TARC Note

Effect of calcium peroxide on rice seedling emergence from floodwater at high temperatures: varietal difference

Seedling establishment of direct-seeded rice is seriously inhibited at high temperatures (Chapman & Peterson, 1962; Chapman, 1969). Yoshida and Rivera (1978) showed that calcium peroxide* improved the emergence of rice seedlings from floodwater at high temperatures for a variety IR36. This paper deals with varietal difference of the emergence ability for indica and japonica rices, improved and traditional rices, and lowland, upland and deep-water rices.

The following 8 varieties were used: IR8 and IR36, improved lowland indica; E425, upland indica; Peta, traditional lowland indica; Leb Mue Nahng III, deep-water indica; Koshihikari and Reimei, improved lowland japonica; Hiderishirazu, upland japonica.

Twenty seeds were placed at 1 cm depth of soil in a circle in a 4-liter plastic pot. These pots were placed in glasshouse rooms of IRRI phytotron at day/night temperatures of 26/18, 29/21, 32/24 and 35/27°C. The water depth was maintained at 5 cm.

Fig. 1 shows the effect of different temperatures on seedling emergence from floodwater in different varieties. In general throughout the varieties, seedling emergence was the best at 29/21°C, next at 26/18°C, considerably inhibited at 32/24°C and the worst at 35/27°C. Thus, seedling establishment was strongly inhibited at higher temperatures.

For varietal differences, improved lowland varieties of both indica and japonica types showed higher emergence ability, in which japonica tended to be higher; upland varieties and a traditional lowland indica variety showed lower ability. A deep-water rice variety showed extremely low emergence ability from floodwater. Deep-water rice is normally sown and grown under upland conditions for several weeks before flooding starts.

Fig. 2 shows the effect of calcium peroxide on seedling emergence from floodwater at

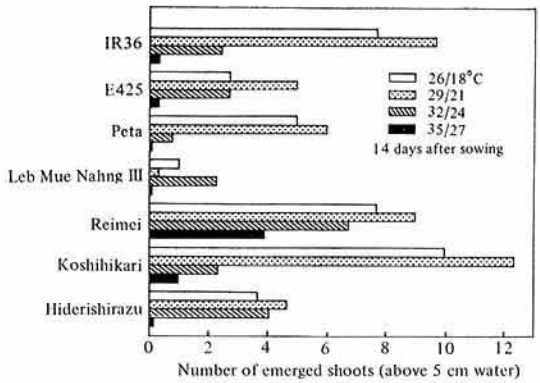

Fig. 1. Emergence of rice seedlings from floodwater at different temperatures in indica and japonica varieties

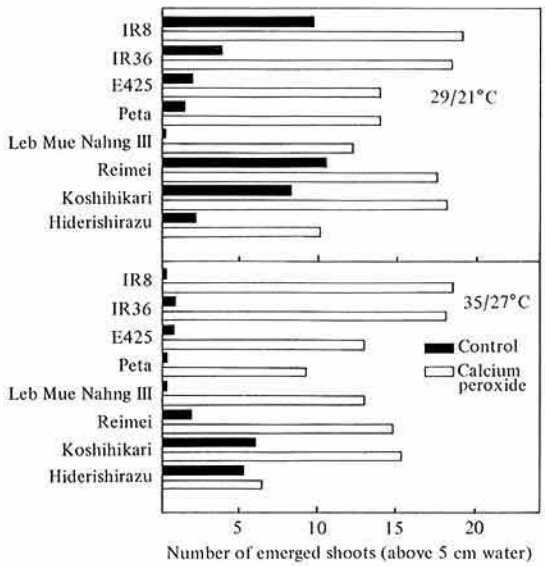

Fig. 2. Effect of calcium peroxide on seedling emergence from floodwater at 29/21 and 35/27°C in indica and japonica varieties 10 days after sowing

* The use of calcium peroxide as an oxygen supplier for crop plants was devised by Noboru Yamada in 1952 (Proc. Crop Sci. Soc. of Japan, 21(1) 65-66).

29/21°C and 35/27°C. Rice seeds were coated with calper (a formulation of calcium peroxide) at 1 : 1 weight ratio. At both temperature regimes, the seedling emergence was greatly improved in all the varieties used except Hiderishirazu at 35/27°, and the effect was greater in varieties of lower emergence ability. Chapman and Peterson (1962) reported that the deficiency of dissolved oxygen in the floodwater was unlikely to be a limiting factor in seedling establishment even at 35°C. The results obtained here indicates that oxygen deficiency or suffocation is a cause of the inhibition of seedling emergence from floodwater, when seeds are placed in soil.

Thus, calcium peroxide appears to be a promising chemical to be used when rice is sown into water or wet soil, even at high temperature.

1) Chapman, A. L.: The thermal environment in clear and turbid water in the Darwin region of northern Australia in relation to the water seeding of rice. *Agr. Meteorol.*, 6, 231–243 (1969).
2) Chapman, A. L. & Peterson, M. L.: The seedling establishment of rice under water in relation to temperature and dissolved oxygen. *Crop Sci.*, 2, 391–395 (1962).
3) Yoshida, S. & Rivera, C. T.: Effect of calcium peroxide on seedling emergence of IR36 from puddled soil at different temperatures. *Internat. Rice Res. Newsletter*, 3(6), 17–18 (1978).

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Iwao NISHIYAMA *Tropical Agriculture Research Center, Japan*
Shouichi YOSHIDA *The International Rice Research Institute, Philippines*
Victoria CORONEL *The International Rice Research Institute, Philippines*