

Effects of the Hot Water Treatments (52°C) for the Prevention of Ratoon-Stunting-Disease, on the Germination of Cutting-Buds in Sugarcane

Masaki YAHIRO and Jōichi ARIZONO

(Laboratory of Tropical Crop)

Received for Publication Sep. 4, 1985

Introduction

El-Banna *et al* carried out hot water treatment for 90 minutes at 52°C, and in the result, it was noted that virus was inactivated without giving any effect to the germination of buds. The authors tried some experiments to examine the result obtained by El-Banna *et al*¹⁾, and particularly to ascertain the germination of buds after the hot water treatments (52°C).

Materials and Methods

Sugarcane variety (NCo310) was used as material. Sugarcane was planted in March of 1984 in Tane-Islands and was cultivated there. Shoots of sugarcane were harvested at the three dates (Oct. 22, Nov. 15 and Dec. 12, 1984). The shoots harvested were transported from the Tane-Island to Kagoshima City. The method in which the shoots were cut, was similar to the one described in the previous report²⁾, and this method was adopted in making the bottom-buds and the middle-buds. Each treatment plot consisted of 30 buds in total. The hot water treatments were done on the next day of the harvest (Oct. 23, Nov. 16 and Dec. 13). In the hot water treatments (52°C), the cuttings were put into vinyl bags in which several holes with 1 cm diameter were cut, the bags were further put in the vessels made of wirenetting, and then the vessels were immersed in the waterbath kept at 52°C for 90 or 120 minutes. As control, the cuttings were immersed in the water kept at the room temperature for 90 or 120 minutes. After the hot water treatments, the cuttings were planted, with the buds put upwards, in the eight plantbeds containing river-sands, and the upper parts of the cuttings were covered with the river-sands 5 mm thick. Suitable tap-water was given to the river-sands. Eight plant-beds were put in a dark incubator kept at 30°C. Emergence of the buds out of the surface of sands was regarded as germination. The investigation of germination was done every day after planting.

Results

The germination of control buds was good throughout all the experiments. On the other hand, in the hot water treatments carried out at 52°C for both 90 and 120 minutes, the germination inhibition was observed throughout all the experiments (Fig. 1, 2, 3), regardless of bottom-buds or middle-buds. In the comparison of the germination inhibition in buds by the 90 minutes hot water treatment and that by 120 minutes treatment, the inhibition of the 120 minutes treatment was

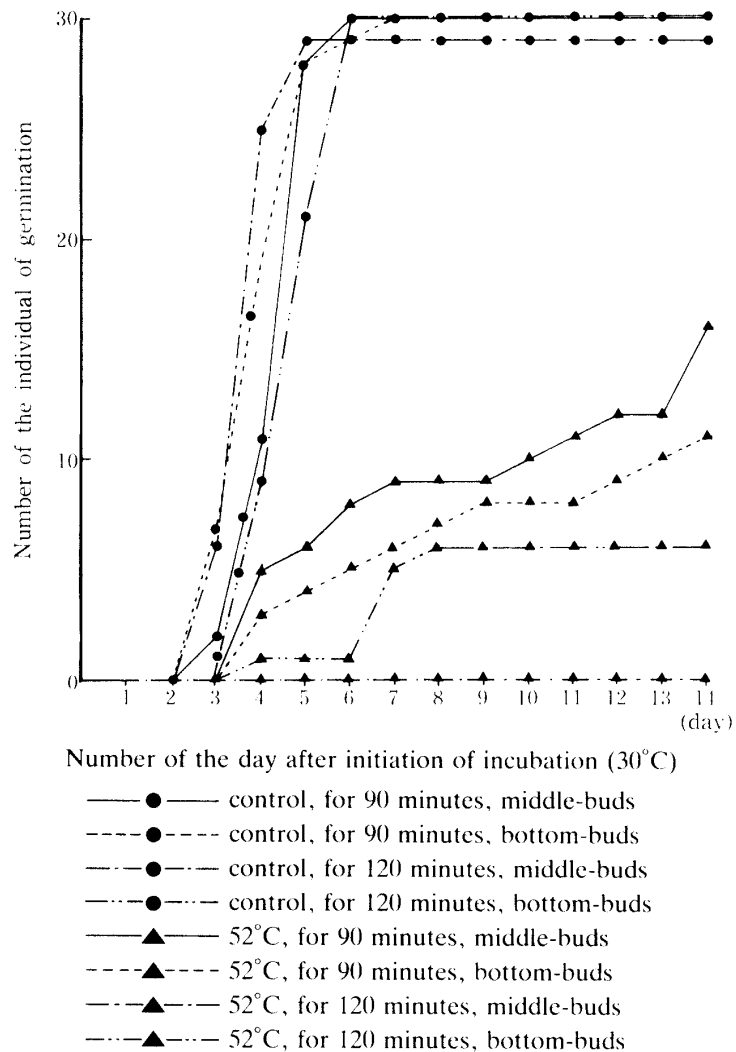


Fig. 1. Number of the individual of germination in case kept at 30°C after water-treatments (controls) and hot-water treatments (52°C), for 90 or 120 minutes, of middle and bottom cutting-buds (harvested on Oct. 22).

stronger than that by 90 minutes treatment, throughout all the experiments; but in the 120 minutes treatment on Dec. 13, a comparatively high germination percentage was obtained in the middle-buds (Fig. 3). In the comparison of the germination inhibition by the 90 minutes hot water treatments in the bottom-buds and in the middle-buds, the germination inhibition in the middle-buds was weaker than that in the bottom-buds; but in comparison with the 120 minutes treatment, no fixed tendency was observed.

Discussion

Generally, the germination inhibitions in both bottom-buds and middle-buds at the hot water treatments for 90 minutes at 52°C were weaker than those for 120 minutes at 52°C throughout the three experiments, though in the third experiments (in the treatment of Dec. 13) the germination percentage of middle-buds in the treatment for 120 minutes at 52°C was higher than those of middle-buds and both bottom-buds for 90 minutes at 52°C. From the above mentioned results, if

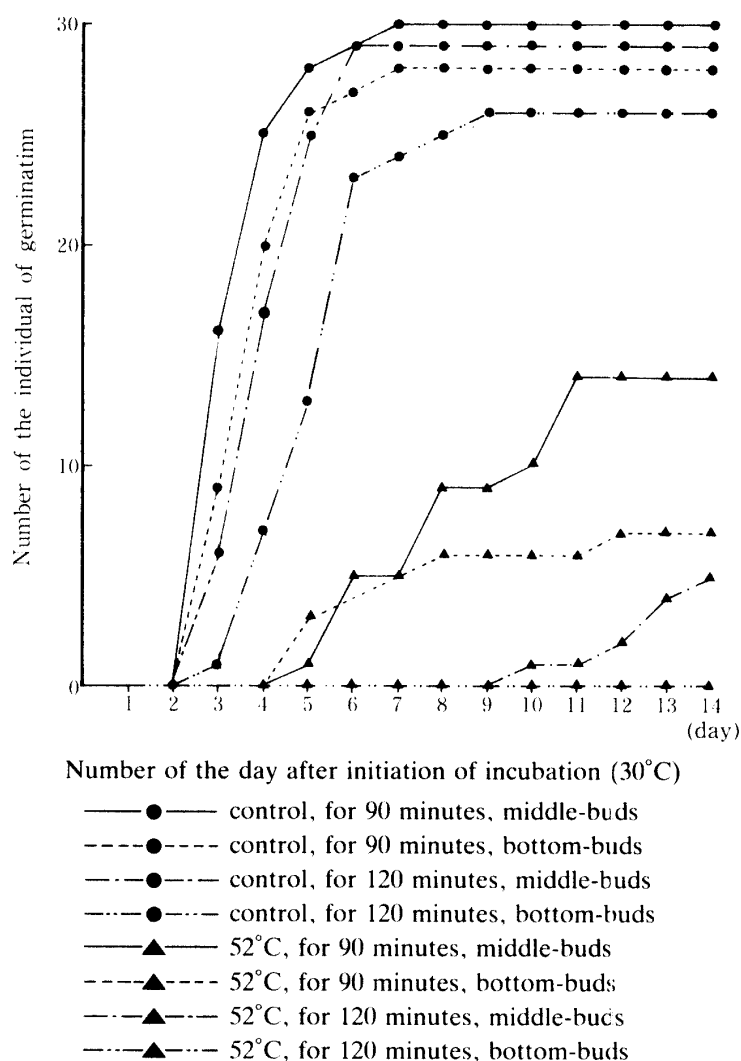


Fig. 2. Number of the individual of germination in case kept at 30°C after water-treatments (controls) and hot-water treatments (52°C), for 90 or 120 minutes, of middle and bottom cutting-buds (harvested on Nov. 15).

the inactivation of virus was enough by the hot water treatment for 90 minutes at 52°C, it was assumed that the hot water treatment for 90 minutes at 52°C was more favorable than that for 120 minutes at 52°C in the germination of buds until the 14th day after the initiation of incubation at 30°C. El-Banna *et al* carried out hot water treatment for 90 minutes at 52°C, and in the result, it was noted that virus was inactivated without giving any effect to the germination of buds. In the present experiments, however, the germination inhibition of buds was recognized obviously in the hot water treatments for 90 minutes at 52°C. Although the cause of the germination inhibition of buds was not clear, even the ungerminated buds were not dead up to the end of the experiments. The germination inhibition in middle-buds in the treatments for 90 minutes at 52°C was weaker than that in bottom-buds. This fact was noted to be adverse to the result of the previous report²⁾ in which the germination inhibition of the bottom-buds was weaker than that of the middle-buds in the hot water treatments for 2 or 3 hours at 50°C.

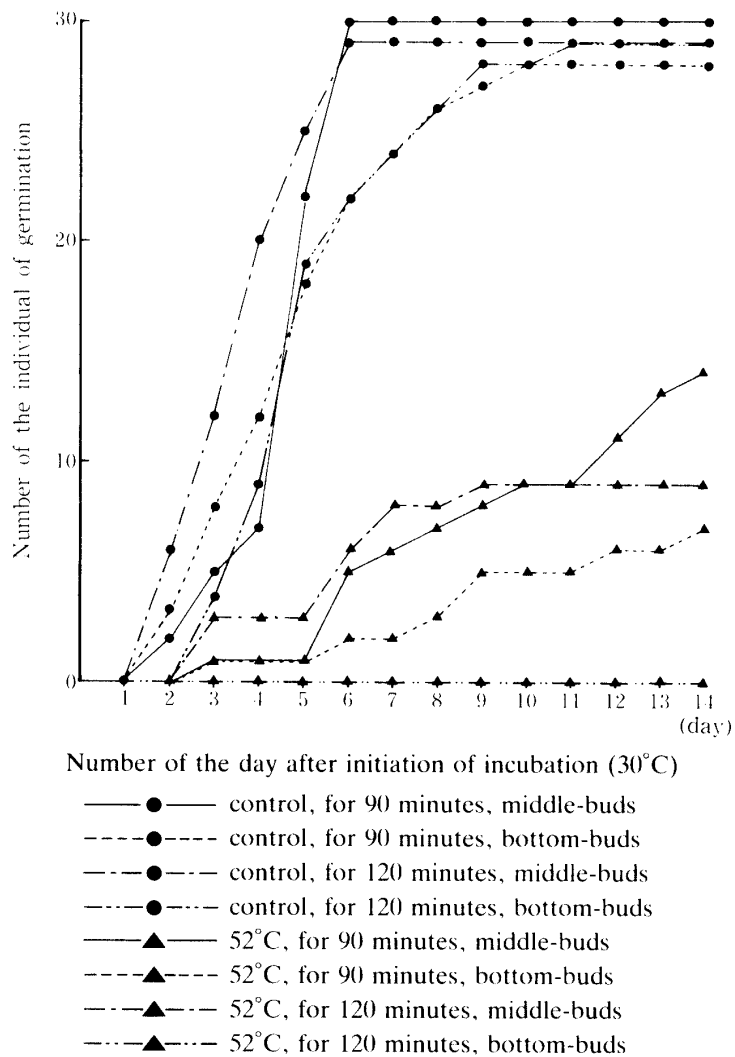


Fig. 3. Number of the individual of germination in case kept at 30°C after water-treatments (controls) and hot-water treatments (52°C), for 90 or 120 minutes, of middle and bottom cutting-buds (harvested on Dec. 12).

Summary

The hot water treatments (52°C) were done to the cutting-buds of shoots in the variety NCo310 of sugarcane. The shoots were divided into the bottom-parts and the middle-parts, and further the respective parts were divided into the three cuttings containing one bud, respectively. The hot water treatments (52°C) were done for 90 or 120 minutes to the cutting-buds of shoots harvested at the three dates (Oct. 22, Nov. 15 and Dec. 12, 1984). In the results, the hot water treatments (52°C) of both 90 and 120 minutes inhibited conspicuously the germination of both the bottom-buds and middle-buds, throughout all the experiments. These results were different from the result of the previous report done by El-Banna *et al*; that is, the hot water treatment (52°C) for 90 minutes did not give any effect to the germination of buds.

References

- 1) El-Banna, M. T. *et al*: Studies on sugar cane ratoon stunting virus disease. *Agr. Res. Rev. U. A. R.*, **45** (1), 74–92 (1967)
- 2) Yahiro, M.: The effects of the hot water treatments (50°C) for the prevention of ratoon stunting disease, on the sprouting of cutting buds of sugarcane. *Japan. J. Trop. Agr.*, **29** (2), 71–76 (1985)