MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE

Semester End Theory Examination

B.Sc. (Hons.) Agriculture

MODEL ANSWER SHEET

Semester	:	VI (New)		**Academic year**	:	2022-22
Course No.	:	GPB 366		**Title**	:	Crop Improvement II (*Rabi* Crops)
Credits	:	2(1+1)		**Total marks**	:	40
Day & date	:			**Time**	:	2 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 diagram wherever necessary.				

SECTION "A"

Q.1.		Describe in detail hybridization technique in mango. Give the constraints encountered in mango hybridization.
Ans.		**Caging technique for crossing:** developed at IARI following the discovery of self incompatibility in Dashehari, Langra, Chausa and Bombay Green, involves planting of grafted plants of the self-incompatible varieties along with those of male parents enclosed in an insect proof cage and allowing pollination by freshly reared house flies and thus ting away with the tedious hand pollination. **The constraints encountered in mango hybridization are:** 1. High fruit drop 2. Only one seedling can be obtained from one fruit. 3. The heterozygous nature and cross fertilization makes it difficult to predict the qualities of the hybrids. 4. Complex nature of panicle and flower and excessive fruit drop. 5. Large area of land is required for hybrid seedlings.
Q.2.		Describe the floral biology of chickpea. Write its breeding objectives.
Ans.		**Floral biology** 1. The flowers are papilionaceous. 2. They are solitary in axillary racemes. 3. Double flowers are rare, but are very much sought after by the breeders as possible sources of yield increase. 4. The calyx has five deep lancelolate teeth. Peduncle and calyx are hairy. 5. Generally, corolla is white. 6. The vexillum is obovate, 8-11 mm long and 7-10 mm wide. 7. Wings are obovate, 8-9 mm long. The keel is 6-8 mm long. 8. Number of pods/plants is highly variable, generally between 30 and 150 depending on the year, location, sowing time and other factors. Breeding Objectives

(i) Increased seed yield.
(ii) Increased biomass, tall, erect and compact cultivars
(iii) Resistance to diseases
(a) Ascochyta blight.
(b) Fusarium wilt.
(c) Root rot.
(d) Botrytis grey mould
(iv) Resistance to insect pests:
(a) Pod borer.
(v) Tolerance to stress environments:
(a) Cold
(b) Heat
(c) Drought
(d) Saline and alkaline soils.
(vi) Mechanical Harvesting

Q.3. Define stability enlist the different models of stability and explain Eberhart and Russell model.

Ans. Stability refers to the suitability of variety for general cultivation over wide range of environments.

Stability models:

1.Finlay and Wilkinson model (1963)
2.Eberhat and Russell model (1966)
3.Perkins and Jinks model (1968)
4.Freeman and Perkins model (1971)

- **1.Eberhat and Russell model (1966)**
- It is the most popular and useful model.
- In 1966 both made further improvement in stability analysis by partitioning the G.E interaction of each variety into 2 parts. one is slope of the regression line, second is deviation from regression line.
- In this model total variance is first divided into 2 components:
  - -genotypes
  - -environment plus interaction (E+G*E)
- The second component is further divided in to 3 components.
  - -Environment linear
  - -G. E linear
  - -Pooled deviations

This model consists of three parameters
a) mean yield over locations
b) regression coefficient =bi
C) Deviation from regression $=s^2di$ **S** Analysis of stability parameters is simple asw compared to other models of stability analysis.
The degree of freedom for environment is 1.
It requires less area hence less expensive when compared to other models.
It does not provide independent estimation for mean performance and environmental index

Q.4.		Give the centre of origin and scientific names of following crops 1. Maize 2. Cotton 3. Mustard 4. Sunflower
Ans.		1. Maize: **Origin**: Central America **Scientific name**: *Zea Meys* L. 2. Cotton: **Origin:** South America **Scientific name:** *Gossypium hirsutum* L 3. Mustard: **Origin**: India **Scientific name:** *Brassica nigra* 4. Sunflower: **Origin:** Central America/ Mexico **Scientific name:** *Helianthus annuus* L.
Q.5.		Define ~~Plant genetic resources~~ Gene Pool. Describe various methods of germplasm conservation.
Ans.		**Definition:** The sum total of genes in a crop species There are two important methods of germplasm conservation **(3 marks)** 1. *In situ* conservation Conservation of germpalsm under natural habitat is referred to as *in situ* conservation. It requires establishment of natural or biosphere reserves, national parks or protection of endangered areas or species. In this method of conservation, the wild species and the complete natural or semi natural ecosystems are preserved together. 2. *Ex situ* conservation It refers to preservation of germplasm in gene banks. The germplasm is conserved either in the form of seed or meristem cultures. Preservation in the form of seed is most common and easy method. Seed conservation is relatively safe, requires minimum space and easy to maintain. Glass, tin or plastic containers are used for preservation and storage of seeds. The seeds can be conserved under long term (50 to 100 years), medium term (10 to 15 years) and short term (3-5 years) storage conditions.
Q.6.		Give the information of Sugarcane and Linseed on following points. Wild relatives 2. Mode of pollination 3. Improved Varieties 4. Inflorescence
Ans.		**Sugarcane**: 1. Wild relatives/species: *Saccharum spontaneum, Saccharum robustum,* 2. Mode of pollination: cross pollination, 3. Improved Varieties/Hybrids: Co 86032, Co-94012, Co-92005, Phule 265 4. Inflorescence: Arrow **Linseed:** 1. Wild relatives/species: *Linum bienne, Linum floccosum, Linum hirsutum, linum nervosum* 2. Mode of pollination: self pollination 3. Improved Varieties/Hybrids: Surbhi (KI-1), Nagarkot (KL-31), Jeevan (DPL-21), Janaki (KL-43), Himalini, Inflorescence: Racemose or cymose
Q.7.		Define ideotype. Describe the plant ideotype for wheat
Ans.		**Ideotype:** A plant model which is expected to yield greater quantity of grains, fibre, oil or other useful product when developed as a cultivar **Ideotype for Wheat:** 1. A Short strong stem. 2. Erect leaves.

3. Few small leaves.
4. Larger ear.
5. An erect ear.
6. Presence of awns.
7. A single culm.
8. Semi dwarf plant height.

Q.8. Enlist different breeding methods used in sunflower. Write about the head to row and remnant seed method used for increasing the oil content in sunflower.

Breeding Methods:

1. Introduction 2. Mass selection 3. Hybridization and selection 4. Mutation
5. Head to row and remnant seed method 6. Heterosis Breeding

Head to row and remnant seed method:

Developed by Pustovoit in Russia. By this method oil content is increased.

Steps involved:

a) a large no (10,000 to 12,000) plants are selected from open pollinated type based on Head size.

b) The selected lines analysed for oil content and high oil content lines are isolated (1000 plants).

c) Part of the seed reserved and the part is sown in progeny rows along with check to estimate yield.

d) Second season testing is also done. The best lines are identified. The remnant seed of elite plants are raised in isolation and multiplied for crossing in next season. The multiplied lines also tested for oil content. and high yielding high oil content lines were raised in isolation and crossed.

Q.9. Enlist the different cultivated species of wheat along with its chromosome numbers. Describe the multiline development in wheat.

Ans.

Cultivated species of wheat:

1. Triticum monococum: 2n=2x= 14 2. Triticum durum: 2n=2x= 28
3. Triticum aestivum: 2n=2x= 42

Multiline development in wheat:

Multiline is a mixture of pure lines which are phenotypically similar but genotypically dissimilar. Each line is produced by separate back cross method. Each line having resistance against a particular race of a disease.

Borlaug developed multilines against rust. MLKS 15 at IARI.

Characteristics of a good multilines: genetic diversity, normal resistance, component line should be uniform agronomically, yield advantage

Achievements in wheat: KSML 3, MLKS 11, KML 7404

Q.10 Write short notes on (**Any Two**)

1. Mutation	2. NBPGR	3. Primary gene pool

1. **Mutation**: sudden heritable change in the phenotype of an individual.

   A physical or chemical agent which greatly enhance the frequency of mutation is called as mutagen.

   Different mutagens used to induce mutation

   1. Physical mutagens: X-ray, Gammy rays, UV-rays, Alpha particles, beta particals.
   2. Chemical mutagens: Ethyl methane Sulphonate (EMS), Methyl methane Sulphonate

proflavin, Sodium Azide.

2. **NBPGR:**
NBPGR: National Bureau of plant genetic resources
Established in 1976 in New Delhi.
Function of NBPGR:
To conduct research and promot collection, conservation, evaluation, documentation and utilization of crop genetic resources in india.
NBPGR is assisted by various crop research institutes.
NBPGR has five stations located at 1) Shimla (Himachal Pradesh), 2) Jodhpur (Rajasthan), 3) Akola (Maharashtra), 4) Kanya-kumari (Kerala) and 5) Shillong (Meghalaya).

3. **Primary gene pool:**
The gene pool in which intermating is easy and lead to production of fertile hybrids is known as primary gene pool
It includes plants of same species or closely related species.
Such gene pool, gene can be exchanged between lines simply by making normal crosses.
such gene pool is known as GP1.
This is the material of prime breeding importance.

SECTION "B"

Q.11		Define following terms
		1) Isolation distance 2) Rouging 3) Plant introduction 4) Seed
		1) **Isolation Distance:** separation of the field of a variety from that of another variety of the same crop to prescribed standard distance to avoid contamination. 2) **Rouging**: Act of removing the off-type plants from a seed production plot. 3) **Plant introduction:** Transposition of crop plants from the place of their cultivation to such areas where they never grown earlier 4) **seed:** The product of fertilized ovule that consists of embryo, seed coat and cotyledon
Q.12		Fill in the blanks.
		Botanical name of Linseed is ***Linum usitatissimum* L.**
		In bajara cross pollination occurs due to **protogyny** condition.
		Male part of maize is known as **Tassel.**
		Write the full form of PPVFR **Protection of plant varieties and farmers rights act-2001**

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