

# TARC Notes

## Avoidance of high temperature sterility by flower opening in the early morning

The sterility induced by high temperature at the flowering stage is the severest among high temperature damages of rice plants. Satake & Yoshida (1978) reported that high temperature just before and during flower opening has decisive effect in inducing the sterility. Rice varieties usually open flowers around 1000–1200 hrs (this depends on varieties, climatic, edaphic and cultural conditions; local time must also be taken into consideration). While air temperature goes up very rapidly in the morning and exceeds the critical temperature (35°C) at around 1000 hrs in many high-temperature damage-prone areas (Fig. 1 shows an example of the diurnal change of air temperature in those areas). Thus, the advancement of flower opening early in the morning is one way to avoid high temperature-induced sterility.

An African cultivated rice species, *Oryza*

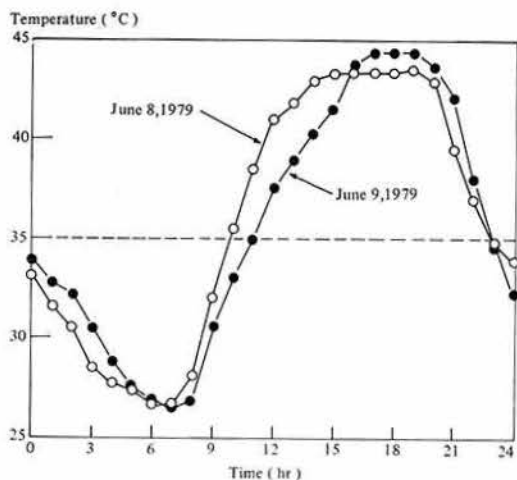


Fig. 1. Diurnal change of air temperature on 2 consecutive days in June in Punjab, India

*glaberrima*, opens flower in the early morning (IRRI Ann. Rep. for 1977). We have tried the introduction of this gene (or genes) for early flower opening into the modern high-yielding variety through the interspecific crossings between *O. glaberrima* and *O. sativa*.

Twenty-five  $F_1$  lines from the back crosses between 3 lines of *O. glaberrima* and 1 line of *O. sativa*, and 2 *O. glaberrima* parents were provided by Department of Plant Breeding, IRRI. IR36 was used as a modern variety check. Twenty seeds were sown in a 4-l pot, and grown in a screenhouse. Flower opening was observed on several fine days for each lines, at 0700, 0800, 0900, 1000, 1100, 1300, 1500 and 1700 hrs.

The result is shown in Fig. 2. The peak of *O. glaberrima* was at 0700–0800 hrs, which was 3 hrs earlier than that of IR36. The earliest flower opening line in the hybrids had a peak at 0900–1000 hrs, which was approximately 1 hr earlier than that of IR36, while the latest was slightly later than IR36. For the average of 25 hybrid lines, the peak came between 0900–1000 and 1000–1100 hrs.

*O. glaberrima* started flower opening and reached the peak earlier than IR36 and the hybrids took longer time to complete flowering of all the spikelets.

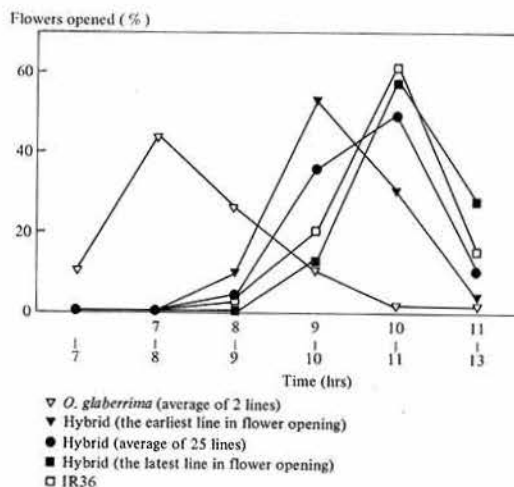


Fig. 2. Flower opening time of *Oryza glaberrima* × *O. sativa* hybrids, *O. glaberrima* and IR36

Table 1. Origins of 6 hybrid lines of early flowering

Designation	Parents
IR20959-43	<i>Oryza glaberrima</i> Acc. No. 102485/3*IR1561-228-3-3
IR20965-11	<i>Oryza glaberrima</i> Acc. No. 102550/3*IR1561-228-3-3
IR20965-17	<i>Oryza glaberrima</i> Acc. No. 102550/3*IR1561-228-3-3
IR20965-23	<i>Oryza glaberrima</i> Acc. No. 102550/3*IR1561-228-3-3
IR20965-26	<i>Oryza glaberrima</i> Acc. No. 102550/3*IR1561-228-3-3
IR20971-12	<i>Oryza glaberrima</i> Acc. No. 102550/3*IR1561-228-3-3

Six hybrid lines among 25 tested showed about 1 hr advance in flower opening in comparison with IR36. The origins of those lines are shown in Table 1.

Even 1-hr advancement in the opening time may have a significant effect on sterility, because air temperature rises at a rate of 3°C/hr or more around 1000 hrs (Fig. 1). Further studies on this line are being continued.

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- 1) International Rice Research Institute: High temperature. In Annual Report for 1977 (Los Baños, Philippines), 142-144 (1978).
- 2) Satake, T. & Yoshida, S.: High temperature-induced sterility in indica rices at flowering. *Jap. J. Crop Sci.*, 47, 6-17 (1978).

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