Model Answers

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE

SEMESTER END EXAMINATION

B.Sc. (Hons.) Horticulture

Semester	: III (New)			Academic Year	: 2018-19
Course No.	: H/FS- 234(N)	Title	:	Temperate Fruit Crops	
Credits	: 2 (1+1)				
Day and Date	:	Time	:	Total Marks	: 40

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.

SECTION –"A"

Q.1 Explain in brief importance and scope for cultivation of temperate fruits in India.

Ans: Importance:

1. Temperate fruits can play important role in boosting economy of the farmers from hilly areas.
2. High nutritive value of temperate fruits eg.Apple,Walnut,Kiwi
3. Used in processing industry on large scale eg.Apple Jam,wine,cider
4. Rate of Apple, cherry and kiwi is higher than any other tropical and subtropical climate
5. Due to climatic condition in hilly areas its storability is more than any fruit crops so these fruits gave constant returns to growers

Scope:

In country like India there is a great demand for above mention crops round the year so there is large scope for area expansion with high density planting, dwarfing root stocks and modern training and pruning methods

Area Expansion : Both North-West and North-Eastern regions of India offer large areas ideally suitable for cultivation of pome and stone fruits. In the North-West India, stone fruits like peach, plum and apricot come up well at elevations between 900 to 1500m with an annual rainfall of 90-100cm. Apple, cherry and pear are commercially successful at elevations between 1500-2700 m above msl. The cold arid regions between 1550-3650m with annual rainfall of 25-40 cm are again highly suitable for dry nuts and drying type of apricots. There are vast tracts of land still available for further expansion of these crops.

In the North-Eastern Hills, excepting the rain shadow belts of Arunachal Pradesh and high altitude area of Sikkim, apple may not be successful commercially. Other crops like pear, peach, plum and apricot offer good scope for further expansion.

Widening the Cultivar Base

The low productivity and poor quality of apple are often linked with monoculture of a few old cultivars and their degeneration over the years. The Uttarakhand hills, particularly Kumaon division, have the unique advantage of harvesting apple fruits for early market. Similarly, the rain shadow belts in North-Eastern Hills can offer good quality apple for the eastern Indian markets, thus reducing the cost of long distance transportation from North-Western Hills. Part of the markets of Bangladesh can be captured by the fruits of the North-East. There is good scope for introduction of new promising cultivars, replacing the Delicious group. Similarly, use of clonal rootstocks of Malling and Malling-Merton series and even their indexed material 'EMLA' selections is greatly changing the productivity and quality of fruits. High density planting with spur type cultivars offer a good scope. The identification of low chilling peach, plum and pear cultivars offer good possibilities for their cultivation in the low hills and in sub-tropical plains. Some of the new hybrids, including scab resistant apple cultivars need verification trials on a commercial scale.

Management Practices

Scientific water management and practicing proper training and pruning of trees including introduction of renewal pruning techniques, will make significant impact on increased production even in the existing orchards. Drip irrigation, *in-situ* water harvesting and correcting macro and micro-nutrient deficiencies will go a long way in bringing notable improvement in productivity as well as fruit quality. By adopting IPM strategy and organic farming practices, selected export markets can be targeted well.

Processed Products

There is immense scope for increasing various processed products of pome and stone fruits, for which technologies are available. The existing capacity of the most organized processing unit of HPMC is only marginal as compared to the volume of fruit available for processing.

The expansion of grading and packing stations, their further modernization with mechanical grading equipment, use of CFB boxes and more number of pre-cooling and cold storage units will improve the marketing system and enhance marketability of the produce. Apple has been identified as one of 6 most promising fruits for fresh fruit exports.

Q.2 Describe the cultivation of apple on following points.

1. **Soil and Climate**
2. **Propagation and planting**
3. **Varieties**
4. **Harvesting**

Answer:

Soil and climate:

Soil: Loamy soil, rich in organic matter having a pH of 5.5 to 6.5 with general to moderate slope, proper drainage and good aeration are most suitable. The site should be free from hard substrata and waterlogged conditions.

Climate: Most of the apple varieties require 1000-1500 hours of chilling be 7" C during winter to break the rest period. These conditions are available a elevation of 1,500-2,700 m above mean sea-level in Himalayan ranges. By large, the average summer temperature should be around 21 °_24° C during a growth period. The areas with frost-free spring and adequate sunshine during summer without wide fluctuations in temperature are most suitable for cultivation. Fully opened blossoms may be killed at temperature below 2.2^{0}C. The optimal temperature for pollen germination and fruit setting is 20^{0}C to 21^{0}C

Varieties: Red delicious, Starking delicious, Granny smith, Golden delicious

Propagation and Planting

Apples are propagated on seedlings of crab apple or self pollinated varieties. Golden Delicious, McIntosh, Yellows Newton and Northern Spy good seed viability, germinability and seeding growth. The common method of propagation of Clonal rootstocks of apple is mound layering (stooling). The rooted layers of the clone are planted in well-prepared stool beds during winter at a distance of 30 cm in the row and 60 cm apart. The 3 to 4 years old layers give rise to numerous suckers during spring. The suckers are covered with the soil before monsoon. The suckers are ringed or notched near the base during the rainy season and covered with soil to encourage rooting. The difficulties-to- propagate rootstocks like M 9 need the treatment of 1,000 to 2,000 ppm IBA at the notched portion for quick root initiation. The rooted layers are separated at the onset of dormancy (December) and lined out in nursery beds for further grafting with scion varieties during February-March. The rootstock should be healthy and disease free and should attain the thickness of 0.9 to 1.25 cm at grafting height for proper bud-take success. The growth of the rootstock should be straight and upright, with proper root development. Scion should be collected from bearing trees only. One year old shoot growth is ideal for scion wood. Scion sticks should have only vegetative buds and not the reproductive buds. The scion wood should be healthy and disease free. They should have 3-5 well developed buds with smooth internodes. These should be collected during dormancy. Tongue grafting is the ideal method of grafting scion cultivar on rootstock with more than 90 % bud-take success. The scion should be gra 15-20 cm above the

ground level. February-March is most suitable time of to grafting. It should be just before the bud-break.

Planting

The planting distance varies according to variety, vigor of roots fertility of soil and climatic conditions.. In flat and valley areas, the planting done in square or hexagonal system of layout. However on slopes, contour terrace planting is preferred. The usual pit size is 1 x 1 m x 1 m without any pan or rock at its base or on the sides. The pit should be dug and filled up month before planting. The top soil and sub-soil should be piled separately digging. Top soil must be filled first followed by sub-soil on the top to imp the fertility of lower layer of pit. While pit filling, 40-50 kg well rotten farm. Manure and 500 g of superphosphate should be mixed in soil. The soil is all to settle for one month before planting. An early planting of apple in December- January is desirable for proper establishment. Graft union should be kept2i above the ground level to avoid collar-rot and scion rooting. In standard plantations, the plants of standard varieties grafted seedling stocks are planted at a distance of6 to 7.5 m, accommodating 180· plants/ha. The planting distance can be reduced according to the vigor rootstock. The Clonal rootstocks particularly dwarfing and semi-dwarf rootstocks should be used where the soils are flat, fertile and irrigated.

HARVESTING AND POSTHARVEST MANAGEMENT

Since apple is climacteric fruit, the maturity of fruits does not coincide with ripening. The fruits usually do not attain fully ripe edible quality on the tree while harvesting. The fruits should be harvested at proper picking maturity to attain proper edible quality at ripening.. Picking of immature fruits results in poor quality fruits lacking flavor and taste which shrivel during storage. Over-mature fruits develop soft scald and internal breakdown with poor shelf-life. There are several maturity indices which can be adopted in proper fruit harvesting. The TSS of fruit pulp, ease in separation of fruit from spur, change in ground surface colour from green to pale, change in seed colour to light brown, fruit firmness and days from full bloom to harvest are some re able maturity indices for apple which can be considered singly or in combination. All the fruits do not mature evenly on trees depending on the time and number of lower flushes. Thus, more than one picking are required. Apple fruits should be picked in such a way that bruising and stem punctures are avoided and pedicel must remain with fruit.

Q.3 Write in brief about cultivation of Kiwi and Cherry on following points.

1. Soil and Climate
2. Propagation and planting
3. Varieties
4. Yield

Kiwi Cultivation:

1. Soil and Climate: For kiwi deep sandy loamy soil is suitable. A soil pH less than 6.9is beneficial. In India kiwi successfully grown at 800-1500 m above mean sea level. A rainfall of 150 cm/year is sufficient.

2. Propagation and Planting

The propagation through cuttings is most rapid and suitable method of multiplication. Various types of stem cuttings - hard wood, semi-hardwood and soft-wood are quite successful. The cuttings 0.5-1.0 cm thick with relatively short internodes and 15-30 crn long are ideal. Hard wood cuttings are prepared during the dormant season (January-February) from the previous year summer growth. Well matured dormant shoots are used for cuttings having at least 3 healthy bold buds from middle of the shoot. Tips of the shoots should be avoided as they give a very low rate of rooting. The cuttings of the central and basal parts are ideal. Cutting having more number of spurs should not be selected. The cuttings should be planted, 6-8 cm apart in rows spaced at 12-] 5 cm. The nursery bed should be thatched or shaded with shade net. The kiwi planted at the distance of 6 x 6 m.

3. Varieties

The kiwi varieties are Allison, Bruno, Hayward and Monty and Tomuri

4. Harvesting

Harvesting starts after 4-5 years of planting and obtained commercial yield at the age of 8-9 years. In H.P fruits are harvested from November last week to December. The yield varies from 20 to 100 kg/vine.

Cherry Cultivation:

Cheery is confined to Kashmir, Himachal,hills of Uttar Pradesh in India.

Soil and Climate

Cherry requires colder climate. It is grown successfully in areas 2,000 and 2,7000 m above mean sea-level, requiring 1,000-1,500 1m period during winters.The soil must be Well-drained deep sandy loam soils with pH 6.5-7.0.

Propgation and Planting

Cherry is commercially propagated by mound layering.Cherry is planted at the spacing of 6 x 6 m.

Varieties: Early Purple Black Heart, Guigne Lucenta, Guigne Noir Hative, Guigne Pourpo Bigarreau Napoleon.

Harvesting: harvesting starts after 5 years of planting.Colur development,TSS and flavor are the standard for harvesting

Yield: The average yield is 12 to 20 kg/tree

Q.4 Explain in brief the importance of root stocks in temperate fruits with suitable Examples

Ans

The specific characteristics of Clonal rootstocks must be known to use them to advantage. Important traits to consider are the growth, tolerance to varied soils and climates, resistance to insects and diseases, precocity and yield efficiency, anchorage and ease of propagation. The rootstocks developed at the
East Malling are designated as M series while MM series were specifically bred for resistance to woolly aphids.MM 110 and MM 106 rootstocks showed higher production of rooted suckers, M 7, M 25 and M2 were mediocre and M 9, M 26, MM 108 and MM 111 rootstocks had a low production of rooted suckers

Growth control

The various rootstocks are grouped as following according to vigour induced.

Very dwarfing M27. I t was raised at East Malling by Herry Mark Tydeman in 1929 from a cross between M9 and M 13. This can be planted as close as 0.5m, in rows 1.5m apart.

Dwarfing: M9:This is the most widely used dwarfing rootstock for apple. It had originated as a chance seedling. It has brittle and shallow roots and needs staking.

Semi-dwarfing. M 26. M 7. MM106

Q.6 Write about the propagation of following crops.
1. Pear 2.Plum 3. Strawberry 4.Apricot

Ans:

1. Pear propagation

The rootstocks commonly used for propagation are pear, *Kainth* and *Shiara* seedlings and clonally propagated Quince. In Punjab, root suckers of wild pear are also employed as rootstock. In some areas in plains of north India, own-rooted cuttings of Patharnakh are also used for propagation.

Seed Propagation

For raising rootstock, seeds of pear, *Kainth* and *Shiara* are extracted from fully mature fruits. The seeds need stratification (chilling treatment) for proper germination. The stratification can be completed by sowing seeds in open nursery in November or placing them alternate layers with the moist sand and/or vermiculite at optimum low temperature (SOC-7°C) for the required duration during October-November, The seeds are kept in the stratifying medium till the uppermost layer of seeds pushes the sand upward and protrudes the radical. The germinating seeds are sown in the beds or directly in the beds or directly in the nursery rows immediately at a distance of 1 0-IS em in rows 15 cm apart.

Clonal rootstock

'Quince A' is most commonly used clonal rootstock producing trees SO-60% of the standard size. However, this rootstock has poor compatibility with most of the commercial cultivars. Incompatibility can be overcome by double grafting with Old Home or Hardy varieties. Mound layering is generally done to propagate this rootstock clonally.

Budding and grafting :Pear plants are commonly propagated by T-budding during April-September or tongue grafting done during December-January.

2. Plum Propagation

Plum grown in India belongs to Japanese groups and required more chilling temperature than peaches.The plum required light sandy soil.The plum can be planted at the spacing of 6 x 6 m.The wild apricot generally used as a root stock for plum.The other clonal root stock which is used in plum propagation is Myrobalan B.,Mariana and GF-667

3. Strawberry Propgation

Strawberry is commercially propagated by runner. Generally, one plant produces 7- I 0 runners. It can also be propagate through crowns (3-5 plants/ crown). Runner formation cab be stimulated with the application of IBA (100 ppm)

10 days before flowering, and also with Morphectin (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.

4.Apricot propagation

Aprocot is propagated by budding or grafting.Wild apricot or wild peach are generally used as a root stock.The other root stocks which are clonal root stock also used in western countries like Myrobalan, and Marianna in France.The chip budding is done in the month of sepetember..The plants are plantedat the spacing of 6 x 6 m

Q.7 Describe alternate bearing problem and their remedies in apple

Ans

In apple an alternate-bearing tree is the one that does not bear a regular crop year after year rather than heavy yield in one year and which is followed by less yield or no yield

Causes of alternate bearing

1. Environmental triggers
2. Climatic Stresses
3. Endogenous factors
4. Inhibition of flower initiation by growing fruits
5. Fruit set as a conditioned by pollination
6. Effect of fruit load

Control measures for alternate bearing

1. Thinning of blossoms and fruits during on year
2. Pruning techniques
3. Application of fertilizers
4. Selection of regular bearing varieties

Q.8 Write about low productivity of apples in India and their remedial measures

Ans: In India productivity of apples is low compared to western world.Average productivity in India is low i.e 8 to 10 tones/ha.

Low productivity of apple due to following factors

1. Lack of availibity of planting martial
2. Low density planting
3. Monoculture of varieties
4. Lack of suitable root stocks
5. Climatic factors

Harvesting : Persimmon fruits are harvested when they have attained yellow to reddish colour. Persimmon fruits mature in mid sepetember.
The yield of mature tree is 50 kg/tree. The yield start after 4-5 years after planting.

Q.10 Write short note on pre-mature leaf fall and re-plant problem in apple

Ans :

Pre-mature leaf fall

Premature leaf fall is caused by *Marssonina coronaria* (Syn. *Marssonina mali* with *Diplocarpon mali* as its perfect stage. It has become number one in importance and severity as an apple disease in Himachal Pradesh since 1995. This disease is also prevalent in Uttarakhand and Jammu and Kashmir. The disease causes severe defoliation and thereby affecting the fruit size, and colour. The disease also appears on fruits as blotches and thereby reducing the market price. Fruit bearing capacity of the trees is also affected by premature defoliation year after year.

Management

1. Remove the fallen leaf litter from the orchard floor to reduce the primary inoculums level.
2. Adopt proper tree pruning to allow adequate air circulation to helps reduced disease development.
3. Keep the orchard area clean from weeds to avoid excessive humid conditions in the rainy season.
4. Give protective sprays of mancozeb/ propineb/zineb/ziram, dodine, carbendazim/ thiophanate methyl/ benomyl and dithianon from fruit set till preharvest stage to provide effective control of the disease at 15-20 days intervals.

Re-plant problem in apple

Apple replant disease (ARD) is a complex syndrome that occurs in young apple trees in replanted orchard. Apple replant problem, though reported in the literature for more than century, has yet to have its causes clearly defined. Decline in apple productivity has been attributed to fungi, bacteria, nematodes, toxic agents, insect-pests, nutritional disturbances and chemical

residues. The reasons for low productivity could be many but one of the most important reasons is age of orchards. In general, apple orchards of more than 40-50 years age have shown much more unfruitfulness than the young orchards.

Management of Apple re-plant problem

1. Use of proper root stock
2. Soil fumigation
3. Application of plant growth regulators.
4. Integrated nutrient management for enhancing soil biological properties

SECTION 'B'

Q11. State True or False

1. Crab apple is seedling root stock of apple.: **True**
2. Black Heart is a variety of cherry : **True**
3. J.H.Hale is a variety of Peach : **True**
4. Santa Rosa is a variety of Plum : **True**

Q.12 Match the pairs

				Answers
1	Apple	A	Early china	1 : C
2	Pear	B	B. ;o	2: A
3	Strawberry	C	Tropical beauty	3: D
4	Kiwi	D	Chandler	4: B

Signature of Course Instructor
Name : Dr. Prashant.S.Joshi
Mobile no:9657725794

Signature of Head of the Department
Name: Dr.D.M.Panchbhai
Mobile No.:9970070922