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Effects of Hydrophilic Coating on the Mobilisation of Endosperm Reserves in Seedlings of Summer Barley (*Hordeum vulgare* L. *maltasia*)

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Abstract

Seed coatings containing hydro-absorbers increase the amount of water available for germination and support seedling establishment particularly when unreliable rainfall early in the season leads to drought spells threatening the survival of the crop. Efficient mobilisation of seed reserves, onset of photoautotrophy, and the partitioning of biomass between roots and shoots are critical parameters for early crop establishment. Barley seeds coated with (1) absorber alone, (2) humic acid alone, and (3) a combination of humic acid, absorber, and a plant fortifier were assessed for mobilisation of seed reserves and onset of photo autotrophy as compared to uncoated seed. Coats containing humic acid were included in this study since humic acid is known to promote water penetration into seeds and germination. Coated seeds were categorised into 2 classes related to the original uncoated seed weight as (1) small coats (coats comprise less than 50% of total grain weight) and (2) large coats (coats comprise more than 75% of total grain weight). Grains were grown in growth chambers on moist filter paper for 16 days at 25°C and biomass of roots, shoots and remaining grain were assessed for 24 seedlings every 2 days. Initially total biomass of germinating seeds decreases due to respiratory losses for mobilisation of grain reserves and growth of roots and shoots until respiration is compensated by the onset of photosynthesis. Independent of the coat composition, germination patterns followed those of uncoated seeds in grains with a small coat. Respirational losses were increased for small coats and thus root and shoot growth delayed in comparison to uncoated seeds. Seeds with large coats showed a slower mobilisation of endosperm reserves compared to uncoated seeds, however, independent of the coat composition respiration losses during germination were minimal, root and shoot growth optimal, and total biomass losses during early germination marginal. This indicates a strong influence of seed coats on the energy balance of the germinating seed which may be either related to water uptake properties of the seed or to oxygen diffusion into the growing embryo. Implications for the use of hydroabsorbers and other substances in seed coats will be discussed.

Keywords: Germination, hydroabsorbers, respiration, seed coats, seedling growth