SHORT COMMUNICATION

Increase in Dry Weight and Decrease in Moisture in Wheat Kernels during Ripening

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There is little information at present on the relationship between the dry weight of grain kernels and the moisture content during ripening, under English conditions. This information is often needed by those growing grain experimentally for later study of the stored crop.

Some years ago, in the course of a study of a subepidermal fungus in wheat grains (Hyde, 1950; Hyde and Galleymore, 1951), and subsequent production of fungus-free wheat for laboratory measurement of grain respiration (Hyde, 1954), the progress of ripening was followed during the period after anthesis (i.e. emergence of the stamens and shedding of pollen) and formation of the kernel.

The physical appearance of the plant and of the developing ear were related to the moisture content of the kernels and their dry weight. These were determined by drying duplicate samples of 10 grains each, hand-picked from the middle of the ears, on an induction-heated metal ring in a vacuum desiccator, as devised by Oxley (1948).

Although the most complete results were obtained with autumn-sown Bersée wheat, those found in other varieties (Yeoman, Atle, Vilmorin) and with spring-sown Bersée agree well with the rather surprisingly uniform results for the autumn-sown Bersée over the six harvest seasons 1949–1954. A few measurements on the moisture content of barley, in 1955 and 1964, gave drying curves following the same slope as those for wheat; the dry weight of the barley was not measured.

The values for dry weight (mg/kernel) and moisture content (% wet weight basis) are plotted in smoothed form for the individual seasons in Fig. 1.* The rate of drying and the increase in dry matter are remarkably consistent, once drying out had begun, and the dry weight had begun to increase, namely, when the moisture content was slightly over 70% and the single kernel dry weight about 10 mg. This was about 3 weeks after anthesis. The date at which this stage was reached naturally varied with the season, but, once started, the increase in dry matter and loss in moisture proceeded steadily, with only slight variations, whatever the season, as shown by the parallel curves in Fig. 1. Averages of the six seasons show that maximum dry

* The detailed results are available on application to the Pest Infestation Control Laboratory, Slough, Bucks.
weight was reached when the moisture content had fallen to about 40%. In most years there was subsequently a slight fall from the maximum dry weight attained.

With the combine harvesting of certain crops at an ever higher moisture content, e.g. maize for grain at 35–40%, some concern has been expressed whether at this stage of maturity the full dry weight of the kernels has been reached. The present results show that if maize follows a similar pattern to wheat, it should have just reached full dry weight by the time it is normally combined.

The consistency of the results makes it possible to predict, from knowing the moisture content on a particular date, how many days, in the climate of S.E. England, will be needed for it to fall to a known lower value. For example, from the average curve given in Fig. 2, if the moisture content is 60% on a given date, it should be about 25% 21 days later. Similarly, the dry weight on a given later date can be estimated.

Even if no measurements are possible, if the date of anthesis is known, it should be possible to predict the later state of the grain, from the curves in Fig. 2, with a moderate degree of accuracy, as the six seasons studied varied within only a few
days of each other in relation to time after anthesis and a particular state of the kernels. For example, if anthesis was on 7 June, the grain could be expected to be at about 60% moisture content by 12 July, and at about 25% by 2 August.

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REFERENCES