

8.3 JENS LOEL, CHRISTA HOFFMANN

Institute of Sugar Beet Research (IfZ), Holtenser Landstr. 77, D – 37079 Göttingen

FACTORS AFFECTING THE WINTER HARDINESS OF SUGAR BEET

Divers facteurs affectant la tolérance au gel de différentes variétés de betteraves sucrières / Einflussfaktoren auf die Winterhärte von Zuckerrüben

ABSTRACT

The cultivation of winter sugar beet can contribute to a marked yield increase compared to spring sown beets. Sown in August, the plants have to survive frost temperatures. For survival, the environmental conditions during winter (minimum temperature) as well as plant development and composition may play a role. The objective of the study was to analyze factors affecting the survival rate of sugar beet plants.

From 2009/10 to 2012/13 field trials were conducted at 3 locations in Germany (in total 11 environments) which were accompanied by greenhouse experiments with controlled frost conditions. A high variation of the survival rate after winter occurred due to environments, so that the environmental effect was much higher than the genotype effect. The minimum temperature for sugar beet plants was found to be between -6 and -8 °C. The environment (temperature) also affected the growth stage, which was essential to survive frost. The optimal growth stage was reached after 600 to 900 °C days, in particular plants too much advanced in growth were lethally damaged. Winter hardiness of genotypes was positively related to the concentration of dry matter, betaine, amino acids as well as osmolality, whereas raffinose and proline did not improve the winter hardiness, although accumulated during acclimatization.

These results can contribute to further improve the winter hardiness of sugar beet by breeding which would be a substantial prerequisite to establish a cultivation system with winter sugar beet in future.
