

Quality Seed Production in Sorghum [*Sorghum bicolor* (L.) Moench] Using Emasculation and Pollination Techniques

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Introduction

In hot arid region of north-southern India, systematic cereal crop production is limited way to produced. Because there aren't enough desirable sources of crop-genotypes, seed-planting materials, or technological advancements as well as incompatible with the local agro-climatic conditions. Sorghum is a major millet (nutra-cereal crop) which is extensively utilised in India. It serves as food, a raw material for the agricultural industry and a feed for animal. The botanical name for sorghum is *Sorghum bicolor* (L.) and it is a member of the *poaceae* family. It is a crop that is often cross-pollinated and the pollinators are insects and wind. Based on the type of ear head, the extent of out crossing ranges from 6 to 45 percent. Due to the valuable hybrid seeds in normal cultivation, seed production generates more income to the farmers (Sudha *et al.* 2006). Pollination and emasculation methods are required to produce hybrid seeds in sorghum crop. Sorghum under ordinary conditions possessing long storability which has made “*Famine reserver*” as well as nutritionally superior as their grains contains high amount of protein, essential amino acid, minerals and vitamins (Vinoth and Ravindharan, 2017). So, hybrid seed production is very important in sorghum.

This article will inform to readers about sorghum crossing techniques and the how hybrid seed production carried out which whole information provided through this article.

Crossing programme

The crossing is performed by hand emasculation followed by manual hand pollination.

Floral parts-Anthesis

Flowering started at the tip of panicle and moves downward in sorghum called 'Basipetal' (Fig. 1). Spikelet's occur in pairs on the lateral branches of the panicle (Reddy, 2017). One is sessile, while another spikelet is pedicellate. Sessile is bisexual, and pedicellate spikelet is either male or sterile. Sessile spikelet is comparatively larger than staminate spikelet, and each spikelet has two florets. Anthesis starts from tip to downwards at 2-5 cm per day and completes within 7-10 days. Anthesis time 3-6 am. The pollen grains are viable only for a short period, and stigma is receptive for 8-16 hours. The colour of fertile pollen is Lemon-yellow. Normally, older pollen grains will turn orange (Gami and Chauhan, 2022).

Selfing technique

Head bagging is efficient for selfing the ear heads. Once the decision to bag heads has been made, all heads in a row should be covered (Fig. 2). If a head has already begun to flower, the flowering portion should be cut off. During head bagging, the boot leaf of the plant is usually removed before placing the bag.



Figure 1: Sorghum anthesis and pattern floral parts



Figure 2: Selfing of sorghum

Emasculation technique

Emasculation was done by grasping the florets between the thumb and forefinger, with the pedicelled spikelet held away from the operator. The emasculation needle or pencil turned such that the flat portion remains parallel to the opening between the glumes. The needle was inserted just below the middle of the floret, and then moved towards the back glume, and across the floret. The needle was then rotated slightly and lifted; the three anthers came up were removed. The emasculation was carried out during evening hours between 4:00 to 7:00 P.M. on well-developed buds of female parents which is about to open the next day morning (Fig. 3).

Bagging

After removing the already open and very immature buds, the emasculated buds of female parents were covered with white paper bags.

Pollination

Pollen usually sheds just before or shortly after sunrise on dry mornings. Pollination should begin soon after normal pollen shedding is over in the morning. The flowers which emasculated in the previous day evening were pollinated next day morning (between 7.00 to 10.00 a.m.) by collecting the pollen grains from protected flowers from parents. The pollen grains were applied on a receptive stigma by brush and these flowers were covered with suitable paper bag, and labelled. Under field conditions, the pollen is viable for 10 to 20 minutes.



Clipping of tip and the lower panicle branches



Anther lift out through pencil or needle



Emasculated panicle



Bagging with white paper bag



After pollination covered with bag



Panicle with F₁ seed (crossed seed)

Figure 3: Emasculation techniques in sorghum

Seed setting

The selfed and crossed panicles were harvested separately at the time of maturity. After around 5 to 7 weeks, the seed get mature and turn a completely yellow colour, which is a sign of mature seeds. The panicles were dried under the sunlight and threshed. The seeds were collected separately.

Crossing procedures carried out in sorghum need some precautions:

- To avoid damaging the gynoecium during emasculation, care must be taken.
- The emasculated spikelet's are covered with a large parchment paper bag to prevent contamination from foreign pollen.
- To prevent pest infestation, use the right insecticides frequently, this will result in healthy and vigorous seed.
- Bagging is carried out in proper way to protect the flower and seed from the sorghum gall midge *Stenodiplosis sorghicola* (L.).
- Use lightweight white paper or butter paper bag to avoid excess weight on the flower petiole.

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