Floret sterility, commonly called blanking, has been recognized as a problem in California rice production for a considerable period. Surveys in 1971 and 1972 showed average sterility of 12.5 and 12.8 percent, respectively. Data from tropical areas also indicate an average sterility of 10 to 12 percent. Sterility losses sometimes are two to three times this level, however, depending on the variety, production area, and year.

Cold night temperatures below 60°F 10 to 14 days before heading are known to be one of the major causes of sterility, and the rice-growing region subjected to cool marine airflow from the San Francisco Bay (San Joaquin, Sacramento, and Yolo counties) has a reputation for high sterility. Other factors also considered to be causes are hot temperatures at flowering time and high levels of nitrogen fertilization (rates above 150 pounds per acre).

Sterility has displayed high varietal as well as geographic variation. The purpose of this research was to analyze the sterility performances of four commercially important rice varieties at widely different locations to assess the variety-environment factors related to high sterility.

M-101, M9, S-201, and L-201, commercial varieties with early maturity, short stature, and high yield, were selected for investigation. Varieties were grown in a randomized complete block design with four replications at the following locations: 12 miles east of Stockton in San Joaquin County; 5 miles east of the Sacramento Metropolitan Airport in Sacramento County; between Knights Landing and Dunnigan in northern Yolo County; 5 miles north of Marysville in Yuba County; in Kern County near Bakersfield; and at the Davis Rice Research facility (early and late plantings), 1 mile west of Davis, Yolo County.

If one looks at the overall varietal means (table 1), M-101 had significantly less sterility than the other three varieties. L-201 was significantly higher in sterility than the other three varieties. S-201 and M9 had similar, intermediate sterility between M-101 and L-201. However, the varieties did not perform similarly at all locations. A significant variety x location interaction was demonstrated.

Analyzing the sterility performance of M9 and M-101 at the different locations explains this interaction. Although M9 had higher overall sterility than M-101 and S-201, M9 had the lowest sterility of all four varieties in the moderate-temperature areas (Yuba, northern Yolo, Sacramento, San Joaquin counties). Moderate areas are defined as those in which air temperatures stayed above 55°F at meiosis (10 to 14 days before flowering) and below 95°F at flowering (see table 2). Cold areas are those where minimal temperatures at meiosis fall below 55°F (the two Davis trials). Hot areas sustain temperatures above 95°F at flowering (Kern County).

The sterility performance of M-101 and M9 was reversed in the Davis trials (cold). The effect was especially pronounced in the early Davis trial, which was afflicted with cool irrigation water, resulting in colder canopy temperatures. M9’s sterility increased greatly from 4.5 to 49.7 percent between the Sacramento County and Davis (early) locations. In the same comparison, M-101 only increased from 7.3 to 17.7 percent. Thus, M9 was much more susceptible to cold than M-101, whereas in moderate areas M9 had less sterility than M-101 and the other varieties.

L-201 and S-201 showed a fairly consistent pattern of increased sterility in colder areas.
that the two locations with the highest nitrogen rates (Yuba and Yolo, north) had the highest sterility.

Temperature up to 100°F at flowering time does not appear to contribute significantly to sterility. Sterility data at the hot Kern County trial were incomplete because of bird damage. However, samples of M9 and S-201 were taken. Although maximal temperature during flowering at this test was much higher (over 100°F) than in any other area in the rice-growing region, sterility was low. Data from sterility studies in the Imperial Valley (author’s unpublished data) indicate that some California varieties maintain high floret fertility under hot conditions at flowering time. Calrose 76 and M7 had sterility percent-
gages of only 22.4 and 21.2 percent, respectively, while lines reported to be heat tolerant introduced from the tropics showed sterility ranging from 30 to 80 percent.

In summary, the sterility data of M-101, M9, L-201 and S-201 in the 1979 statewide trials demonstrate some important points about this phenomenon. Sterility markedly increases when rice is grown in areas where air temperatures fall below 55°F during meiosis. However, significant sterility differences can also occur between locations within moderate areas. Hot temperatures at flowering are an unlikely cause, since low sterility occurred in S-201 and M9 when grown in the hot Kern County locations.

M-101 showed the least sterility of all four varieties when data were averaged over all locations. However, an analysis of variety means at specific locations shows that M9 actually has less blanking in moderate areas, but M-101 demonstrates lower sterility in colder areas. L-201 had significantly higher overall sterility than the other three varieties. S-201 was fairly stable, having less sterility than L-201 at all locations, but generally more than M9 and M-101. However, in colder areas S-201 had less sterility than M9. Results of these trials should be useful to rice growers when choosing varieties for different planting dates and climatic areas.

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