

Title The role of carbohydrates in wound-healing of sweetpotato roots at low humidity
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Abstract

It has previously been shown that sweetpotato cultivars differ in the efficiency by which their roots can heal wounds at low humidity, although this does not appear to relate to rate of wound-healing at high humidity. It has also been shown previously that there is a negative relationship between cultivar root dry matter (DM) content and efficiency of root wound-healing at low humidity (assessed by a lignification score; LS). Root DM content tends to be negatively related to root sugar levels. The study presented here was undertaken to examine further the role of carbohydrates in root response and ability to heal wounds in the presence of water stress. Data from 17 cultivars confirmed the negative correlation between LS and DM and the positive correlation between LS and root sugar levels. Measurement of sugar levels at the root surface both at the time of wounding and after complete healing (5 days) for 10 cultivars indicated a stronger relationship of LS with final sugar levels than initial DM content. This was confirmed in further experiments using a system of adjacent tissue cuboids cut from the parenchyma which were able to exhibit lignification almost as efficiently as whole roots. With this system it was also possible to demonstrate a relatively rapid accumulation of sugars within 24 h of healing. The data were examined further by the development of linear regression models of LS. Comparison of the levels of variance accounted for by the models indicates that LS is strongly cultivar dependent, and most of the cultivar effect is related to cultivar differences in sugar levels during wound-healing. Differences in sugar levels between roots/cuboids of each cultivar also have an effect. Further, the similarity of the models for the whole roots and cuboids gives us confidence in the validity of using the cuboids to investigate wound-healing of whole roots.