MAHARSHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION
B.Sc. (Hons.) Agriculture
MODEL ANSWER PAPER

Semester: V (New) **Academic Year:** 2023-24
Course No: HORT- 354 **Title:** Production Technology for Ornamental Crops, MAP and Landscaping
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. Discuss in short the importance of ornamental, medicinal and aromatic crop **4 marks**

Ans:

Ornamental crops: Flowers are associated with the mankind from dawn of civilization.Even nostalgic peoples can't ignore importance of ornamental crops. Daily Indians especially Hindus religious offering flowers to the family deity.Aesthetic value in our daily life can't overemphasize.No social function is complete without use of flowers.Flowers symbolize purity, peace, love, passion and beauty. Floral ornamentals or flower arrangements find a pride of place in social gathering, marriage, birthday parties and honouring dignitaries. Arrivals of newborn rejoiced with flowers, sicks are wished speedy recovery by offering flower, dead are bidden farewell with flowers along with tears.Ornamental crops having potential as an industry. Good demand for quality flower seeds, which are presently in short supply. Nursery stocks such as bulb, budded roses, potted plants have good internal and export market.

Medicinal crops: Plants rich in secondary metabolites. Plants form main basis for manufacturing of drug of Indian system of medicine & homeopathy. Almost all plants cultivated due to diverse climate. India is major exporter of medicinal plants.80% population of developing countries relies on traditional medicines. Modern medicines containing 25% drugs derived from plants. Foreign exchange earned by India from medicinal plants & byproducts. International market herbal product 62 billion dollars poised to 5 trillion dollars by 2050. India's share in global market is 0.5%. Livelihood option for to millions of tribal rural people. Employment generation 35 million work days year^{-1}.

Aromatic plant: Producing essential oils, perfumes, flavours used with civilization. Successful commercial cultivation- vast area & varied climate. Essential oils & aroma – indispensable in different human activity.Used as adjuncts in cosmetics, perfume and pharmaceutical preparation. Many of aromatics are powerful germicide & antibacterial properties. .

Q.2. Enlist garden feature and describe about garden feature which is called green carpet **4 marks**

Ans:

Garden Wall, garden gate, garden lights, arches and pergola, hedges, edges, avenue, roads, paths, drives, steps, rosary, fernery, rockery, lawn, flower beds, hanging baskets, garden pot stands, garden seats, standards, bridge, fountains. water flow, water pools, channels, ponds or aquaculture, garden statue, garden plays, gently moulded hills, sound and light effect, wild life, garden woods, informative boards and labels.

Lawn- is heart of garden or green capet .A fairly uniform well maintained dark green ground cover is good asset in binding together the different features. Green carpet of grass for a landscape. **Importance of lawn-** acts as background for the rest of garden features, no garden is completed and beautiful without having a good lawn, 75 % beauty of garden depends on lawn, helps to improve appearance of home, resorts, public parks, increases convenience, provides perfect setting for flower bed, border, shrubbery, a specimen tree or shrub, source of charm, pride, heart of garden. **Various lawn grasses used-** *Agrostis alba, Agrostis canina, Agrostis palustris, Agrostis tenuis, Axnonopus affinis, Cynodon dactylon, etc.* **Methods of planting of lawn-** By seed sowing, dibbling, turfing and turf plastering.

Q.3. Write in brief cultivation practices of Gerbera under protected conditions

Ans: B.N. : *Gerbera jamasonii* Family : Asteraceae Important flower grown through out world.

Gerbera is a very attractive, commercial cut flower successfully grown under different conditions in several areas of the world as well as in India and meeting the requirements of various markets. This flower is originated in Asia and South Africa. Gerbera jamesonii has been developed through cross breeding program.

Varieties :

There are many multi coloured varieties of Gerbera developed through tissue culture. Jaffa, Sangria, Rosula, Oprab, Romona, Salina, Tecora and Starlight.

Climate :

Bright sunshine accelerates the growth and quality of the flowers, however, in summer this flowers needs diffused sunlight. Gerbera plants grown in locations with insufficient light will not bloom well. Temperature day 22-25° C, Night 12-15° C, Optimum 23° C. Below 12° C above 35° C will affects bud initiation. Optimum humidity – 75-80 % and required light intensity is 400 w/m² 450 or 600 FC. Optimum CO^2 – 700 ppm (0.07%)

Soil :

Red lateritic soils are good for Gerbera cultivation at it is having all the essential qualities that anidealsoilshouldhave.Plantingmediumshouldbewelldrained-poroussoilswithpH–6.5–7.0 are highly suitable. Well decomposed FYM, Sand and coconut coir pith 2 : 1 : 1 used for preparation of raised beds. After fumigation with formaldehyde, the raised beds are prepared on which Gerbera plants areplanted.

Bed Preparation :

Top width – 60 cm

Bottom width – 70 cm

Height – 45 cm

Path way – 40 cm

Planting Distance :

Plant to Plant Distance - 30 cm

Row to Row Distance – 30 cm

Planting density – 8-10 plants/sq.m.

Planting Material :

Division of clumps and tissue culture plants are used as propagating material. Plants should not be less than three months old. At the time of planting the tissue culture, plant should have at least 4 to 5 leaves. Gerberas are planted on raised bed in two rows formation. Zigzag plantation system is mostly preferred. While planting 65 % portion of root ball should be kept below ground and rest of the portion i.e. 35 % should be kept above the ground for better air circulation in the root zones.

Manures and Fertilizers :

Organic manures are required to be added so that top 30 cm of the soil has 30 % organic matter content. Application of nutrients should be based on analysis of soil and plant. 20 : 20 : 20 NPK @ 1.5 g/L once in two days for first three months and at flowering – 5 : 8 : 35 NPK @ 1.5 g/L on alternate days.

Cultural Practices :

1) **Weeding and Raking of soil :** Weeds take the nutrients of the plants and affect the production. Hence, they should be removed from the bed. Due to daily irrigation, the surface of the gerbera bed becomes hard hence raking of soil is done with the help of a raker. It increases soil aeration in the root zone of the plant. This operation should be done regularly, may be twice in amonth.
2) **Disbudding :** Removal of inferior quality flowers at the initial stage after plantation is called disbudding. The normal production of gerbera plants starts after 75-90 days from the date oplantation. Production of flowers starts 45 days after plantation but initial production is of inferior quality, hence these flowers should be removed from the base of the flowers stalk. This helps in making the plant strong andhealthy.
3) **Removal of old leaves :** Sanitation helps in keeping the disease and pest infestation below the economic threshold level. The old, dry, infested leaves should be removedfrom the plant and burst outside the greenhouse or dumped in to a compost pit. This practice allows producing good, healthy new leaves and better aeration in thecrops.

Irrigation : Gerbera plant water requirement is 500-700 ml/plant/day 4.5 to 6 litres/m² and Avoid excess watering.

Pest and Diseases :

The principal diseases of Gerbera are –

i. Pythium
ii. Sclerotinia
iii. Whiterust
iv. Rhizoctonia
v. Fusarium

Major insect pests of the rose are

i. Red SpiderMite
ii. Aphids
iii. Thrips
iv. White fly

Control :

The preventive spray programme with a volume of 155 litres/spray at an average interval of once in a week is suggested.

The chemicals could be as under –

a) Dithane M-45 0.6gm/litre
b) Metasystox 1.25ml/litre

c) Karathane 1.00ml/litre

Harvesting :

Disbudding done at 75 days after planting and the first flowers may be harvested after 75-90 days after planting. Flowers of most of the varieties (single types) are ready to be picked when 2-3 whorls of stamens have entirely developed and out 2-3 discs perpendicular to stalk. Some varieties are picked little riper, especially the double types. Skilled labours are required for harvesting of gerbera cut flowers. After harvesting the flowers should be kept in bucket containing chlorinated water. Flowers are very delicate hence they should be carefully handled otherwise can be damaged and their quality get deteriorated. For harvesting gerbera no secateurs are required and are done by naked hands, 200 flowers/m²/year (6-7 plants) – 85 % first grade.

Grading : Graded based on Stalk length 45-55 cm and flower diameter – 10-12 cm Packing : Harvested flower heads are capped with – Polythene sleeve (small polythene bag) and such 10 flowers are made in to one bunch which are tied with rubber band. 500 flowers are packed in CFB boxes 98 x 30 x 12 cm.

Q.4. Q.4. Write protected cultivation of lilium on following aspects **4 marks**

1. CO2 and humidity

CO2 injection benefits the growth and flowering of longiflorum hybrids -produces a sturdier and a greener crop.

With the help of hanging burners the gas is supplied from the central boiler or pure CO2.

When using assimilation lighting, CO2 injection can be carried 24 hours a day. Keeping track of the CO2 require monitoring using a simple monitoring device

Optimum level --80to 85 %.

It is important to avoid large fluctuation in humidity levels which will cause stress and leaf scorch in susceptible varieties

2. Forcing

Forcing lily flower for normal durations, the bulbs require cold treatment at 2-4^0.C for 6 weeks in case of Asiatic hybrids and 8 weeks for the Oriental ones.

It is possible to use "frozen-in" bulbs which are kept at 10C after pre-cooling treatment for offseason flowering.

A night temperature of 16 0C with a day temperature below 21 0C inside the greenhouse is recommended for forcing

3. Types and cultivars

Types

A. Asiatic type
   - Early bloomers
   - Usually non fragrant
   - Rapidly multiply
   - Greater color range
   - More variance in flower shape and bloomliness

B. . Oriental type
   - Late bloomers
   - They are heavily scented
   - Slow multiplication
   - Larger flowers
   - Many Oriental lilies have raised papillae in the petal nectaries

Cultivars

ASIATIC CULTIVARS:
Connecticut king
Gran paradiso
Elite
Prato
Solemio
Pollyana

ORIENTAL CULTIVARS
White star gazer
Marco Polo
Casablanca
Apart from these easter lily Lilium longiflorum var. Oscant is grown under greenhouse.
4. Harvesting
8 to 10 cm above the ground when lower first bud shows the colour of flower.
2)Prevent the stems drying out during and after harvesting. 3)After harvesting , stems are graded according to number of flower buds per stem, length and firmness of stem
4. During bunching, remove 10 cm of foliage from the end of the stems and subsequently sleeve the flowers
4)Immediately after bunching, the cut flowers should be placed in cold water in cold storage room at 2°C to 3°C. Add 2% sucrose and 100 ppm GA3 as a preservative agent to water to improve vase life of flower.
5) perforated boxes to maintain a proper temperature during transport

Q.5. Give detail cultivation of orchids considering following points- **4 marks**

Ans: 1. Types: Two - 1. Sympodial and 2. Monopodial. Sympodial- Prostrate rhizome, growth terminates periodically with upright pseudobulb, leaf & flowers. Flower- terminal. After flowering: vegetative bud starts to grow at base of pseudobulb forming prostrate rhizome. Ex. Cattleya and Cymbidium. Monopodial- Form aerial roots from stem- upward growth. Upright stem continues in uninterrupted terminal growth. Producing closely spaced leaves Flower stalk develops from leaf axil. Ex. Phalaenopsis.

2. **Propagation:** Seed & vegetative. Cymbidium- division of one or more of pseudobulb in mixture of sand & peat at 18^0C in moist surrounding. Cattleya- Division of pseudo bulb. Phalaenopsis- Offsets. Hard wood cutting- Monopodials. Air layers- Vandas & other monopodials. Meristem culture: Tissue culture.

3. **Climate at different growth stages:**

Growth stage	Day temp ^{0}C	Night temp ^{0}C	Relative humidity %
Seedling planting to bud stage	15.0	25.0	70-75
Flower opening	14	21	75-80
Growth of flower stem	10	20	70-80

3. **Harvesting:** Cattleya flower cut from 3-5 days after bud dehisces. Phalaenopsis flower cut: when fully open either individually or as in entire spray. Cymbidium flowers cut individually but more after entire spike is removed and individual flowers are cut at the time of grading & packing. Dendrobium- 5-10 flower buds on stem. Matures within 3-4 days & ready for harvest. Harvest at 50-80 % opening condition.

4. **Grading and Packing:** Flower stem- stought at harvest 10 flowers- 1 Bundle.

Grade	Flower stem per box	Dimension of CFB box
Super long	400	38x39x75 cm
Long	400-500	38x39x75 cm
Medium	500	38x39x75 cm

Q.6. Write in detail cultivation practices of gladiolus about-4 marks

1.Propagation

Commercially gladiolus is vegetatively propagated through corm and cormels.

For cutflower production gladiolus is propagated by corms however for generation of the planting materials it is propagated by cormels.

Gladiolus is propagated by corms of at least

4-5 cm diameter.

It should be healthy and disease free.

Conical shaped corms preferred

2. Varieties

Spic & Span (orange), Oscar (red), White Prosperity (white), Her Majesty (purple) ,Red candyman (rani colour) , Dhannawanti (purple), Sunny Boy (purple).

Phule Ganesh, Phule Nilrekha, Phule Prerna and Phule Tejas

other : Shobha, Darshan, KumKum, Punjab Dawn, Sagar, Dhanvanthari, Gulaal, Urvashi, Jyotsna, Urmi, Urmil

3 Intercultural operations

Mulching :

Mulching is important for conserving the moisture and reducing the weed populations.

Its effectiveness is depends on the type of materials and thickness of mulch used.

Mulching is done between and across the rows.

Care should be taken to mulch the beds only when there is sufficient moisture, otherwise it will not serve any purpose.

Fresh manure, chopped straw, dried grass, clippings, saw dust, peat, husk, bark and strips of black polythene may effectively be used as mulching materials.

Erthing up :

corm need 12-15 days for sprouting .

Initial few days the corm should not be disturbed except the removal of the initial weeds.

Once the plant attain to a height of about 15-20 cm a light earthing up should be provided from both side of the row.

At this stage if the weather is dry irrigate it

Occasionally the weeds should be removed and the soil should be loosened with the help of a fork.

When the plant will be a 5-6 leaf stage the second earthing up should be done.

Staking:

At 5-6 leaf stage, the plant should be stake with the help of a bamboo stick.

During staking care should be taken to avoid any damage to the underground corm and cormels.

4. Harvesting and yield :

For local market gladiolus is harvested when the lower most pair of floret is fully opened.
For distant market harvesting is usually done when the lower most pair of floret has just shown the colour.
For local market harvesting is usually done in morning hours.
Immediately after harvesting the spike should be kept in a bucket of a plain water.
For local market it is advisable to sent the flower in the bucket of water itself.
The flower spike yield in gladiolus is vary according to the cultivar, corm size , planting density and management practices etc.
Approximate yield of flower spike would be around 2,00,000 per hectare.

Q.7. Discuss cultivation of asparagus in respect of– **4 marks**

1. Medicinal uses
Shatavari roots are used mainly as galactagogue which stimulates the secretion of breast milk.
- It is applied in improving the lost body weight and also known as an aphrodisiac.
- The root is useful in treating the ailments like dysentery, tuberculosis and diabetes.
- Commonly, it supports to maintain the health by giving immunity to diseases.
- It is considered as very good energy provider to the weak body system

2. Propagation and planting
It is propagated by root suckers or seeds. For commercial cultivation, root suckers are preferred over seeds.
- laid out into ridges at 60 cm apart.
- Well developed root suckers are planted on the ridges.

3. Irrigation and interculture
The field is irrigated immediately after planting. It is continued at 4-6 days interval until a month and thereafter at weekly interval.
Care should be taken to avoid any damage to growing shoots at the time of weeding.
The crop being a climber requires support for its proper growth. For this purpose, 4-6 feet long stakes are used to support the general growth.

5. Harvesting and yield
The roots come to maturity in about 12-14 months after planting
A single plant may yield about 500 to 600 g of fresh root.
12,000 to 14,000 kg/ha of fresh roots, 1000 to 1200 kg of dried roots.

Q.8. Furnish information about cultivation of vetiver pertaining to- **4 marks**
1. Uses
Bulk produce is consumed in soap making.
Roots are used to make aromatic mats, brooms, screens, pillows and mattresses.
Roots put in drinking water for imparting aroma.
Roots used in pharmaceutical preparations.
Used as stimulant, refrigerant and stomachic.
root portion branching into spongy, aromatic and fine rootlets.
the root which gives the essential oil, and is strongly scented.

2. Varieties
There are mainly two types of grass viz.
1. Seeding type
2. Non-seeding type.
Hybrid-8, Hybrid-7 and ODVI 3.

3. Propagation and planting
tillers and slips.
2-3 slips are planted in each hole.
1,50,000 to 2,25,000 slips/ha.
Best planting time under South Indian conditions- June-July.
Spacing 30 x 30 cm

4. Harvesting
Harvesting is done during dry months of year. Harvesting is done at 10-12 months old.
Uprooting is done with digging forks having prongs of 45 cm length.
To start with the stem portion is cut at height of 15-20 cm and the clumps are then uprooted. About 50-60% roots come away with the clumps leaving the rest in soil.
The clumps are beaten on a piece of log to remove stones and earth adhering to roots and the roots are separated with sharp knife.
As far as possible, the roots left in soil are also collected.
The roots that possess the following characteristics have a good oil content. It should
Expose a hard surface when the skin is peeled off.
Be thick, hard, long and wiry and
Give a very bitter taste when chewed.

Q.9. Explain in brief various principles of Landscaping. 4 marks

Ans:

1. **Initial approach-** Plot size, shapes. Natural undulations. Fencing – look natural, practicable, no obstruction to view. Formal garden having no any tree can be drawn on paper & implemented without any appreciable change.
2. **Axis** – Imaginary line. Around Imaginary lines garden created with striking balance. Formal garden – central line is axis. At end of axis – focal point. At mid point erect – architectural feature - sundial, birdbath
3. **Focal point** – One of the elements of good landscape. Central point of attraction. Generally architectural feature/design. Focused as point of interest.
4. **Mass effect** – Use of one general form of plant material on large scale at one place. Size – varied. Mass arrangement – should not monotonous.
5. **Unity – Important** in garden. If achieved – improve artistic look of garden. Achieve - Unity of style, feeling & function between house and garden. Different garden components merge – harmoniously. Due to this, visitors get overall impression of garden rather than special feature. Achieve harmony between landscape outside & the garden.
6. **Space** – Aim – garden appears larger than actual size – Illusion. Also referred as "Forced Perspective". For this keep vast open spaces – under lawn. Restrict planting in periphery, Avoid planting at center. Illusion of large space – alternate large lawns followed by group of trees.
7. **Divisional lines** – Shouldn't hard & fast divisional lines. Necessity of dividing rather screening. Lawn, shrubbery, gravels, stones – have natural divisional lines. Should be artistic with gentle curves &useful. All lines harmonize with each other.

8. **Proportion & Scale** – Proportion – definite relationship between masses. Ex. rectangle – 5: 8 ratio – pleasing. No set rule. A simple rule – design should look pleasant. Ex. Steps – wider, A tiny pool – midst of large lawn – disproportionate. Small rockery under base of large tree with small thorny plant- ugly

9. **Texture** – Surface character of garden unit – Texture. Texture (ground, tree, leaf, shrub) determines overall effect of garden. Texture of rugged ground – lay small pebbles. Gulmohor - fine textured in full leaf Spathodia - coarse textured tree. Keep all various textures with harmony & contrast - ultimate desirable effect.

10. **Time & Light** – Time factor – imp.

1. Daily time – during day receiving diff qty & qlty of light. Morning sun – vital for flowers. Design should be – in afternoon its possible to sit in a shaded place where best part of garden should be visible.

2. Seasonal changes – Keep in mind seasonal movement of sun & shade – light to fall during different parts of season.

11. **Tone & Colour** – Annual flowers – consist of all iimaginative hues. Arrangement – doesn't spoil beauty, patchy look but bring harmony. Basic colour – formulate colour scheme viz. Red, yellow, blue - hard/warm colour. Secondary colour – Orange, green, violet – soft/cool colour neutral colour - White, black, gray.

12.**Mobility-**

Sharp & contrastingly seasonal change in garden colour- mobility or movement. Ex. Leaf colour in autumn – wonderful hues. Shading of leaves in winter – dull & melancholy. New leaves with in spring - new life. Trees – *Termenalia catappa, Ficus religiosa, Attraction of Birds* – Movement & cluttering of birds – life, mobility. Large trees, Bird bath – Birds, flowering trees – *Bombax malbaricum* – bloom stage. Seasonal flowers – motion & movement of butterflies. Fountain, lawn, sprinkler, stream – movement, lily pool with colourful fish.

13. **Style** –

It commensurate with budget, taste, and nature of site. Develop own style.

Q.10. Describe the cultivation of aromatic rose on following points – **4 marks**

Ans:

1. **Soil and climate:** Soil with high amount of organic matter- Best. Grown on all types of soil. Sandy loam to heavy clay soil with high pH (9.0). Ideal pH- 6.0-7.5. Temperate plant. Flowering requires a dormant period. Flowers had borne on- 60-75 days old shoots. Northern India- temperature does not fall enough to induce dormancy. Plants drastically pruned- to induce artificial dormancy. 15 to 27 °C temperature.

2. **Propagation and planting:** Cutting & Suckers. Stem cuttings- 15-20 cm length, 0.5-1.0 cm thick, past season's growth at time of pruning. Suckers- Large suckers arise from single bush. Oct-Dec. – make Pits- 0.5 m deep and 0.5 m wide. Separate- rooted suckers from mother plant and plant in pits. **Planting:** Circular pits- 50 cm wide & 50 cm deep. Add- 3 kg FYM + 100 g SSP + 50 g MOP in each pit. Time- December-January. Spacing- 1 x 1 m - 1 ha - 10,000 plants.

3. **Manuring:** Flower yield increased- Apply FYM and NPK. 8-10 t FYM + 200 kg N + 80 kg P + 60 kg K per ha. Full FYM, P, K and ½ N- each year after prunning(Oct) ½ N (100)- at flowering (Jan). Foliar application- 1 % urea- at flower bud formation. Micronutrients- apply to soil- improves flowering

4. **Flowering and yield:** Light pink and highly scented flowers. Oil- all parts of flower- sepals, petals, stamens & carpel's. Weight of single flower- 1.98 to 2.70 g. Flowers in beginning- heavier than those borne late in seasons. Size of flower- 4 to 7 cm . No. of petals per flower- 48 to 60. Blooming- 2nd yr after planting. Commercially - 3rd years after planting till 12-15 years. Time- 2nd week of March- lasts 3-4 weeks. Flowers picked- early morning contains more essential oil- better

suited to oil extraction. Quantity of essential oil - decreases with advancement of time. Flowers picked- afternoon not suited for oil extraction. **Yield-** 30-40 q flowers ha^{-1}. Favourable climatic conditions- 50 q flowers ha^{-1}.

SECTION "B"

Q.11. Define the following -

1. Corm

A specialized underground organ consisting of enlarged stem axis with distinct nodes and internodes and enclosed by dry, sale leaves

2. Bulb

A specialized underground plant organ consisting of a greatly reduced stem (basal plate) surrounding by fleshy, modified leaves called scales.

3. Bract

Modified leaf, often brightly coloured, which subtends a flower, or which enfolds an inflorescence.

4. Cut flower

Cut flowers are fresh flower harvested in clusters / spike or in single along with their stem

Q.12. Answer in one sentence **(One mark each)**

1. What is bio aesthetic planning ?

Bio - aesthetic Planning: It refers to the proper utilization of the available flora and fauna in the beautification of the surroundings

2. What do you mean by sucker?

Some plants have capacity to produce new stems from the adventitious buds formed on their roots, such new growth are called suckers. Stem suckers are also produced from the base of the stem from below (he ground

3. What is family of mentha?

Family- Labiatae

4. What is botanical name of geranium ?.

Pelargonium graveolens (L.)

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I have checked the question paper as per the given checklist and the question paper is found correct.
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