THE ACCURATE evaluation of the milling and baking characteristics, herein referred to simply as quality, of pure-lines or early generation progenies of wheat (*Triticum aestivum* L.) is a major problem of breeders. Most plant breeders and cereal chemists agree that full-scale tests of both milling and baking characteristics are necessary for an accurate evaluation of a wheat variety, strain or of bulk samples of grain. Such a test requires from 1220 to 2000 grams of seed and therefore cannot be used on experimental strains until they have reached advanced stages of testing.

Wheat varieties or strains of very diverse quality characteristics are frequently used in a breeding program because of the need to introduce genes for pest control or special agronomic types. Several workers have shown that quality characteristics are inherited in a relatively simple manner and that selection for desirable quality may be made in early generations, especially where the parents differ greatly. Elimination of that portion of the segregating generation with low quality would greatly reduce the work of improvement.

Numerous single quality tests which use only small quantities of seed have been devised and used by chemists and breeders. All have some value under some conditions or with certain types of wheat. Among these are the protein, pearling, absorption, wheat-meal fermentation time (Pelshenske test), mixograph, farinograph, and other tests. Shellenberger et al. (7) described micro-milling and baking facilities now available where only 100 grams of wheat are required. However, all the tests mentioned require investments in special equipment, trained personnel, and time. Consequently they may not be available or practical for use by many breeders.

The sedimentation test described by Zeleny (11) and later modified by Pinckney et al. (6) is one which, if proved to give an accurate evaluation of quality, could be of great value to a breeder. The sedimentation test was made a part of the U.S. wheat price support provisions for the 1962 crop (1) but was dropped in 1965. Great diversity of opinion was expressed as to its value in measuring this study only to evaluate the sedimentation test as a breeding selection criterion for quality in wheat.

Originally the sedimentation test was designed to use 200 grams of seed, but Dewey (2) has shown that programs can be used satisfactorily for a starter test. Recently Zeleny et al. (12) and Wise et al. (9) suggested modifications in which 2 or 5 grams can be evaluated satisfactorily. These micro-tests enable a breeder to evaluate the quality of seed, experimental strains grown as spaced hills or head rows and still provide enough seed to reseed.

In research that relates to the present study, Zeleny et al. (12) compared sedimentation values, mixing and baking tolerance, and protein in 159 F₃ lines from a good quality spring wheat, Conley (sedimentation value 31), and P.I. 56219-12, a low quality, good quality spring wheat (sedimentation value 27). Correlations between sedimentation value and mixing tolerance were high, but were low between mixing value and protein. Lebsock et al. (5) reported on this cross, grown from F₃ through F₈. The correlation between sedimentation value and mixing time was 0.61 to 0.74 for the several generations. Correlations for protein were significant but much lower, ranging from 0.50 to 0.52. Heritability estimates of mixing and protein were 63% for F₃ vs F₅ and 87% for F₅ vs F₈. Heritability of sedimentation values were 56 and 60%, for protein 37 and 70%, respectively.

Kaul and Sosulski (4) studied the inheritance of sedimentation and protein percentages in BC₁ and BC₂ of the spring wheat cross Selkirk X Gaba. High sedimentation value was partially dominant. High sedimentation values ranged from 50 to 60, while those for protein content ranged from 10 to 14.

Earlier studies of quality inheritance involved wheat-meal fermentation time test. Worzella (10) included from tests of the F₂ and F₃ progenies of a hard red winter wheat cross that the fermentation time test was reliable for the F₂ and F₃ generations. Means for mixing time in F₁ varied from 3 to 90%.

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