RESEARCH HYBRID SEED PRODUCTION IN COTTON

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Abstract. This article describes in detail the process of growing and cultivating seeds, one of the most important parts of the cotton industry. In Cotton hybrid seed production is done either by conventional hand emasculation and pollination or by nonconventional (male sterility based).

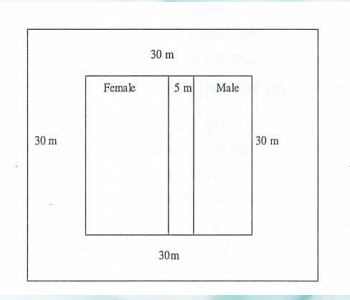
Keywords: Cotton, hybrid seed, leaf, method, growing, industry.

Introduction. Cotton is a major fibre crop of global significance. It is grown in tropical and sub-tropical regions of more than 80 countries. The major cotton producing countries are China, India, USA, Pakistan, Uzbekistan, Turkey, Brazil, Greece, Argentina, Australia and Egypt contributing about 85% of global production. Uzbekistan has the largest area under cotton cultivation in the world and grows all four cultivated species namely on commercial scale. Ok-dare 6, Namangan 77 and Tashkent 6 are the common varieties of cotton planted in the country However, the productivity of cotton in Uzbekistan is low due to its rain forced cultivation in major areas (66%) and inadequate use of quality inputs.

Methods and objects of research

Majority of the hybrids released so far are conventional ones. Development of such hybrids involve three steps viz. (i) Identification and growing of male and female parents, (ii) emasculation of female parent and (iii) pollination of female parent with identified male parent. Cotton is an often cross pollinated crop. The average outcrossing is 6%. The pollen is heavy and sticky and hence cross pollination occurs only by insects i.e. honey bees and bumble bees. In diploid cottons conventional method is highly uneconomical since boll setting is low due to small flower size and brittle pedicel.

The development of hybrids using male sterility eliminates the process of emasculation since the anthers are sterile in female parent without pollen. Thus the cost of hybrid seed production can be reduced. However, pollination has to be done manually. In cotton, mainly two types of male sterility such as genetic male sterility and cytoplasmic genetic male sterility are used for seed production.



Maintenance of genetic purity for certified seed production of conventional or male sterility based hybrids depends upon the use of safe isolation distance. The cotton hybrid seed production plot should have **30 m** isolation distance on all sides from other fields. The isolation distance between parents should be minimum 5 m as shown below. The other field standards to be met for certification given in table.

Fertilizer dose of 100: 50: 50 or 150: 75: 75 kg/ha NPK depending on the soil fertility has to be given out of which 50: 50; 50 or 75: 75: 75 Kg/ha NPK as a basal dose and remaining 50 or 75 Kg N in 2 - splits at square initiation, flowering, boll development stage to be given.

Recommended dose for rainfed cotton is 60:30:30 NPK per ha. Basal dose of Suphala (2 bags containing 100 kg suphala has NPK - 15: 15: 15) is given @ 200kg/ ha. The remaining 30 Kg of nitrogen is given in the form of urea @ 32.6Kg/ha each in 2 splits at flowering and boll formation stage.

Raising of Parental lines

If male sterile lines are used as parents for producing hybrid seed, following eligibility requirements are to be considered:

An inbred line to be eligible for certification shall be from a source such that its identity may be assured and approved by the certification agency.

Hybrid seed to be certified should be the progeny of two approved inbred lines one of which shall be male sterile.

An inbred line shall be a relatively true breeding strain resulting from self pollination with selection.

The foundation class seed shall consist of an approved male sterile line to be used as female parent and an approved inbred line to be used as a male parent for the purpose of producing hybrid seed.

A male sterile line shall be a strain carrying cytoplasmic genetic male sterility which sheds no viable pollen and is maintained by the normal sister strain (2) which is used as a pollinator.

The certified class seed shall be the hybrid seed to be planted for any use except seed production.

Sowing

Breeder/ foundation seeds of selected hybrids. Female and male parents are planted in the same field in separate lots with 5 m isolation between parents and 30 m from other cotton crop. The sowing dates of parental lines are so adjusted in such a way that there is synchronization of flowering in female and male parent and there will be continuous supply of pollen till the crossing season is over. Staggered planting of male is generally done depending on the date of flowering in male and female.

Hybrids	Female	Male
H x H (Both parents flower at the same time)	100%	50% along with female, 50% 7-10 days after sowing
H x B / Diploid Multi nodal - (*G barbadense*) Female flowers early and Male flowers late	100%	50% along with female, 50% 7-10 days after sowing
H x B Un nodal (*G. bardadense*)	100%	10% along with female 30% one week after 30% two weeks after 30% three weeks after

The spacing and planting ratio to be followed for parental lines of different hybrids is given in table:

Seed rate and spacing for female and male parents of conventional, GMS (desi) and CMS hybrids

Type of hybrid	Female Parent (0.67ha)	Male Parent (0.33 ha)
(H x H) Planting ratio	Seed Rate: 3.0-3.5 Kg/ha Spacing: 90cm x 90cm cm/120cm x 120cm (one plant/hill) 2	Seed Rate: 8-10Kg/ha Spacing: 90 x 30 cm/ 90 cm x 60 cm. 1
(H x B) Plantingratio	Seed Rate: 3.0-3.5 Kg/ha Spacing: 90x90 cm/120x120 cm (one plant/hill)2 1	Seed Rate: 8-10 Kg/ha Spacing: 60 x 30 cm 1 (Multinodal sympodia) 1 (Uninodal sympodia)
DiploidSpacing Plantingratio	Seed Rate:10Kg/ha Spacing: 90x90 cm/90cm x 60cm (one plant/hill)2	Seed Rate: 10 Kg/ha Spacing: 90 x 20 cm/ 90 x 10 cm 1

The plants in these seed production plots are to be thoroughly examined for purity, and off-types if any should be removed.

Plant Protection Measures: Sucking pests and boll worms are the major pests of cotton. The attack of sucking pests (jassid/aphids and thrips) occurs during early growth stages of the crop and can be effectively controlled by spray of Confidor @ 100 ml/ha. During flowering, spray of Endosulphan @ 2L/ha can manage the attack of boll worms on squares and flowers. In case of severe infestation Avaunt @ 500 ml/ha need to be sprayed. Towards boll setting stage control of pink boll worm can be achieved by spray of Thiodecar @ 1 Kg /ha. Grey mildew, alternaria and bacterial blight are the major diseases affecting cotton. Spray of Bavistin @ 10g in 10 litre water controls the grey mildew and spray of streptocycline 1g along with 20g copper oxychloride in 10 litres of water controls the bacterial blight.

Doak method or thumbnail method:

This is the most successful method used in hybrid seed production of tetraploid cottons wherein 40 to 50% or more seed setting is obtained. The method involves removal of corolla along with anther sheath by giving shallow cut at the base of the bud with thumb nail and removing corolla and anther column in one jerk twisting action (Doak, 1934). Care should be taken to ensure that the white cover membrane of the ovary is not damaged or removed during this operation as this affects the boll setting. It should also be verified that no anther sac remains at the base of ovary at the time of emasculation. This will cause selfing and cause genetic impurity by increased number of seed of the female parent. Emasculated flower buds are generally covered with tissue paper bag (9cmx7cm) so as

to prevent contamination from foreign pollen. If no open flowers are left over in the field of female parent, bagging may be avoided but marking of emasculated flower helps in identification during pollination Though commonly adopted, this method is not suitable for developing diploid or desi hybrids since the flower buds of these are small and the style is short and brittle rendering the method unsuitable in large scale seed production of hybrid seeds. Unless appropriate alternative method is developed, the seed cost for this type may become too prohibitive to become an economic feasibility.

Doak method of emasculation

A. Bud selection

B. Removal of corolla and another sheath

C. Emasculated flower bud

D. Covering with red bag

Conclusion: This article describes in detail the process of growing and cultivating seeds, one of the most important parts of the cotton industry. In Cotton hybrid seed production is done either by conventional hand emasculation and pollination or by nonconventional (male sterility based).

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