellow while some varieties remain green.

The latex of the fruit becomes almost watery. The individual fruits are harvested by giving a slight twist with the hand or by using a sharp knife. Fruits for local market can be harvested when they are half ripe. Fruits are not allowed to fall on the ground or come in contact with soil while plucking. On an average, yield of 40-55 tonnes/ha may be expected in a season from an orchard of papaya with well crop management.

Harvested fruits are packed for export in a single layer in corrugated fibreboard cartons lined with low density polyethylene film, storage period of mature fruits is 3 weeks at 10 ^{o}C.

iii. Important Varieties of arecanut:-

Mangala, Sumangala, Sree Mangala, Mohitnagar etc.

Sriwardhini – Dr. B.S.K.K.V. Dapoli fruits large, more white portion yield 2 kg/tree (dehusked nuts)

Q. 7 **Write in detail cultivation of coconut on the following points.**

1. Soil & climate: Lateratic, Lateratic red, sandy, alluvial sandy, alluvial coastal, black soils are good for its cultivation pH 4.5-6.8 Coconut is humid tropical plantation crop, mean annual temp. 27^{0}C, Rainfall-well distributed 800-2500 mm/year, Altitude-Sea level to 600m from mean sea level. Humidity 80-90%, Sunshine-Open situation.

2. Propagation & Selection of seedling: Coconut is commercially propagated by seed nut. Selection of seedlings for planting -: 1) Early germination 2) Broad and dark green leaves 3) Early splitting of leaves 4) Short and broad leaf stalk 5) Straight and short stem 6) Good girth at collar 7) Tendency to produce large no. Of roots.

3. Improved varieties: Pratap, TxD, Banawali green round, TxD (Kera sankara), Chandrakalpa (LO), Philipines ordinary, DxT, DxT-2.

4. Harvesting and yield: Harvesting is done by climbing on individual palm. Nuts are harvested after 11-12 months for dry copra 5-7 months for tender coconut & water & 9-11 months for mature nuts and fresh copra. Yield 100-150 nuts/tree/year.

Q. 8 **Write in detail cultivation of Cashewnut on the following points.**

1. Soil & climate: Cashew is raised on laterites, red soils and coastal sands. In the East coast it is grown on porous and poor sandy soils. In the west coast it is grown on laterites.

Sandy loam soils having 3 meter depth are ideal for cashew nut cultivation. The crop cannot stand water logging but can stand drought. It requires a pH of 6 to 7.5. It is a hardy tropical plant. It grows between 28^0 N and South latitudes. It grows to 1000 m elevation. It is profitable up to 600 m. It requires a well distributed annual rainfall of around 500 mm. It can stand 300 to 400 mm. Rainfall should spread over 5-7 months with 3-4 months of dry period before flowering. It requires 15 to 40 ^{0}C temperature. Mean annual temperature should not be less than 20 ^{0}C. It is sensitive to cold. If relative humidity is less than 10%, leaves scorched and fruits drop. Excess humidity favour incidence of pests and diseases. Proximity to sea is favourable (160 km)

2. Propagation & Planting: It is propagated by seed and by vegetative means. It is used to collect seed from high yielders. Elite mother tree should have the following characters 1. Compact canopy. 2. Dwarf trees with intensive branching 60% or more productive shoots per unit area. 3. Short flowering phase (2-3 weeks). 4. More than 20% bisexual flowers. 5. 5-8 fruits per panicle. 6. Medium nuts with 5-6 grams average nut weight (120 to 130 nuts per kg) 7. Regular bearing habit.

Vegetative propagation: Methods like air layering, patch budding, veneer grafting, side grafting, 6picotyls grafting, soft wood grafting were found to be successful. However, soft wood grafting has become more suitable and commercial method of propagation of cashew nut. Pit size: 50 cm3. Pits at 8-10 meter spacing are dug during April – May and are refilled with top soil mixed with 25 kg FYM. Planting is to be done during July August. Plant one year old graft. Provide water and support.

3. Improved varieties: Maharashtra – Vengurla 1 to 9, Tamilnadu – Vridhachalam 1 and 2, Andra Pradesh- BPP 1 to 9, Karnataka – Ullal 1 and 2, Kerala – Anakkayam 1, BLA 39-4, K22 -1,

4. Harvesting and yield: Harvesting commence from February on west; April on East coast. Fallen fruits are gathered. In Goa, fruits are plucked from the tree for preparation of a liquor called Feni. After gathering fruits, nuts are to be separated from apples. Nuts sun dried for 2 to 3 days, stored in gunny bags nuts should not be dried for more than four days, since they become brittle and break during processing and cause damage to the kernels. Yield depends on strain, soil, rainfall, sex ratio, fruit set and management. Individual tree yields vary particularly in seedling progenies. Highest yields are obtained in Kerala. Yield at 15 years age is 1.5 tonn/ha.

Q.9 **Describe cultivation of grapes with respect to following points**

i . Propagation and rootstocks **ii. Training and prunning**

iii. Varieties **iv. Harvesting and yield**

i.Propagation-

Grapevine is most commonly propagated by hard-wood cuttings, though propagation by seed soft wood cutting, layering, grafting and budding is specific to certain situations. Occasionally, unrooted cuttings are also planted directly in the field in the pre-determined position for a vine.

For hardwood cuttings, IBA, 1000 ppm treatment is useful for early, better and uniform rooting of cutting.

For grafting Dogridge, Ramsey, 1616, 1613,1103P, So4, etc. are used.

Sometimes the rootstocks are planted in the field and there they are grafted with suitable varieties.

ii. Pruning and training: The vines are trained on a suitable trellis i.e. 'T', 'Y', 'H' or bower and regularly pruned twice in a year. First annual pruning is done during the month of April to get the new vegetative growth while second pruning to get the crop is done during the month of October. While doing April pruning 0 to 2 buds on arm are kept while doing October pruning 5 to 10 buds on fruiting cane are kept. Use of HCN is done to have early, uniform and higher sprouting particularly after winter pruning is made.

iii. Varieties

Table purpose seeded varieties –Cardinal, concord Emperor, Italia, Anab-e-shahi, Cheema sahebi, Kalisahebi, Rao Sahebi,

Seedless varieties – Thompson seedless, flame seedless, kishmish chorni, perlette, Arkavati.

Raisin purpose varieties – Thompson seedless, manik chaman, sonaka, Black corinth, Black monukka, Arkavati, Dattier

Wine varieties – Chardonnay, Cabernet Saurignnon, Bangalore Blue, Muscat, Blanc, Pinot Noir, Pinot Blane, White Riesling, and Merlot.

iv. Harvesting and yields: Normal grape harvest season starts in February and continuous up to end of April. Well matured bunches having at least 18^0 Brix are harvested. Av. yields - For seedless varieties - 20 to 30 t/ha/y. For seeded varieties - 40 to 50 t/ha/year.

Q.10 **Write about cultivation of guava with respect to following points**

i . Planting **ii. Nutrition**

iii. Varieties **iv. Harvesting and yield**

i.Planting

Land is prepared during the summer season by ploughing, harrowing, levelling and removing weeds.

Square system of planting is generally adopted. Pits of 1x1x1m size are dug before the monsoon and filled with a mixture of farmyard manure and soil. (10 kg FYM + 1.5 Kg SSP + 100 g Carbaryl)

Planting is done during the rainy season. June-July is the ideal time for planting the layers and seedling. Staking is done with bamboo sticks.

Standard spacing is 6 m x 6 m (278 plants/Ha).

ii.Nutrition

During Planting: For quick and better growth 25- 30 g N

1st year: 20 to 30 kg FYM + 125 g N: 50 g K & P

4th years onwards: 100 kg FYM, 600:300:300 g

FYM , ½ N, P & K during Bahar & ½ N after flowers

Never receive manure in practical, but never suffers from excessive manuring.

Also not suffers from consequent vegetative growth as fruit bear on new growth only

Zn deficiency is observed in water logged area, area between veins develop yellow patches, leaves become small and bearing reduced.

iii. Varieties - L-49, Allahabad Safeda, Lucknow Safeda, Apple Colour, Chittidar, Red Fleshed, Allahabad Surkha, Sardar, Mirzapuri Seedless, CISH-G-1, CISH-G-2, CISH-G-3

iv. Harvesting and Yield -

The plants start bearing at an early age of 2-3 years but they attain full bearing capacity at the age of 8-10 years. The yield of a plant depends on its age, cropping pattern and the cultural practices. A 10 year old plant yields about 100 to 150 kg of fruits every year. If both rainy and winter season crops are taken, more yields may be obtained in the rainy season. Peak harvesting periods in *north* India are August for rainy season crop, November- December for winter season crop and March-April for spring season crop. Guava fruits develop best flavour and aroma only when they ripen on tree.

The stage of fruit ripeness is indicated by the colour development which is usually yellow. For local markets, fully yellow but firm fruits are harvested, whereas half yellow fruits are picked for distant markets. Fruits are harvested selectively by hand along with the stalk and leaves. The guava yield ranges from 10 to 11.25 t/ha.

SECTION "B"

Q.11 Match the following

A		B
1) ~~i)~~	Jackfruit	5) a) Moraceae
2) ~~ii)~~	Pomogranate	6) ~~b)~~ Solapur Lal
3) ~~iii)~~	Strawberry	d) ~~e)~~ Runner
4) ~~iv)~~	Coffee	c) ~~d)~~ Rubiaceae

Q.12 Fill in the blanks with appropriate words

1 Pusa Nanha is the variety of **Papaya.**

2 Botanical name of plum is ***Prunus domestica***.

3 *Citrus aurantifolia* is botanical name of **Kagzi lime**.

4 Pineapple is propagated by **sucker/slips.**