181 to

MODEL ANSWER

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION
B.Sc. (Hons.) Horticulture

Semester : II (New)	**Academic Year:** 2017-18
Course No. : H/VS-121	**Title:** Potato and Tuber Crops
Credits : 2 (1+1)	**Total Marks:** 40
Day & Date :	**Time :**2.00 hrs.

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 Write in short the scope and importance of potato and tuber crops. (4 Marks)

Scope - Tuber crops including cassava, sweet potato, yams, potato and other minor root crops are important to the agriculture and food security of many countries and overall are a component of the diet for 2.2 billion people as well as contributing to animal's feeds and industry. The global consumption of tropical root and tuber crops is around 110kg/capita/year. India ranks on 5th position in area and production of potato. Potato is considered as 4th major food of the world after rice, wheat and maize. Most of the potato production is consumed in the developed countries whereas most of the cassava, sweet potatoes, yam, taro and other aroids are consumed in the developing world. Therefore any advances in research and development in tropical root and tuber crops have a major direct impact on improving food security, income generation and commercial development in the developing world, leading to improvement in the social and economic livelihoods of hundreds of millions of poor people. Despite their importance, however, investment in tuber crops has been much lower than in the cereal crops. The productivity of tuber crops is often affected by the accumulation of pests and diseases which are passed on through vegetative propagation. A further challenge is that compared to cereals, tuber crops are bulky, have high water content and a relatively short shelf-life. This constrains value chain development and the expansion of production. Hence there is need to develop new varieties that meet a consumer demands.

Importance- Tuber crops are important because they meet local food preferences, providing an important part of the diet as they produce more edible energy per hectare per day than any other crop, they play an important role in food security, nutrition and resilient crop towards climate

change, they provide important sources of income through direct sale and value-addit processing for food and non-food uses. It is also an important source of carbohydrate. Ce varieties of sweet potato having yellow flesh are rich in carotene, a precursor of vitamin A. India the minor tubers include elephant foot yam, taro, karunai kilangu and they are consume for vegetable purpose, in addition these tubers are also used for indigenous medicinal preparations for various ailments. The elephant foot yam, taro and karunai kilangu have nutritionally beneficial components and it has significant importance in enhancing the income of the farmers. The tuber crop flours are a good replacement to refined wheat flour for making gluten free diet and it can be fortified with addition of pulses and millets to make it more nutritious and it can play a good role in health sector. Tubers can be converted into flour, flakes and sujii (rava) and processed tuber can be used for development of various traditional South Indian value added products like pakkoda, spiced chapathi, murukku, and bakery products like cookies as a substitute for refined wheat flour.

Q.2 Write the cultivation of potato with respect to following aspects. (4 Marks)

1. **Climate and soil-** Though a temperate crop, it is adapted to a wide range of climatic conditions. About 20 °C temperature is good for tuber formation and it reduces as the temperature increases. Tuberization is badly affected at about 30°C temperature. In India, potato crop is raised in regions where day and night temperatures are below 35°C and 20°C respectively. Potato can be produced on a wide range of soils, ranging from sandy loam, silt loam, loam and clay soil. Preferably it should be sandy loam and medium loam having (pH 5.0 to 6.5) with well drained, well aerated, friable, fairly deep and well supplied with organic matter. Alkaline or saline soil is not suitable for potato cultivation.

2. **Planting time-**

In Plains Early Crop: Third week of September to first week of October. Main crop: First week of October to third week of October. Late Crop: Third week of October to first week of November

In Hills- Third week of February to second week of April.

In Plateau Regions- Maharashtra, Karnataka Bihar and Madhya Pradesh, potato is raised in rainy (June-July) and winter seasons (Sept-oct).

3. **Varieties-** Satha, Gola, Up-to-date, Phulva, Great Scot, President, Kufri Kuber, Kufri Kisan, Kufri Naveen, Kufri Chamatkar, Kufri Neelmani, Kufri Alankar, Kufri Jeevan, Kufri Moti, Kufri Lavkar, Kufri Dewa, Kufri Chandramukhi, Kufri Jawahar, Kufri Ashoka, Kufri Laukar, Kufri Jyoti, Kufri Sadabahar, Kufri Sindhuri, Kufri Badshah, Kufri Chipsona 1,2 & 3.

4. Harvesting and yield- Harvesting of potato is done before temperature riscs above 30^0C. Harvesting is done manually with help of a spade or bullock-driven single row plough or mechanically with help of potato digger. Under good crop management, 350-450 quintals of marketable potatoes of good quality can be produced from one hectare land. Average yield of early maturing varieties is 20 t/ha while that of late maturing varieties is 30 t/ha.

Q.3 Explain in brief about sweet potato on following points (4 Marks)

a) **1. Uses-** Eaten after boiling, baking and frying. It can be candied with syrup or used as puree. Tubers are canned, dehydrated and floured and are important sources of starch, glucose, pectin, sugar syrup and industrial alcohol. It is also a cheapest source of calories. It is utilized in feeding livestock. Tender tops and leaves used as vegetable in Africa, Indonesia and Philippines.

b) **2. Varieties-** H 41, Sree Nandini, Sree Vardhini, H 42, Rajendra Sakarkand 35, Varsha

c) **3. Method of propagation-** It is often propagated by vine cuttings and rarely through seeds. Freshly harvested matured vines should be used. Vines of one crop are used for planting the next crop. For seed propagation scarification is required due to hard seed coat. Plant from seeds is poorly grown with low tuber yield.

d) **4. Use of plant growth regulators**

- CCC at 250 to 1000 ppm increased yield.
- GA inhibited tuberization.
- Kinetin enhanced tuberization

Q.4. Describe the cultivation of cassava on the following points. (4 Marks)

a) **1. Climate and soil-** Cassava is a tropical crop tolerant to drought and cannot withstand frost. It is grown in altitudes up to 2000 m, but performance is better in lower altitudes. Though crop can be grown even in semi-arid conditions, growth and productivity are better in warm humid climate with well distributed rainfall. Cassava grows on all types of soils, but saline, alkaline and ill-drained soils are not suitable. Crop is mainly grown in lateritic soils to loam in Kerala and black and red soils in Tamil Nadu.

b) **2. Planting-** Sets 25 – 30 cm lengths are planted vertically in beds, mounds or ridges to a depth of 5 cm. Care should be taken to avoid planting of sets inverted. Spacing depends on branching pattern of varieties. Normally erect and non-branching varieties are planted at 75 x 75 cm and branching or semi-branching varieties at 90 x 90 cm. In case, sets are dried after planting, 5% of stakes may be planted as reserve in field, separately at a closer spacing of 4 x 4 cm for gap filling after 20-25 days.

c) 3. **Manures and fertilizers-** Cassava is a heavy feeder crop. Hence apply FYM 125 t / basal dose. For high yielding varieties, a fertilizer dose of 50 kg N, 50 kg P2O5 and 50 kg K2 ha is recommended at the time of land preparation. If planting of sets is done during h condition, basal dose of fertilizers and manures may be postponed to one month after planting. This will avoid attack of termites and drying up of sets. Apply second dose of fertilizer i.e., 50 kg N and 50 kg K2O, 45-50 days after planting. In short duration varieties, fertilizer dose can be reduced to 75:50:75 kg NPK/ha.

d) 4. **Harvesting and yield-** The crop is ready for harvesting in 10-11 months after planting. Short duration varieties can be harvested in 6-7 months. Delayed harvest results in deterioration of quality of tubers. Harvesting is usually done by uprooting plants gently by holding stem. Yield is 25-30 t/ha for short duration varieties and 30-40 t/ha for other varieties.

Q.5) Write short notes on (Any two) (2 Marks each)

a) 1. **Seed plot technique in potato-** The basic information on buildup of aphid population in various regions made it possible to develop *Seed Plot Technique* for growing healthy seed potato in sub-tropical plains of India under low aphid periods (*Pushkarnath, 1967*). Seed plot technique in brief can be described as raising the crop during a period, when aphid population is very low, after taking precautions such as use of insecticides against aphids, periodical rouging of mosaic (virus) affected plants and finally dehaulming the crop before aphid's population attained the critical level of 20 aphids per 100 compound leaves.

b) 2. **Value addition of cassava tubers-** Cassava tubers are processed into various forms for value addition. After removing the skin, the tubers are sliced and dried to make chips. For parboiled chips, the slices are boiled in water for about ten minutes before drying. For making cassava flour, tuber pieces are boiled and then sun drying. The dried tubers are ground into flour for making various preparations. Traditional Indian foods such as chapattis, uppama, idlies and dosa are made from cassava flour. Besides, bread, biscuits, ice cream powder, flakes etc are also made from cassava flour. It is also used as a raw material for the production of starch, sago, liquid glucose, dextrin, gums and high fructose syrup and animal feed.

c) 3. **Post-harvest management of sweet potato-** After harvest, tubers is spread in partial shade for 5-6 days, for healing and curing. They should be stored in semi-dark condition in a well-ventilated room. In some parts of the country, tubers are stored in a layer of dry sand/soil after curing under ambient conditions. For storing, graded tubers free from sweet potato weevil and bruises should be selected. Farmers store the graded tubers by keeping in a pit shade and covering the pit with paddy straw. Finally, the heap is plastered with mud or cow dung slurry.

Q.6 Describe in brief about amorphophallus on following points. (4 Marks)

1. Nutritive value and uses

- Tubers are mainly used as vegetable after thorough cooking.
- Tender stem and leaves are also used for vegetable purpose.
- Chips are made of starch rich tubers.
- Tubers and leaves are quite acrid due to high content of oxalates.
- Amorphophallus corm has some medicinal values also.

The nutritive value of amorphophallus in 100 g is given below

Moisture	78.7 g
Fibre	0.8 g
Fat	0.1 g
Calories	79
Phosphorus	34.0 mg
Vit. A	434 I.U.
Protein	1.2 g
Other Carbohydrates	18.4 g
Calcium	50.0 mg

2. Climate and soil

- Warm humid climate with temperature 30-35°C
- Rainfall 1000-1500 mm
- It requires well drained sandy loam or sandy clay loam soils.

3. Method of propagation

- It is propagated through corms.
- Before planting corms are cut into 750-1000 g
- Cut corms are smeared with cow dung slurry & allow to dry under partial shade.

4. Method of planting

- Prepare pits of 60cm³ sizes at 60x60cm distance.
- Pits are half filled with top soil and FYM.
- Planting material is placed vertically in the pit.
- Apply 40:60:50 kg NPK/ha after planting.
- Top dressing with 40 kg N & 50 kg K one month after first application.
- Shallow intercultural operations like weeding, earthing up and mulching are necessa

Q.7 Describe the cultivation of colocasia on following points. (4 Marks)

a) **1. Propagation and planting-** Mother corm and cormels of 20-25 g are used as planting. Plant is done after june-july. Plant tubers at 60x45 cm on ridges.

b) **2. Varieties-** Sree Rashmi, Sree Pallavi, Sree Kiran and Konkan Ghorkand. (Greater yam)

c) **3. Manures and fertilizers-** Apply 12 tons of well rotten farm yard manure in one hectare along with the application of inorganic fertilizers for better growth and development of crop i. e. 80:25:100 kg NPK/ha. The 1/3rd dose of nitrogen and full dose of P & K should be applied at 2 weeks after sprouting whereas remaining dose of N should be applied 1 month after first dose. Regarding intercultural operations regular weeding is necessary to keep plot weed free and also follow the earthing up operation for proper development of tubers and to keep crop aerated.

d) **4. Harvesting and yield-** Crop will be ready to harvest in 6-8 months after planting. Harvest by carefully uprooting the plants. Mother corms and cormels are later separated. Average yield is 15-20 t/ha.

Q.8 Describe the cultivation of greater yam with respect to following points (4 Marks)

a) **1. Land preparation-**The land is ploughed or digs up to a depth of 15-20 cm. The pits of size 45 X45 cm are diged at a distance of 1 X 1m. The 3/4th of the pits are filled with 1-1.25 kg cattle manure or compost and mixed with top soil.

b) **2. Time of planting-** Seed tubers are normally planted during the later part of dry season (March-April)and tubers start sprouting with the onset of monsoon showers. If the planting is delayed yams start sprouting in storage which is not desirable for planting.

c) **3. Seed treatment-** The cut pieces are dipped in cow dung slurry and allowed to dry under shade before planting.

d) **4. Seed rate-** 2500-3000 kg/ha.

Q.9 Write in brief about lesser yam on following aspects. (4 Marks)

a) **1. Soil-** Lesser yam requires loose, deep, well drained and fertile soil. The crop does not come up well in water logged soil.

b) **2.Manures and fertilizers-** Incorporate 10-15 t/ha compost or FYM. Apply 80:60:80 kg NPK/ha. Apply full dose of P and half dose of N & K at 30 DAP.

c) **3. Varieties-** Sree Latha, Sree Kala.

d) **4. Harvesting and yield-** The crop is ready to harvest by about 7-8 months. Harvesting should be done carefully to avoid the injury of tubers. Average yield is 20-25 t/ha.

Q.10 Give the information in tabular form. (4 Marks)

Sr. No.	Name of the crop	Botanical name	Family	Propagation	Varieties
1	Xanthosoma	*Xanthosoma sagittifolium*	Araceae	Corms headsets ("tops") or root suckers	Konkan Haritparni
2	Chinese potato	*Solenostemon rotendifolius*	Labiatae	Vine cuttings	Sree Dhara, Nidhi

SECTION "B"

Q.11 Fill in the ~~following~~ blanks. (1 Mark each)

1. India ranks on **fifth** position in area and production of potato.
2. Botanical name of horse radish is ***Armoracia rusticana***
3. 'Gajendra' is a variety of **amorphophallus.**
4. CTCRI is located at **Trivandrum in Kerala.**

Q.12 Match the following pairs. (1 Mark each)

A	1	2	3	4
B	d (Convolv.	c Solanal.	b Aracea.	a Dioscorea

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