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The XXI International Grassland Congress / VIII International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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Presenter Information

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Varietal difference in the pre-germination flooding tolerance of commercial cultivars of silage corn and the availability of a ridge-making seeder for the avoidance of wet injury to corn seeds

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Key words : flooding tolerance, ridge-making seeder, *Zea mays* L.

Introduction Silage corn (*Zea mays* L.) is the most available forage species in Japan with high productivity and high forage quality. However, flood damage or wet injury will sometimes occur in silage corn, especially when planted in upland paddy fields. In this study, the varietal difference in pre-germination flooding tolerance was examined among commercial silage corn cultivars in Japan (Experiment 1). Moreover, the availability of a ridge-making seeder was evaluated as a new seeding technique for the avoidance of wet injury to corn seeds (Experiment 2).

Materials and methods *Experiment 1*: The pre-germination flooding tolerance (FT) of 51 and 76 commercial corn cultivars was examined with a laboratory germination test in 2005 and 2006, respectively. FT was evaluated as the percentage of a germination rate in a water-soaking treatment (at 25°C for eight days) to that in a control treatment. In 2007, FT was compared among six cultivars in outdoor conditions: 20 seeds of each cultivar were sown in a container (25cm x 35cm x 7cm) filled with soil with five replications, soaked in a water for eight days, and then kept in a glasshouse for two weeks for measuring the seedling emergence rate.

Experiment 2: The ridge-making seeder used in this study was composed of a rotary tiller (170cm in width) and two seeders, and its rotary blades were arranged for making 10-15 cm ridges. The experimental site was an upland paddy field in which the water table was high, so that water logging would occur easily after rain. On June 5, 2007, seeds of cultivar KD640 were sown with a non-ridge-making seeding method (conventional method) and the ridge-making method with four replications. Each plot consisted of two rows of 10m: each row width was 75cm, and the planting space within each row was 19cm. Two days after the seed sowing, it rained heavily (55mm per day), and seedling emergency was severely restricted. Then, on June 13, 2007, the seedling emergency rate was measured in each plot.

Results and discussion *Experiment 1*: Both in 2005 and 2006, varietal difference was observed in FT among the corn cultivars examined. The FTs of cultivars DK708, DKC61-2, 34N43, 31N27, Cecilia and 3470 were higher than average both in 2005 and 2006. Therefore, the FT of those cultivars was compared again in an outdoor condition in 2007: 31N27 and Cecilia showed significantly higher seedling emergence rates than the other cultivars, and were evaluated as high tolerance cultivars for pre-germination flood damage.

Experiment 2: In the ridge-making treatment, the height of the ridges was 11.9cm on average, and their height was 6 cm higher than the soil surface of the non-ridge-making treatment. Seed depth was approximately the same in the two treatments. Because of the flood damage, the seedling emergency rate in the non-ridge-making treatment was only 0.7%, while it was 46.3% in the ridge-making treatment. Though severe flood damage was observed even in the ridge-making treatment plots, the large difference in the emergency rate between the two treatments indicated the availability of the ridge-making method for avoiding flood damage to the corn seeds.

Table 1 Height of the ridges, seed depth and the seedling emergency rate after rain.

Treatment	Height of the ridges ¹⁾ (cm)	Seed depth ²⁾ (cm)	Seedling emergency rate (%)
Non-ridge-making	5.89 ± 1.15	3.88 ± 0.83	0.7 ± 0.9
Ridge-making	11.90 ± 1.45	3.68 ± 0.21	46.3 ± 31.8

Note: 1) The height of the soil surface level from the lowest part of the experimental site. 2) Distance from the soil surface to the soils.

Conclusion Cultivars 31N27 and Cecilia were evaluated as high tolerance cultivars for the pre-germination flood damage, and the ridge-making seeder was available for the avoidance of flood damage to corn seeds.

Reference

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