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# Pigeonpea

## Male-sterile Line ICPM 1

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Seeds



Anthers

- A source of  $ms_1$  male-sterile gene
- Has good combining ability
- Is medium-maturing (ca 127 days to 50% flowering)
- Has small seeds (ca 7 g  $100^{-1}$ ) but size is variable
- Is particularly recommended for developing disease-resistant male sterile parents



ICRISAT

**Plant Material Description no. 10**

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## Purpose of Description

ICPM 1 has been found useful for hybrid seed production and as a donor of the gene  $ms_1$  for developing a wide range of male-sterile parents.

## Origin

ICPM 1 (originally designated MS 4A) came from a single male-sterile plant identified at ICRISAT Center from the line ICP 1596-2 (Reddy, B.V.S., Green, J.M., and Bisen, S.S. 1978. *Crop Science* 18:362-364). ICP 1596 (P 5036) is a line from the Agricultural Research Station at Mohol in Maharashtra. From the time it was first identified, ICPM 1 has been maintained by sibbing or by open pollination in isolation plots.

**Synonyms.** MS 4A. (Previously designated ICPP 1 in ICRISAT 1984 Annual Report.)

## Performance

**Hybrids.** ICPM 1 has been used as the female parent for the production of about 50 experimental hybrids. The hybrids have consistently shown a heterozygous advantage, averaging in yield more than 200% above low-yielding pollen parents to around 20% above high-yielding pollen parents. One hybrid, ICPH 2 (ICPM 1  $\times$  BDN 1), was suggested for release because of its consistently good performance in All India Coordinated multilocation (ACT 2) trials and in on-farm minikit trials. However, ICPH 2 was withdrawn by ICRISAT because of its high susceptibility to wilt.

**Donor of male sterility.** The  $ms_1$  gene from ICPM 1 has been successfully transferred through backcrosses to several cultivars and lines. Thirteen such lines with a range of characteristics are shown in Table 1. These male-sterile lines are being used to constitute new experimental hybrids including those with disease resistance. Hybrids using ICPM 1 directly have all been highly disease-susceptible.

## Male-sterile Character

**Description.** Plants that are homozygous for the simply inherited recessive  $ms_1$  gene are male-sterile. Male-sterile plants can be recognized as early as 3-4 days before anthesis by their translucent anthers (see illustration on p.1). Such plants have remained fully male-sterile in several environments. No linkages with the  $ms_1$  gene have been established. The male-sterile plants have always formed fully fertile  $F_1$  plants when pollinated by any parent homozygous for male fertility.

**Table 1. Characteristics of some male-sterile lines developed by transferring the  $ms_1$  gene by backcrosses from ICPM 1, ICRISAT Center 1984.**

MS line	Genera- tion (1985)	Maturity group <sup>1</sup>	Seeds/ pod	100-seed mass (g)	Seed color	Special traits
MS-Prabhat (DT)	BC <sub>5</sub> F <sub>4</sub>	I	3.6	6.6	Brown	
MS-Prabhat (NDT)	BC <sub>4</sub> F <sub>5</sub>	II	3.8	6.9	Brown	
MS-T 21	BC <sub>5</sub> F <sub>4</sub>	III	3.9	7.5	Brown	
MS-BDN 1	BC <sub>5</sub> F <sub>3</sub>	V	3.5	9.0	Brown	
MS-ICP 7120	BC <sub>5</sub> F <sub>2</sub>	V	3.9	10.5	Brown	
MS-ICP 102	BC <sub>5</sub> F <sub>2</sub>	V	3.5	10.7	Brown	
MS-ICP 1	BC <sub>5</sub> F <sub>3</sub>	VI	4.0	10.4	Brown	
MS-C 11	BC <sub>5</sub> F <sub>3</sub>	VI	3.6	10.0	Brown	
MS-ICP 7035	BC <sub>5</sub> F <sub>2</sub>	VII	4.8	19.1	Brown	
MS-ICP 3783	BC <sub>5</sub> F <sub>2</sub>	VII	4.8	18.4	White	Resists SMD <sup>2</sup>
MS-ICP 7086	BC <sub>5</sub> F <sub>1</sub>	VIII	4.5	16.1	White	
MS-NP(WR) 15	BC <sub>5</sub> F <sub>2</sub>	IX	3.5	8.7	White	Resists wilt; tolerates SMD <sup>2</sup>
MS-ICP 7105	BC <sub>5</sub> F <sub>2</sub>	IX	4.0	9.2	Brown	

1. Group I is early flowering (ca 65 days to 50% flowering), and Group IX very late flowering (> 160 days to 50% flowering). Data from ICRISAT Center.

2. Sterility mosaic disease.

**Maintenance.** The male-sterile line can be maintained in isolation with open or hand pollination by harvesting seed only from the half of the population that is homozygous male-sterile. As the pollinator plants are heterozygous for the  $ms_1$  gene, half of the plants in the following generation should again be homozygous ( $ms_1ms_1$ ) and male-sterile, and the other half heterozygous ( $MS_1ms_1$ ) and produce pollen.

**Hybrid seed production.** Excellent production of hybrid seed has been obtained on male-sterile plants using one pollinator row with as many as 12 male-sterile rows. The male-fertile plants, which develop in the male-sterile rows when seed from the maintenance block is sown, must be rogued out before their flowers open and their pollen contaminates the hybrid seed by fertilizing the male-sterile plants. This requires daily examination, which should start when the male-sterile rows first show flower buds and continue until the male-sterile status of all plants has been identified and the male-fertile plants have been removed. The pollination of the male-sterile flowers results from the activity of pollinating insects.

Tests have shown that hybrid seed can be produced in India for less than Rs 2 (US\$0.17) kg<sup>-1</sup> when land costs, and the cost of maintaining the male-sterile plants, are not taken into consideration.

## Plant Characters

ICPM 1 is medium-maturing, semispreading, with an indeterminate plant growth habit, yellow flowers, and pods that are green with maroon streaks. In a trial at ICRISAT Center (1984) it reached 50% flowering in about 127 days and grew to about 1.5 m. The plants had an average of 3.3 seeds per pod, a 100-seed mass of 7.3 g, and a yield of 1.27 t ha<sup>-1</sup>. ICPM 1 has not been shown to have any disease or insect resistance.

## Seed Characters

The color of ICPM 1 seeds varies from light brown to brown. There is also variation in seed size and shape, but most are small, globular and oval (see illustration).

### Plant Material Descriptions from ICRISAT

Leaflets in this series provide brief descriptions of crop genotypes identified or developed by ICRISAT, including:

- germplasm accessions with important agronomic or resistance attributes;
- breeding materials, both segregating and stabilized, with unique character combinations; and
- cultivars that have been released for cultivation.

These descriptions announce the availability of plant material, primarily for the benefit of the Institute's cooperators. Their purpose is to facilitate the identification of cultivars and lines and promote their wide utilization. Requests should be addressed to the Director General, ICRISAT, or to appropriate seed suppliers. Stocks for research use issued by ICRISAT are sent to cooperators and other users free of charge.

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