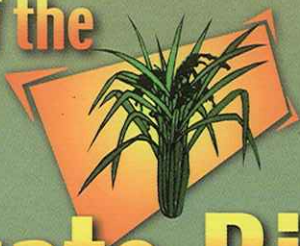


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Cold tolerance of short-season rice cultivars in Uruguay

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The reproductive phase of rice growth, including panicle development and anthesis, is very susceptible to low temperatures that cause grain sterility. Cold periods during the reproductive phase are common in Uruguay and were identified as one of the main reasons for yield instability. The warmer months of summer, January and February, have an average of 10 and 9.6 days, respectively, with minimum temperatures below 15 °C. The development of short-season cold-tolerant cultivars with good milling and cooking quality has been a priority for the local breeding program. The short-season high-yielding cultivars INIA Yerbal and INIA Tacuarí were released in 1989 and 1992, respectively. Their cold tolerance performance in trials from 1989-90 to 1992-93 compared with check cultivars Bluebelle and El Paso 144 was demonstrated. INIA Caraguatá, a semidwarf, long-grain, and high-yielding variety, was released in 1995. It has superior milling and cooking quality, but, according to preliminary information, it was considered as susceptible to low temperature. All these cultivars, except El Paso 144, an indica-type variety, are tropical japonica types.

The information from time of seeding experiments from 1989-90 to 1996-97, including 36 trials, was used to compare the cold tolerance of INIA Tacuarí and INIA Caraguatá to that of the check cultivars Bluebelle and El Paso 144. Minimum and mean preflowering temperatures for a 20-d period (20 DPF) and 12-d period (12 DPF), mean temperatures during flowering (10 DF), mean temperatures during the whole reproductive phase (12 DPF + 10 DF), as well as mean temperatures during a 20-d postflowering period (10-30 D + F) were recorded for each plot and related to the observed grain sterility, adjusting regression equations.

The higher determination coefficients (R^2) for grain sterility were obtained with mean temperatures during 20 DPF and 12 DPF

+ 10 DF. The R^2 values for the different varieties ranged from 17% to 59% in the first case and from 11% to 66% in the second case. INIA Tacuarí had the smallest R^2 values. At the same time, its regression equations showed less incidence of mean temperature on grain sterility than INIA Caraguatá and the check cultivars.

At 20 DPF and 12 DPF + 10 DF, the grain sterility of El Paso 144, Bluebelle, and INIA Caraguatá showed a sharp increase with mean temperature lower than 23 °C. INIA Tacuarí maintained moderate sterility (about 30%) at the lowest temperatures, which resulted in high sterility in the cold-susceptible cultivars (60–70%).

Selection under natural conditions in late-seeded populations has been effective for developing cold-tolerant cultivars that may help to increase and stabilize grain yield in the country.