DORMANCY IN WHEAT GRAIN

(*Triticum aestivum* L.)

Studies on Grain-coat Pigment Formation
and Abscisic Acid Content During the
Development of Wheat Grain of Six Genotypes

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ABSTRACT

Dormancy in wheat grain has been associated with red pigmentation of the grain-coats. The development from anthesis to harvest-ripeness of two-white-grained and four red-grained genotypes of varying dormancy was investigated. Grain growth was measured as changes in fresh weight and dry matter. Dehydration to harvest-ripeness (17.5% moisture) was calculated. The developmental rates of grain of the six genotypes were similar.

Dormancy-breaking germination tests showed that embryo maturity was attained at similar stages of development of four genotypes. It appeared to be somewhat delayed in two red-grained genotypes, which also had the lowest germination rates in standard germination tests. Dormancy was estimated as the percentage of grains with mature embryos, which did not germinate in the standard germination tests. Grain of all the genotypes had a period of dormancy during development. However, in white-grained genotypes it had disappeared before harvest-ripeness was attained and it lasted only a little longer in one of the red-grained genotypes. In the other three red-grained genotypes, dormancy was prolonged for at least several weeks beyond harvest-ripeness.

The concentrations of flavonoid precursors were similar in grains of all six genotypes throughout their development. Assays of crude extracts of a group of enzymes (phenolases) involved in pigment synthesis did not reveal peaks of activity associated with the appearance of mature grain-coat colour. Successive extractions of the grains showed that the pigment was probably a large flavonoid polymer. The amounts of endogenous abscisic acid in developing grains was analysed by high pressure liquid chromatography. Significant quantities of the 2-trans isomer, as well as of the common 2-cis isomer (abscisic acid) were found. The amounts did not appear to be related to either dormancy or to maturation and dehydration of the grain, as had been suggested.

The mechanisms prolonging dormancy beyond harvest-ripeness in wheat grain were discussed with reference to pigmentation. It was considered that dormancy of the red-grained wheats was probably due to impermeability of the grain-coat to oxygen, possibly resulting from molecular properties of the pigment. These properties were the ability to absorb oxygen, which might prevent it reaching the embryo, and the ability to complex with the large proteins of the immature testa, which might prevent their degradation during grain development. During imbibition the complexed proteins might swell to create a physical barrier to oxygen permeation.