

HYBRID SEED PRODUCTION IN SORGHUM

Breeding technique for Commercial production

Cytoplasmic genetic male sterility (CGMS)

Seeds produced in different stages

Nucleus seed stage	:	Maintenance of basic source by seed to row progenies.
Breeder Stage	:	A (AxB), B and R line are multiplied
Foundation Stage	:	A (AxB) and R line are multiplied
Breeder and foundation seed stage	:	Multiplication of male sterile line or maintenance of A and B line
Certified seed stage	:	A x R – F1 hybrid produced.
Certified seed stage	:	Production of hybrid seed

Stages of Seed Production

Breeder seed ---> A x B - B - R

Foundation seed ---> A x B - B - R

Certified seed ---> A x R

Popular hybrids of their parents: The first hybrid (CSH 1) was released in 1964. In 1969, the Coordinated Sorghum Improvement Project was established. Now there are more than 30 hybrids. Some popular are

CSH1	CK 60 A x IS 84
CSH5	2077A x CS3541
CSH 9	MS 296 A x CS 3541
COH2	2219A x IS3541(Kovilpatti Tall)
COH3	2077A x CO21
COH4	296A x TNS30
CSH 13 R	296 A x RS 29
CSH 14	AKMS 14A x AKR 150
CSH 16	27 A x C 43
CSH 15 (R)	104 A x R 585
CSH 17	AKMS 14A x RS 673

Stages of seed multiplication : Breeder seed – foundation seed – certified seed.

Foundation seed production : A and B line are raised in 4:2 ratio with 4 rows of B line as border row and allowed for cross pollination. The seeds from A line will be collected as A line seeds (multiplied).

Certified seed production : Hybrid seed production

Commercial in Hybrid seed production techniques

	Isolation distance	
	FS	CS
Normal	200	100
On presence of Johnson grass	400	400
On presence of forage sorghum	400	200
Hybrids	300	200

Johnson grass



Forage sorghum



Seeds and sowing

Seed rate	:	A line : 8 kg ha ⁻¹ R line : 4 kg ha ⁻¹
Spacing	:	A line : 45 x 30cm R line : 45 x solid row spacing.
Planting ratio	:	Foundation seed stage: 4:2 (A: B) Certified seed stage : 5.2 (A:R)
Border rows	:	4 rows of male (either B or R line) to, supply adequate pollen.
Live markers	:	<ul style="list-style-type: none">• Live plants used for identification of male line live markers are used.• It should have distinguishable

morphological characters.

- Live markers can be sunflower, daincha etc.

Manures and Fertilizers

Compost	:	12.5 t / ha
NPK	:	100:50:50 kg ha ⁻¹
Basal	:	50:50:5 kg ha ⁻¹
Top dressing	:	25kg N after last ploughing 25kg N after boot leaf stage (45 days)

Synchronization technique

1. Staggered sowing: Sowing of male parent and female parents are adjusted in such a way that both parents come to flowering at the same time.
 - ✓ CSH-5, MS 2077 A must be sown 10-15 days earlier to the male CS 3541,
 - ✓ CSH 6, the female parent MS 2219 A can be sown simultaneously with CS 3541
 - ✓ CSH 9, the female parent MS 296 A must be sown 7-10 days earlier than male CS 3541 in November- December season.
2. Spraying growth retardant MH 500 ppm at 45 DAS, delays flowering in advancing parent. MH wont dissolve in water and hence dissolve it in NaOH and then mix with water.
3. Urea spraying 1% to the lagging parent.
4. Withhold one irrigation to the advancing parent.
5. Spraying CCC 300 ppm will delay flowering.

parents.



Roguing: Do it in both

Off types

- In female line remove : off types, wild types, pollen shedders, rogues, partials, volunteer plants, diseased plants, R line, mosaic plants, late / Early flowering plant
- In male line remove : Rogues, A line, Diseased plants, Late / early flowering plants, Wild types

Types of contamination

Presence of B line in A line called as pollen shedders

Presence of A line in B line called as off type

Presence of R line in B line called as rogue

Presence of B line in B line called as rogue

Presence of B line in R line called as rogue

Presence of B line in R line called as rogue

Pollen shedders and off type cause physical contamination, whereas, rogue cause physical and genetical contamination.

Pollen shedders

Presence of B line plants in A line are called pollen shedders.

Partials

In certain A line plants, a part of the earhead-shed pollen due to the removal of sterility due to parental impurity (or) developmental variation or temperature.

Field Standards

	Isolation distance	
	FS	CS
Offtypes (max) Varieties	0.05	0.10
Hybrids	0.05	0.10
Pollen shedders (max)	0.05	0.10
Designated diseased plants (max) (Ergot and smut)	0.05	0.10

Designated disease

1. Kernel smut
2. Head smut
3. Sugary disease of sorghum
 - ❖ It is specific to hybrid
 - ❖ Occur due to low seed set
 - ❖ Spray rogor 0.03% (or)
 - ❖ Endosulfan 0.07%

Method of harvesting

Male and female lines should be harvested separately. The male rows are harvested first and transported to separate threshing floor. Like that female rows are harvested and threshed separately.

Threshing

- ✓ At the time of threshing the seed moisture content should be reduced around 15-18%. Threshing can be done by beating the earheads with bamboo sticks.
- ✓ While using the mechanical threshers, care should be taken to avoid mechanical damage.

Drying

Seed should be dried to 12% for short term storage and 8% for long term storage.

Processing

The sorghum seeds can be processed in OSAW cleaner cum grader using 9/64" round perforated metal sieve.

Seed treatment and storage

- ✓ The seeds are treated with captan or thiram @ 2 g/kg of seed and pack it in cloth bag at 12% moisture content for short term storage and 8% moisture content in 700 gauge poly ethylene bag for long term storage (or)
- ✓ The seeds can also be treated with halogen mixture @ 3 g/kg of seeds. The halogen mixture is prepared by mixing CaOCl_2 and CaCO_3 + *Albizzia amara* at the rate of 5:4:1 and this mixture is kept in an air tight plastic container for 1 week. After one week the mixture is used for seed treatment.
- ✓ The treated seeds can be stored upto 12 months under open storage and upto 18 months in moisture vapour proof containers, provided it is not infested by the storage insects.

Seed yield : 3000 kg ha⁻¹

Seed standards

	Foundation seed	Certified seed
Physical purity (%)	98	98
Inert matter (%)	2	2

Other crop seed	5 kg ⁻¹	10 kg ⁻¹
Weed seed	10 kg ⁻¹	20 kg ⁻¹
Other distinguishable variety	10 kg ⁻¹	20 kg ⁻¹
Ergot disease by number	0.020%	0.040%
Moisture content		
Moisture pervious container	12	12
Moisture vapour proof container	8	8

Others – as in varieties