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SST 221, PRINCIPLES OF SEED TECHNOLOGY**

Seed Production of Red gram (Pigeon Pea)

Seed production of OPV:

Varieties: ICPL – 87 (Pragati); ICPL – 151 (Jagriti), Pusa – 33, JA – 4, JKM – 7, Asha (ICPL – 87119); LRG – 30, LRG – 38, LRG – 41

Land Requirements

Land to be used for seed production of pigeon pea shall be free of volunteer plants. In addition the soil should be light, well drained and with a neutral pH. Isolation requirements:

Red gram is partially self and cross pollinated. Although anthers burst before flowers open, there is considerable cross-fertilization by bees and other insects. Natural crossing to the extent of sixty five percent has also been recorded. Therefore, for maintaining variety purity an isolation of 200 mts. for foundation seed class and 100 mts. for certified seed class is necessary from fields of other varieties and of the same variety not conforming to varietal purity requirements of certification.

Brief cultural practices:

Obtain appropriate class of seed from the source approved by seed certification agency. The seed rate required is 12-15 kg/ha and the spacing adopted is 60 x 25 cm to 75 x 30 cm. Other cultural practices are similar to raising a commercial crop. Necessary prophylactic measures should be taken so as to raise a good crop.

Roguing:

Rogue the off type plants and diseased plants affected by wilt, leaf spot and stem canker, yellow mosaic virus and sterility virus from seed field from time to time, as required.

Number of field inspections:

A minimum two and maximum four field inspections are standardized for certification of different seed production programmes. For red gram, a minimum of two field inspections are required i.e. first one before flowering and second inspection during flowering and fruiting to determine isolation, volunteer plants, off types and diseased plants etc.

Harvesting and threshing:

The crop is harvested soon after the seed is mature. Harvesting is normally done with sickle and the crop is left in the field to dry for about one week. Threshing is done by beating the plants with

sticks. After threshing and cleaning the seed should be dried to 8 to 10 percent moisture before storage. Necessary precautions should be taken to avoid mechanical mixtures during these operations.

Seed yield

The average seed yield varies from 20 to 25 quintals per hectare.

Redgram Hybrid Seed Production:

Hybrids : ICPH – 8 : PPH – 4, COH – 1, COH – 2,; AKPH – 2022, AKPH – 4101

To produce hybrid seed in bulk, male sterile lines are planted in the ratio of six male sterile rows (Female): one pollinator row (Male). The hybrid seed plot is surrounded by four pollinator rows to provide sufficient pollen load. In genetic male sterility (GMS) system 50% plants appears male fertile in the female (MS) rows. Therefore, these fertile sibs needs to be uprooted immediately as the first bud appear on the plant. The male sterile sibs those remain are to be tagged in the female rows.

Periodic picking of immature pods from the pollinator rows may prolong their flowering time. It is possible to produce several hybrids in one isolation block using a common male parent and several male sterile, if their flowering can be synchronized. Appropriate isolation distance of 200 m between two seed blocks should be maintained to avoid contamination.

Seed Production of Green gram and Black gram

Green gram Varieties: WGG-2, WGG-37, MGG-295, MGG-348, LGG-450, LGG-460.

Black gram Varieties for Kharif and Rabi : T-9, LBG-623, LBG-20, WBG-26

For Rabi only: LBG-752, LBG-648, LBG-645, LBG-402 LBG-17

Land Requirements

Land to be used for seed production shall be free of volunteer plants. In addition the soil should be light, well drained and with a neutral ph.

Isolation requirements:

Green gram and Black gram are highly self-pollinated. Natural cross pollination to the extent of 0 to 5% has been recorded. Therefore, for maintaining variety purity an isolation of 10 m. for foundation seed class and 5 m. for certified seed class is necessary from fields of other varieties and of the same variety not confirming to varietal purity requirements of certification.

Brief cultural practices:

Obtain appropriate class of seed from the source approved by seed certification agency. The seed rate required is 15-20 kg/ha for kharif and 20-25 kg/ha for summer and the spacing adopted is 30 x 10 cm. Other cultural practices are similar to raising a commercial crop. Necessary prophylactic measures should be taken so as to raise a good crop.

Roguing:

Rogue the off type plants and diseased plants affected by leaf spot and stem canker, yellow mosaic virus and sterility virus from seed field from time to time, as required. Roguing should be done once before flowering and once after flowering based upon varietal morphological characters

Number a field inspections:

A minimum two field inspections are standardized for certification of different seed production programmes. For green gram and black gram, a minimum of two field inspections are required i.e. first one before flowering and second inspection during flowering and fruiting to determine isolation, volunteer plants, off types and diseased plants etc.

F/s C/s Off types (%) 0.1 % 0.2 %

Harvesting and threshing:

The crop is harvested soon after the seed is mature. Threshing is done by beating the plants with sticks. After threshing and cleaning the seed should be dried to 8 to 10 percent moisture before storage. Necessary precautions should be taken to avoid mechanical mixtures during these operations.

Seed yield

The average seed yield varies from 10 to 15 quintals per hectare.

SEED PRODUCTION OF BENGAL GRAM

Bengal gram Varieties: Jyothi, Annagiri, ICC37, ICCV2, JG11,

Land Requirements

Land to be used for seed production shall be free of volunteer plants. In addition the soil should be light, well drained and with a neutral ph.

Isolation requirements:

Bengal gram is a highly self-pollinated crop. Natural cross pollination to the extent of less than 5% has been recorded. Therefore, for maintaining variety purity an isolation of 10 m. for foundation seed class and 5 m. for certified seed class is necessary from fields of other varieties and of the same variety not conforming to varietal purity requirements of certification.

Brief cultural practices:

Obtain appropriate class of seed from the source approved by seed certification agency. The seed rate required is 50 kg/ha (small seed), 75 kg/ha (medium seed), 100 kg/ha (bold seed), 120kg/ha (kabuli) and the spacing adopted is 30 x 10 cm. The planting time is second fortnight of October to first week of November. Other cultural practices are similar to raising a commercial crop. Necessary prophylactic measures should be taken so as to raise a good crop.

Roguing:

Rogue the off type plants and diseased plants affected by wilt, root rot leaf spot and stem canker, yellow mosaic virus and sterility virus from seed field from time to time, as required. Roguing should be done once before flowering and once after flowering based upon varietal morphological characters.

Number a field inspections:

A minimum two field inspections are standardized for certification of different seed production programmes. For Bengal gram a minimum of two field inspections are required i.e. first one before flowering and second inspection during flowering and fruiting to determine isolation, volunteer plants, off types and diseased plants etc.

F/s C/s Off types (%) 0.1 % 0.2 %

Harvesting and threshing:

The crop is harvested soon after the seed is mature. Threshing is done by beating the plants with sticks. After threshing and cleaning the seed should be dried to 8 to 10 percent moisture before storage. Necessary precautions should be taken to avoid mechanical mixtures during these operations.

Seed yield

The average seed yield varies from 10 to 15 quintals per hectare.

Seed production of Cotton

Land requirement: The land should be free from volunteer plants, soil should be fertile, moisture retentive with good drainage.

Isolation requirement: Cotton is self-pollinated crop but natural cross-pollination may occur from 10-50% in *Gossypium hirsutum*, 1-2 % in *G. arboreum* and 5-10% in *G. barbadense*. It is desirable to produce only one variety at a time. For pure seed production the isolation distance required is 50 m and 30 m for foundation and certified seed respectively from other varieties and same varieties not conforming to varietal requirements.

Cultural practices: Obtain appropriate class of the seed from the source approved by seed certification agency. The seed rate required is 8-10 kg/ha. The package of practices recommended for commercial cultivation should be followed for raising a good crop.

Number of field inspection: A minimum of two-field inspection is required. First field inspection should be done at vegetative stage and the other at flowering stage to verify isolation requirement, offtypes and diseased plants.

Foundation seed Certified seed

Offtypes 0.1 % & 0.2 %

Rouging: remove the offtypes and diseased plants first at seedling stage and then at vegetative stage. Subsequent rouging for offtypes and diseased plants should be done at square initiation and flowering stage.

Harvesting and Picking: Picking is commenced when cotton is fully mature i.e. when the bolls begin to open. Several pickings are necessary since the bolls ripen over a period of 2-3 months. In general early pickings give better germination and good quality seed, however the planting seed is mostly gathered from the cotton harvested during peak period. The cotton picked from late-formed bolls (last picking) should not be used for seed purpose.

Precautions :

1. Start picking when the bolls are fully mature.
2. Picking should not be done when the bolls are wet due to rain or dew.
3. Bolls damaged by rains or insects or otherwise should not be used for seed.
4. The cotton should be clean with minimum amount of leaves and plant barks, so that the seed is not damaged during ginning.
5. Moist cotton with 12 % or more moisture content should not be stored because heating may occur which damages the seed.

Seed yield: Seed yield may be around 3-6 Q/ha depending upon the variety and management practices adopted.

Delinting is the removal of seed coat hairs and short fibers that remain after ginning. Delinting can be done by machine, acid or flame delinting. For acid delinting the seeds are treated with concentrated sulfuric acid and then washed with water 3 or 4 times.

Hybrid seed Production

Land requirement: Same as varieties.

In cotton hybrid seed is produced by manual hybridization i.e. emasculation and pollination. Individual flower buds are emasculated in the evening and pollinated next day morning. The male and female are planted in a ratio of 1:4 or 1:5. The first $\frac{4}{5}$ th of area are sown with female line and the remaining $\frac{1}{5}$ th by male line. For example if 85 there are 50 lines then 40 lines are sown with female parent and 10 lines with male parent. Male parent is sown 3-4 times at an interval of 6-8 days while the female is sown only once, so that sufficient number of male flowers should be available when the female flowers are receptive. The seed rate required for female parent is 3.75 kgs/ha and that of male parent is 2.5 kgs/ha. The spacing adopted for female parent is 150 x 100 cm and for that of male parent is 150 x 50 cm.

Isolation requirement: Isolation distance required is 50 m and 30m for foundation and certified seed respectively and 5 m between the parental lines.

Number of field inspections: A minimum of four inspections shall be made as follows:

1. the first inspection shall be made before flowering to verify isolation, volunteer plants, outcrosses and other relevant factors.
2. The second and third inspections shall be made during flowering to verify isolation, offtypes and other relevant factors. In case male sterile is used for producing hybrid seed, the number of pollen shedding plants in female parent shall also be verified.
3. The fourth inspection shall be made during picking of cotton in female parent in order to determine that selfed bolls are eliminated and only cotton from crossed bolls is picked.

Organizing an efficient crossing program :

1. Rogue out all offtypes from both male and female parental lines before starting the crossing program.
2. Emasculation should be done between 2.00 to 6.00 PM and pollination next day morning between 8.00 to 12.00 AM.
3. Select the bud that will open next day and emasculate it by removing the calyx, corolla and the monodelphous stamens without causing injury to the style and stigma.

4. Emasculate and pollinate all the flower buds appearing during the first seven weeks of reproductive phase to ensure good seed setting and development of the bolls.
5. Emasculation should be perfect and complete.
6. Cover the emasculated flower bud with butter paper bag and pollinate next day morning. (As per certification standards it is not necessary to cover the flower bud with butter paper bag as we are following the required isolation distance)
7. Remove all the unemasculated flower buds next day morning before fertilization.
8. Tie a thread to the pedicel of the bud after each pollination.
9. Crossing program should be stopped after the 11th week and remove all buds and flowers appearing subsequently to facilitate better development of the crossed buds.
10. Nip the terminal shoots to stop further growth and to support the development of crossed bolls.

Harvesting and Picking : Pick up the ripe and completely opened bolls along with pedicel and thread and collect in the basket. The bolls may be sorted once again to assure that they are crossed. Sun dry them for 1 or 2 days and store in gunny bag until supplied to the processing plants. Care should be taken to avoid mechanical admixtures during picking and there after. Grow out test is generally carried for hybrid seed of cotton produced by manual emasculation and pollination to ascertain the genetic purity.

Seed Production of Okra

Land requirement: No specific land requirements are there for okra seed production. However the land should be fertile, well drained and free from soil borne diseases.

Isolation requirement: Okra is self and cross pollinated crop. The extent of natural cross pollination varies from 4-19 %. The seed fields must be isolated from fields of other varieties and fields of same variety not conforming to varietal purity requirements for certification and wild *Abelmoschus* species at least by 400m and 200 m for foundation and certified seed production respectively.

Brief Cultural Practices:

Sowing time : the crop can be grown round the year but it should be seen that harvesting does not coincide with heavy rains. Further rabi sown crop is heavily infested by insects and pests. Early kharif sown crop or summer sown crop is good for seed production.

Seed rate: Kharif crop: 8-10 Kgs/ha

Summer crop 10-15 kgs/ha

Method of sowing: sowing should be done in rows by following a spacing of 60 x 30- 45cm for kharif season and 45 x 30 cm for summer season.

Field Inspection: A minimum of three inspection shall be made. First inspection should be done before flowering, second during peak flowering and fruiting stage and third at mature fruit stage or prior to harvesting. The field standards are as follows;

Objectionable weed plants None

Rouging: Rouging of the seed crop should begin with uprooting and destroying the yellow vein mosaic affected plants soon after they are noticed. This should be continued up to 3 fruit stage. Subsequent rouging for offtypes and wild *Abelmoschus* species should be done prior to flowering. This should continue during the flowering stage also. The offtype plants are easily distinguished on the basis of plant height, leaf and stem characteristics, pigmentation, flower size, shape, color and fruit shape. All the offtypes and diseased plants should be identified and removed before flowering stage.

Harvesting and threshing: Pods should be harvested when they have dried (about 35 days old). The pods are usually picked by hand, dried and threshed by beating with sticks. The seed should be dried to at least 10% moisture content before storage.

Seed Yield: the average seed yield is 12 quintals per hectare.