MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE

SEMESTER END EXAMINATION

B. Sc. (Hons.)Horticulture

Model Answer paper

Semester	: II (New)	Academic Year	: 2018-19
Course No.	: H/VS-121	Title	: Potato and Tuber Crops
Credits	: 2 (1+1)		
Day & 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 Write the importance and scope of potato and other tuber crops.

Ans. Importance and Scope

1. Food security and nutritional security
2. High photosynthetic efficiency
3. Cheap source of energy
4. Source of vitamins and minerals
5. Insurance crop against famine and natural calamity
6. Suited to both upland and lowland situations
7. Cultivated under irrigated and rainfed conditions
8. Raised as monocrop and intercrop and also as a companion crop in cropping systems
9. High potential as source of animal feed, industrial starch, fuel – alcohol and value added products

Q. 2 Discuss the commercial cultivation of potato on following points.

a. Soil and climate **b. Propagation and planting time**
c. Harvesting and yield **d. Physiological disorders**

Ans. Soil: Well drained clay loam soils, rich in humus.
pH 5.5 to 7.5. Sensitive to alkalinity

Climate: A cool season crop, tolerate moderate frost.

- 20°C soil temperature for better germination.
- Young plants growth is good at 24°C but later growth is favoured by a temperature of 18°C
- No tuberization when the night temperature is more than 23°C. Maximum tuberization is encountered at 20°C. Tuber formation stop completely at about 29-30°C.
- Planting is done in the hills when the maximum temperatures are about 20-22°C and minimum temperature are about 12-15°C

Propagation: Propagated through tubers.

- The eyes on the tuber surface contain axillary buds.
- The tubers have a dormancy of nearly 8-10 weeks.
- When dormancy is over, axillary buds start germinating and produce sprouts.
- Planting sprouted tubers put up fast and vigorous growth.

Planting time: Summer, Spring, Autumn, Kharif, Rabi

Harvesting and yield: The crop is harvested when it is fully matured

- This can be characterized by when haulms turn yellow and no pulling out of skin on rubbing of tubers.
- At the time of harvesting, field should not be too wet nor too dry.
- Tractor operated potato diggers are available for digging the tubers from the fields
- Early varieties: 200q/ha
- Late varieties: 300 q/ha

Physiological disorders: Hollow heart, Black heart, Greening, Knobiness, Cracking

Q. 3 Describe in brief about colocasia on following points

a. Manures and fertilizers **b. Propagation**

c. Harvesting and yield **d. Improved varieties**

Ans. Manures and fertilizers: FYM : 10-15 t/ha

Inorganic : 80 : 60 : 60 kg NPK / ha
40 : 60 : 30 NPK → Basal
40 : 00 : 30 → at 45 DAP
Biofertilizer : *Azotobacter*, PSB etc.

Propagation: Healthy & Sprouted mother corms and cormels

- Huli:- 1 cm corm tip along with 15 cm petiole.
- Mother corm: 50-75 g.
- Cormels weighing > 50g ideal for planting material , produce higher yield.
- Planting material → 1 t/ha (60 x 45 cm)
  1.5 to 2 t/ha (45 x 30 cm) for 1 ha. area
- Required dormancy period for 3 months
- Minisett : 10g cormel (the answer to planting material constrainis)

Harvesting and Yield: Leaves RTH : 45 to 60 DAP

- Matures 150-210 days after planting (Final harvesting)
- Foliage turn yellow and drying up of leaves
- By digging out the corms & cormels.
- Corms & cormels P'n is 30 to 40 t/ha (leaves not harvested)
- 15 to 20 t/ha (leaves are harvested occasionally)
- 6 to 8 t/ha (leaves are harvested frequently)

Improved varieties: Satmukhi, Sree Rashmi, Sree Pallavi, Panchamukhi

Q. 4 Discuss the commercial cultivation of sweet potato on following points

a. Soil and climate **b. Manures and fertilizers**

c. Harvesting and yield **d. Improved varieties**

Ans. Soil: Well drained with high organic matter

- Sandy loam with clay → ideal
- Heavy Clay → reduces yield

- pH Between 5.2 to 6.7 (Acid tolerant crop)
- Deep rooted crop : 120 – 180 cm

Climate: Sun loving or shade sensitive crop

- Warm & Humid
- 24^0 C → conducive for growth (Optimum for vine + tuber)
- $20\text{-}30^0$ C for tuber formation
- Above 30^0 C vine growth encourage at the cost of tuber formation
- Well distributed rainfall of 75-150cm
- Can tolerate drought but cannot withstand water logging

Manures and fertilizers: FYM 10 t/ha

- Fertilizers : 75 : 50 : 75
  - : 37.5: 50 : 75 → basal
  - : 37.5: 0 : 0 → 30 DAP
- Use biofertilizers

Harvesting and yield: 120-180 days. (According to cv; climate; soil type; fertility of soil; season of planting, temp.)

- Yellowing of leaves & start falling
- Yellowing of vines
- Cracking of soil near the base
- Tuber: Irrigated 35-40 t/ha, Rainfed; 8-10 t/ha
- Vine: 10-25 t vine/ha as fodder in120 to 180 days
- Yield is negatively correlated with vine length & vine weight
- Foundation & Certified Seed : 5 m

Improved varieties: Varsha, Konkan Ashwini, Sree Nandini, Samrat. Sree Ratna

Q. 5 Discuss the commercial cultivation of cassava on following points
a. Planting season and method **b. Propagation**
c. Uses **d. Improved varieties**

Ans. Planting season and method: Vegetatively by matured stem/ stake

- (8-10 months old stake)
- April-May
- Before the onset of monsoon
- Tamil Nadu : September

Propagation: At the time of harvest, mature, healthy & vigorous stems free from

- disease & Insect are selected & stored under shade as next season's planting material.
- At the time of planting discard the woody basal portion & tender top portion of the stem
- Prepare setts or stakes of 20 cm (Optimum) length, 3 cm width (diameter- thickness) having 5 to 6 nodes
- → by giving a smooth circular cut by saw or hack saw from middle portion, avoid mechanical damage.
- Setts Prepared from stem, stored for 15 days with leaves give better sprouting
- Collect from open area (10 % shade → 10 % Less yield)

- Latex is the indication of usefulness.
- Dipping of stem in cow dung is essential for marking.

Uses: Sago, starch, papad, fryms

Improved varieties: Sree Harsha, Sree Prakash, Sree Jaya, Nidhi

Q. 6 Write short notes (Any Two)

a) True Potato Seed **b) Turning vines in sweet potato**

c) Types of colocassia

Ans. a. True Potato seed

- Cultivation through true potato seed is beneficial because:
- Seed material i.e. potato tubers required to cultivate 1.32 m ha area is around 33 m q (seed rate 25 q/ha).
- Quality seed production, certification and storage of such a huge quantity is very difficult.
- Make nursery bed of size 2 m x 1m & then bricks are laid on these beds.
- Fine soil and FYM in equal proportion is put on thse bricks making the surface 4-5 cm raised.
- Irrigation is given on the surface & the moisture is reaches to the surface through capillary action of the bricks.
- Sowing is done on this surface of the bricks.
- Seed is mixed with fine & well decomposed FYM & then put FYM on the raised surface for good germination or after broadcasting, the seed is covered with FYM.
- 3-4 small seeds are kept at equal spacing on one brick which is covered with FYM to raise small sized tubers.
- Irrigation is given upto the half level of bricks.

b.Turning vines in sweet potato

- In early stage of growth
- Establish → 30 DAP
- Growing vigorously after 3rd week (21 DAP)
- Turning of vine → essential cultural operation
- Tendency to form adventitious roots from every nodes which results in diversion of some quantity of nutrients for the d'ment of such root. To avoid such nutrient losses, To avoid the anchoring of vines in the soil and to avoid adventitious root formation at every node it is essential to lift and turn the vines 30 DAP & then 15 days interval. It is done during early stage of vine growth. It is not necessary to disturb the vines when they have grown to a length of 2.5 to 3 m. Pruning of 15 cm of top vine 60 DAP → does not affect the tuber yield.
- Overlapping of vine or shade produced by weeds reduce the yield drastically.

c. Types of colocassia:

Dasheen	Eddoe
• B.N.-*Colocasia esculenta* var. *esculenta* • Ch. No. 2n = 28	• B.N.-*Colocasia esculenta* var. *antiquorum* • Ch. No. : 2n=42
• Known as bunda in U.S.A.	• Known as Arvi, Alavi in India
• Large edible main corm	• Small non edible main corm
• Number of cormels are none (NIL)	• Cormels are 5 to 20 in no. which is edible
• Cormels are absent	• Cormels are as big as corm
• High yielder, mature in 10 months	• Low yielder, mature in 5 months
• Normally corms are edible & Marketed	• Normally cormels are edible & marketed
• Propagation by tip of corm	• Propagation by tip of cormels
• Only one growing bud	• More than one bud.
• Sterile appendage of spadix is much shorter than male portion	• Sterile appendage of spadix is much larger than male portion
• 3 cvs. NDB-1,3,21	• 21 cvs.
• Commonly grown in W. Indies, Hawaii	• W. Indies & USA

Q. 7 Discuss the commercial cultivation of greater yam on following points

a. Soil and climate **b. Propagation and planting time**

c. Harvesting and yield **d. Improved varieties**

Ans. Soil: Friable

- Sandy loam
- Well drained
- Full of Potash
- Heavy black Soil → not suitable
- pH 5.5 to 7.5 (others 5.5 to 6.5 only)
- Water stagnation is harmful

Climate: Warm & humid, Warm sunny weather

- Sun loving crop, Shade sensitive crop
- Cannot tolerate shading & Frost
- 25 to 30° C temp → ideal, Short Days
- Well distributed → 1200-2000 mm rainfall
- < 20° C → hamper the growth & development
- i.e. Growth and development is severely affected

Propagation and planting time: VP, whole tuber

- Small whole tubers or bits of 125-150 g wt.
- Free from scale insects
- For Seed yam → 25 g is ideal (Minisett)
- Multiplication of yam by vine is also possible but tuber production is very low
- Preferably from top portion of seed tuber

- March – April → under assured irrigation
- Last week of May

Harvesting and yield: Can be harvested at any time

- But prefer time is Dec-January (7 to 9 MAP-HI)
- Yellowing & drying of leaves & vines (HI)
- Delaying in harvesting up to 2 months does not affect yield
- There should not be any soil remain stick with the tubers.
- Keeping in open place under shed is desirable.
- Losses due to evaporation and respiration from the tubers.
- Double harvesting: Removal of mother tuber after two months of growth
- 25 to 40t/ha

Improved varieties: Sree Kirthi, Sree Roopa, Sree Shilpa, Ghorkanda

Q. 8 Discuss the commercial cultivation of lesser yam on following points
a. Propagation and planting **b. Manures and fertilizers**
c. Harvesting and yield **d. Postharvest management**

Ans. Propagation and planting: Traditional method – large whole yams, 100-150 g each. 1800- 2700 kg/ha seed material required

- Minisett technology
- Micropropagation
- Vine cuttings
- Spacing 75 x 75 cm on flat or raised beds.

Manures and fertilizers: FYM : 10 t/ha → basal

- RDF : N : P : K kg/ha
  - : 80 : 60 : 80
  - : 40 : 60 : 40 → 30 DAP (Followed by weeding & earthing up) – ring method – radius : 15 cm and depth 5 cm
  - : 40 : 00 : 40 → 60 DAP (Followed by weeding & earthing up)
- Biofertilizer : 10 l water → 50 ml *Azotobacter* +
- 25 ml PSB + 25 ml Potash Bacteria → Pit @ 1 l solution

Harvesting and yield: Harvest in 7-8 months

- Single harvesting and double harvesting
- 20-25 t/ha

Postharvest management: By heaping the cured yam tubers in pyramid shape in well ventilated room . **Curing:** Temp. 32^0 C + 95 % RH for a week. It allows suberization of surface injury and reduces weight loss & rotting in storage. Cured yams keep longer than non- cured yams.

- Storage Temp. 16° C, R.H. : 70-80 % for 7-8 months
- Treating tubers with monocrotophos (0.05 %) and than storing in sand was found more effective.
- Storing the tubers in saw dust , Paddy husk , Wood ash and fine sand was also found best.

- $< 12^0$ C : Chilling injury is there
- Among the tuber, yam possesses an excellent quality of Postharvest storage as it develop few layers of cork cell around it & protect the tuber from the loss of water. Loss is as much as 20 % due to various factors.

Q. 9 Describe cultivation of amorphophallus on following points.

a. Soil and climate **b. Propagation and planting time**

c. Harvesting and yield **d. Improved varieties**

- **Ans. Soil and climate:** Well drained sandy loam or sandy clay loam soil
- pH 6-7
- Rich in organic matter

Climate: Temperature of 30-35°C.

- Cannot grow under frosty conditions
- Well distributed rainfall of 1000-1500 mm for 6-8 months

Propagation and planting: Traditionally propagated by corms.

- Cormels weighing 50 g
- Minisett planting
- Spacing 75x75 cm on flat pits or ridges
- April – May before onset of monsoon.
- Kerala – Feb-March

Harvesting and yield: Ready for harvest in 8 months after planting.

- Foliage turns yellow and begins to wither.
- Harvesting starts from December upto March.
- Dig soil and take the corm out without injury.
- 12-22 t/ha.

Improved varieties: Sree Padma, Gajendra, Santragachi, AM-15

Q. 10 Give information in tabular form

Sr. No.	Name of crop	Botanical Name	Propagation	Yield	Varieties
1.	Yam Bean	*Pachyrrhizus erosus* L.	Seed or tubers	35 t/ha	Rajendra Mishrikand
2.	Xanthosoma	*Xanthosoma sagittifolius*	Corm and cormels	20 t/ha	Konkan Haritparni

SECTION "B"

Q. 11 Match the pairs

1. Konkan Ashwini	c. Sweet potato
2. Konkan Ghorkanda	d. Greater yam
3. Konkan Kanchan	a. Lesser yam
4. Gajendra	b. Amorphophallus

Q.12 Fill in the blanks

1. Insulin is extracted from tubers of **Jerusalem artichoke.**
2. Botanical name of chinese potato is ***Solenostemon rotindifolius.***
3. Rajendra Mishrikand is variety of **Yam bean.**
4. Sweet potato is propagated by **vine cuttings.**

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