



## Floral traits of TGMS lines in Kerala

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### Abstract

A study was conducted to analysis the floral characteristics of TGMS lines. All TGMS lines in the present study took more than 3 hrs duration for spikelet opening and more than 3 days for complete a thesis in a panicle. This study indicated that the widest glume opening of 38.3<sup>o</sup> was recorded in TGMS 91S and the lowest in TGMS 93S (20<sup>o</sup>). Stigma exertion per centage ranged from 21.88 (TGMS91S) to 80.84 per cent (TGMS 94S).

**Key words:** TGMS; Floral traits; Anthesis; Angle of glume opening; Stigma exertion

### Introduction

Rice is the staple food for about half of the world's population. The rapidly increasing demand for rice and the two line system of hybrid breeding utilizing Environmental Sensitive Genic Male Sterility (EGMS) is considered as an alternative to overcome the problems associated with three-line breeding and to surpass the yield plateau. In rice, both photoperiod sensitive genic male sterility (PGMS) and temperature sensitive male sterility (TGMS) have been discovered and successfully developed. In tropical condition like India, where day length differences are marginal, TGMS system is considered to be more useful than the PGMS system. After the identification of the TGMS mutant, among 1S several TGMS lines have been developed in China, IRR1 and other countries. For successful exploitation of this novel male sterility system in heterosis breeding, more TGMS lines need to be developed and characterized for their sterile and fertile alteration. Studying the inheritance of TGMS would help in breeding new TGMS lines with diverse genetic back grounds. The TGMS lines become completely sterile under high temperature (> 32°C) and fertile under low temperature (< 24°C) at panicle initiation stage. This phenomenon has taken advantage of hybrid seed production and seed increase of TGMS lines. The TGMS gene of Norin PL 12 has been transferred to tropical *indica* varieties at IRR1, Philippines through a Memorandum of Understanding between IRR1 and Government of Japan which states that the TGMS lines derived by using Norin PL 12 gene would be made useful to all countries. The major advantages of TGMS system are simplicity, overcoming the negative effects of male sterile cytoplasm and the ease of multiplication and restoration. These two line hybrids have been reported to exhibit 5-10 per cent yield advantage over the three line hybrids. Two line breeding is a viable proposition in a state like Kerala where rice is cultivated from below mean sea level to altitudes of 1500 MSL. Exploiting the difference in temperature regimes between the high altitudes and plains, the MS lines can be multiplied and hybrids can be produced on a commercial scale.

### Materials and Methods

The materials used in the study comprised seven TGMS lines collected from Paddy Breeding Station, Tamil Nadu Agricultural University, Coimbatore. The details of the genotypes are given in Table 1. Evaluation was carried out at two locations namely College Of Horticulture Vellanikkara, Cardamom Research Station, Pampadumpara.

### Methodology

Sequential sowing of TGMS lines was done from second week of March 2011 to second week of March 2012. Twenty five days old

Sr.No	TGMS lines	Source
1	TGMS 74S	TNAU, Coimbatore
2	TGMS 81S	TNAU, Coimbatore
3	TGMS 82S	TNAU, Coimbatore
4	TGMS 91S	TNAU, Coimbatore
5	TGMS 92S	TNAU, Coimbatore
6	TGMS 93S	TNAU, Coimbatore
7	TGMS 94S	TNAU, Coimbatore

**Table 1:** List of TGMS lines taken for evaluation.

seedlings were transplanted in single seedlings per pots. Five plants per entry were maintained. Manures and plant protection chemicals were applied as recommended in the Package of Practices Recommendations: Crops, Kerala Agricultural University (2010). Observations on floral traits were recorded on each of five plants per entry.

### Observation

Duration of anthesis in a panicle includes the time interval between opening of first flower and closing of last flower in a panicle was calculated and expressed as mean number of days. Duration of spikelet opening includes the time interval between spikelet opening and closing was noted in individual spikelets and expressed in minutes. Angle of glume opening showed the observation was taken one hour after glume opening, in individual spikelets. Three points namely, the tips of lemma, palea and the point of attachment of pedicel were plotted on a thick paper from the field. The angle was later measured using protractor and expressed in degrees. The stigma exertion was calculated by the ratio of spikelets with exerted stigma to the total number of spikelets and expressed in percentage.

### Results and Discussion

For the floral traits all seven TGMS lines took more than 3 hrs duration for spikelet opening and more than 3 days for complete anthesis in a panicle. Two characters *viz* angle of glume opening and duration of glume opening were inter dependent on each other for effecting hybridization. Reports have suggested that large collection of

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rice cultivars reported that variation for angle of glume opening was due to both genetic and environmental effect. This study indicated that the widest glume opening of  $38.33^\circ$  was recorded in TGMS 91S and the lowest in TGMS 93S ( $20^\circ$ ). Also it has been reported the range of  $15^\circ$  to  $25^\circ$  and the range of 23.43 to  $30.20^\circ$ . Duration of glume opening was the highest in TGMS 92S (3.31 hrs) wide opening of glumes for longer

duration in the male sterile plants enables the stigma to intercept with ease the airborne pollen grains. Stigma exertion per centage ranged from 21.88 (TGMS 91S) to 80.84 per cent (TGMS 94S). Similar higher per centage of stigma exertion (80.32) was reported in COTGMS 08. Studies has reported the stigma exertion range of  $25^\circ$  (DRR 5S) to  $70^\circ$  (UPRI 95-167S).