

CSH 22SS – an improved sweet sorghum hybrid

SSV 84-Traits recorded as per guidelines for sorghum as approved by PPVFRA*

Characteristics	Characteristic value of candidate variety									Remarks Measured value etc.
	1	2	3	4	5	6	7	8	9	
Seedling: anthocyanin coloration of coleoptiles	√									Green
Leaf sheath: anthocyanin coloration	√									Green
Leaf: mid rib color (5th fully developed leaf)			√							Yellow green
Plant: time of panicle emergence (50% of the plants with complete panicle emergence)									√	91
Plant: natural height of foliage up to base of flag leaf									√	Tall
Flag leaf: yellow coloration of midrib	√									Absent
Lemma: arista formation (awns)	√									Absent
Stigma: anthocyanin coloration	√									Present
Stigma: yellow coloration	√									Present
Stigma length (mm)			√							Medium
Flower with pedicel: length of flower					√					Long
Anther: length					√					Short
Anther: color of dry anther				√						Grayed orange
Glume: color							√			Grayed purple
Plant: total height									√	Very long
Stem: diameter (at lower one third height of plant) (mm)			√							Medium
Leaf: length of blade of the third leaf from top including flag leaf (cm)									√	Long
Leaf: width of blade of the third leaf from top including flag leaf (cm)									√	Very broad
Panicle: length without peduncle			√							Short
Panicle: length of branches (middle third of panicle)					√					Medium
Panicle: density at maturity (earhead compactness)							√			Semi compact
Panicle: shape			√							Panicle broader at upper part
Neck of panicle: visible length above sheath (cm)	√									Absent
Glume coverage (%)			√							Short
Threshability					√					Partly threshable
Caryopsis: color after threshing	√									Yellow white
Grain: weight of 1000 grains (g)					√					Low
Grain: shape in dorsal view			√							Spherical
Grain: shape in profile view			√							Spherical
Grain: size of mark of germ							√			Large
Grain: texture of endosperm (in longitudinal section)							√			¾ arinaceous
Grain: color of vitreous albumen			√							Grayed yellow
Grain: luster							√			Non-lustrous

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CSH 22SS Salient Features



- ▶ Parentage: IC3A 38 x SSV 84
- ▶ Medium duration hybrid: 120 days
- ▶ Days to 50% flowering: 80 to 88 days
- ▶ Plant height: 280–350 cm
- ▶ High stalk yield (44–52 t ha⁻¹): 29% higher than SSV 84 and CSV 19SS.
- ▶ High ethanol yield (1250–1320 L ha⁻¹): 43% higher than SSV 84 and 34% higher than CSV 19SS.
- ▶ High juice yield (15800–17250 L ha⁻¹): 33% higher than SSV 84 and 24% higher than CSV 19SS.
- ▶ High juice extraction (33–40%): 8% higher than CSV 19SS.
- ▶ High CCS (3.2–4.0 t ha⁻¹): 33% higher than SSV 84.

- ▶ High grain yield: 2.1–2.6 t ha⁻¹
- ▶ Tolerant to anthracnose, grain mold and downy mildew
- ▶ Suitable for cultivation in Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, and parts of Madhya Pradesh and Gujarat.
- ▶ Suitable for cultivation in rainy season as rainfed crop; assured irrigation required during post-rainy season.

About ICRISAT



The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger, malnutrition and a degraded environment through better and more resilient agriculture.

ICRISAT is headquartered in Hyderabad, Andhra Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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CSH 22SS

- ▶ This nationally-released hybrid was developed at the Directorate of Sorghum Research (DSR) and was tested as NSSH 104 in multilocation trials during 2003–04 under the All India Coordinated Sorghum Improvement Project (AICSIP).
- ▶ It was derived by crossing ICSA 38 with SSV 84, and was released in 2005.
- ▶ The female parent, ICSA 38, was developed at ICRISAT and the male parent was bred at MPKV, Rahuri, Maharashtra.
- ▶ This is a sweet stalk hybrid with high commercial stalk sugar.
- ▶ The plant is tan colored, has green leaves with white midribs, red glumes without awns, semi-loose symmetric panicle, and white and spherical grains. The endosperm is yellow and corneous.
- ▶ Based on its performance in AICSIP trials, it has been recommended for cultivation in Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, and parts of Madhya Pradesh and Gujarat.
- ▶ A farmer cannot produce his/her own seed of hybrid CSH 22SS. Hence, new seed should be purchased every season.

The seed of hybrid CSH 22SS should be replaced every year. The seed is available in limited quantities from DSR and ICRISAT. DSR can undertake custom seed production of CSH 22SS for biofuel industries

This hybrid was bred by the sorghum team, PK Biswas, S Balaravi CV Ratnavathi, GB Ramulu, A Laxmareddy, D Gopalakrishna and G Pandurangarao, at the **Directorate of Sorghum Research (DSR)**, Rajendranagar, Hyderabad-500030. The A-line, ICSA 38 (the female parent of the hybrid) was bred at the **International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)**, Patancheru 502 324, Andhra Pradesh, India by DS Murthy, Belum VS Reddy, JW Stenhouse and team. JV Patil and BN Barkhede developed the male parent SSV 84 at **Mahatma Phule Krishi Vidyapeeth (MPKV)**, Rahuri, Maharashtra.

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SSV 84 Salient Features

1. Pedigree:	SSV 84
2. Days to 50% flowering:	90
3. Plant height (m):	02.4
4. Plant girth (mm):	19.13
5. Bio-mass yield (t ha ⁻¹):	52.7
6. Juice yield (t ha ⁻¹):	13.6
7. Juice extraction (%):	26
8. Brix (%):	20
9. Grain yield (t ha ⁻¹):	03.3
10. Male fertility restoration (%):	90
11. Sucrose (%):	04.99
12. Glucose (%):	00.42
13. Fructose (%):	00.18
14. pH of juice :	05.2
15. Electrical conductivity of juice (m S m ⁻¹)*:	07.2
16. Tolerant to:	Shootfly, Aphids, Rust.
17. Adaptation:	Rainy season

* milli siemens per meter



ICSA 38-Traits recorded as per guidelines for sorghum as approved by PPVFRA*

Characteristics	Characteristic value of candidate hybrid parent									Remarks Measured value etc.	
	1	2	3	4	5	6	7	8	9		
Seedling : anthocyanin coloration of coleoptile	√										Green
Leaf sheath: anthocyanin coloration	√										Green
Leaf : midrib colour (5th fully developed leaf)				√							Brown
Plant: time of panicle emergence (50% of the plants with complete panicle emergence)							√				74
Plant: natural height of foliage up to base of flag leaf			√								1.1
Flag leaf: yellow coloration of midrib	√										Absent
Lemma: arista formation (awns)	√										Absent
Stigma: anthocyanin coloration	√										Absent
Stigma: yellow coloration	√										Average
Stigma length (mm)			√								Short
Flower with pedicel: length of flower			√								Short
Anther: length			√								Short
Anther: color of dry anther				√							Orange
Glume: color				√							Light red
Plant: total height			√								1.4
Stem : diameter (at lower one third height of plant) (mm)							√				18.6
Leaf: length of blade of the third leaf from top including flag leaf (cm)									√		80.6
Leaf: width of blade of the third leaf from top including flag leaf (cm)								√			7.6
Panicle: length without peduncle					√						30.7
Panicle: length of branches (middle third of panicle)					√						7.7
Panicle: density at maturity (earhead compactness)								√			Semi-compact
Panicle: shape			√								Symmetric
Neck of panicle: visible length above sheath (cm)									√		24
Glume coverage (%)	√										25
Threshability					√						Partly threshable
Caryopsis: color after threshing	√										White
Grain: weight of 1000 grains (g)					√						25.7
Grain: shape in dorsal view			√								Spherical
Grain: shape in profile view			√								Spherical
Grain: size of mark of germ								√			Large
Grain: texture of endosperm (in longitudinal section)					√						75% corneous
Grain: color of vitreous albumen			√								Yellow
Grain : luster	√										Non-lustrous

*PPVFRA: Protection of Plant Varieties and Farmers Rights ACT.

Improved Crop Management Practices for Higher Productivity

Sweet sorghum is the most suitable crop for rainfed areas. On an average, the crop produces 3,000 kg ha⁻¹ grain and 300–400 q ha⁻¹ fresh stalks per season.

Crop management practices for higher yield:

1. Choose suitable cultivar for the region.
2. Sowing at the onset of the monsoon or within one week of the first shower will help escape shoot fly incidence.
3. Try to keep optimum plant population (110,000–120,000 ha⁻¹) by adopting a spacing of 60 cm between the rows and 15 cm interplant distance within the row. Use 8 kg ha⁻¹ (or 3 kg acre⁻¹) seed after treating it with imidachloprid (5 ml kg⁻¹ seed). Thinning of the crop should be done at 15–20 days after emergence (DAE) and one healthy plant per hill should be maintained with an interplant distance of 15 cm.
4. Apply 80:40:40 kg NPK ha⁻¹ to get maximum yield. 40 kg N, 54 kg P₂O₅ and 40 kg K₂O should be applied as a basal dose at the time of sowing and the remaining 40 kg split into two equal installments at about 20–25 days after sowing (DAS, ie, at final thinning) and at about 35–45 DAS. However, the fertility recommendation should be based on prior soil test results in a particular region where the crop is grown. In some areas, application of 200 kg gypsum, 50 kg zinc sulfate and 1.25 kg of *Agribor* or 2.5 kg borax (boron) per hectare as a treatment once in three years can give significant response
5. Intercropping with soybean (2:2) and pigeonpea (4:2) is beneficial.
6. Plant protection:
 - g. Early sowing and seed treatment will help in reducing shoot fly damage.
 - h. In the late-sown crop, use an enhanced seed rate (10 kg ha⁻¹) with carbofuran 3% G at 20 kg ha⁻¹ as a basal application.
 - i. Apply endosulfan 4G or carbofuran 3% G (12–15 kg ha⁻¹) as a top dressing close to plants at 30–35 DAE to avoid stem borer incidence.
 - j. Spray endosulfan 35 EC at 1 L ha⁻¹ at flowering to control midge damage.
 - k. Harvest the crop at physiological maturity to avoid grain mold damage and to obtain maximum stalk yield and good grain yield.

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Seedling: anthocyanin coloration of coleoptile		√								Yellow green
Leaf sheath: anthocyanin coloration	√									Yellow green
Leaf : midrib color (5th fully developed leaf)	√									Yellow green
Plant: time of panicle emergence (50% of the plants with complete panicle emergence)							√			Very late
Plant: natural height of foliage up to base of flag leaf							√			Very tall
Flag leaf: yellow coloration of midrib	√									Absent
Lemma: arista formation (awns)	√									Absent
Stigma: anthocyanin coloration	√									Present
Stigma: yellow coloration					√					Absent
Stigma length (mm)			√							Medium
Flower with pedicel: length of flower					√					Short
Anther: length					√					Short
Anther: color of dry anther				√						Grayed orange
Glume: color					√					Grayed purple
Plant: total height							√			Very long
Stem: diameter (at lower one third height of plant) (mm)							√			Medium
Leaf: length of blade of the third leaf from top including flag leaf (cm)									√	Very long
Leaf: width of blade of the third leaf from top including flag leaf (cm)									√	Very broad
Panicle: length without peduncle					√					Medium
Panicle: length of branches (middle third of panicle)					√					Medium
Panicle: density at maturity (earhead compactness)					√					Semi-Compact
Panicle: shape			√							Symmetric
Neck of panicle : visible length above sheath (cm)							√			Absent or very short
Glume coverage (%)	√									Short
Threshability	√									Partly threshable
Caryopsis: color after threshing	√									Grayed orange
Grain: weight of 1000 grains (g)					√					Low
Grain: shape in dorsal view			√							Spherical
Grain: shape in profile view			√							Elliptic
Grain: size of mark of germ							√			Medium
Grain: texture of endosperm (in longitudinal section)							√			Half vitreous
Grain: color of vitreous albumen			√							Grayed yellow
Grain: luster							√			Lustrous

*PPVFRA:Protection of Plant Varieties and Farmers Rights ACT.

ICSB 38 Salient Features

- | | |
|--|---|
| 1. Pedigree: | [(BTx 623 x MR 862) B lines bulk]-5-1-3-5 |
| 2. Days to 50% flowering: | 71 |
| 3. Plant height (m): | 01.3 |
| 4. Plant girth (mm): | 23.18 |
| 5. Bio-mass yield (t ha ⁻¹): | 24.4 |
| 6. Juice yield (t ha ⁻¹): | 05.5 |
| 7. Juice Extraction (%): | 22 |
| 8. Brix (%): | 09 |
| 9. Grain yield (t ha ⁻¹): | 02.4 |
| 10. Male fertility restoration (%): | 80 |
| 11. Sucrose (%): | 02.71 |
| 12. Glucose (%): | 02.07 |
| 13. Fructose (%): | 00.65 |
| 14. pH of juice: | 05.4 |
| 15. Electrical conductivity of juice (m S m ⁻¹): | 14.7 |
| 16. Tolerant to: | Shoot fly, Stem borer, Rust. |
| 17. Adaptation: | Rainy season. |

* Milli siemens per meter

