PREPARATION OF BARLEY HYBRIDS FOR QUALITY TESTING

by

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One of the most important phases of quality testing of grains is proper cleaning and grinding of the sample. This fact becomes more apparent when small samples are used in the various laboratory tests. The amount of seed from new hybrids is usually very limited, necessitating extreme care during the preparation of the sample. A true homogeneous mixture of the original sample after cleaning is required for chemical analyses; otherwise the plant breeder would be given unreliable and incomplete results.

A fine, uniformly ground product is imperative for reliable chemical determinations on barley. This product must consist of material solely from the barley kernel, since the composition of weed seeds, awns and other extraneous matter is of no interest to the barley breeder or malster. Consequently, the preparation of barley samples for quality testing requires a great deal of attention. The threshing operation usually does not completely remove the awns from the kernels, and this must be accomplished before grinding. When grinding this grain, the endosperm adheres to the mill casing, which necessitates dismantling the apparatus for thorough cleaning.

Cleaning

The usual method employed for laboratory cleaning of small grains is to run the material over an Emerson "kicker" to remove such foreign material as bits of straw, weed seeds, and parts of unthreshed heads. However, when the sample is very limited, as in the case of barley hybrids, the loss through the "tailings", if they were discarded, would limit the number of physical and chemical determinations that could be obtained, and a representative sample of the original material might not be secured. These "tailings" consist mainly of barley kernels with the awns partially removed. The problem is to remove the awns without cracking the kernels or removing any portion of the hull. This formerly was accomplished in the laboratory by running the tailings through a scourer, but the additional work involved caused us to seek an easier and more efficient method. The handy Waring Blendor provided the solution. It was found that by operating the blender at low speed for a few seconds the barley awn was completely removed without visible damage to the kernels. Blowing off the chaff with a fan completed the cleaning operation. Fig. 1 shows a typical sample of tailings before and after cleaning.

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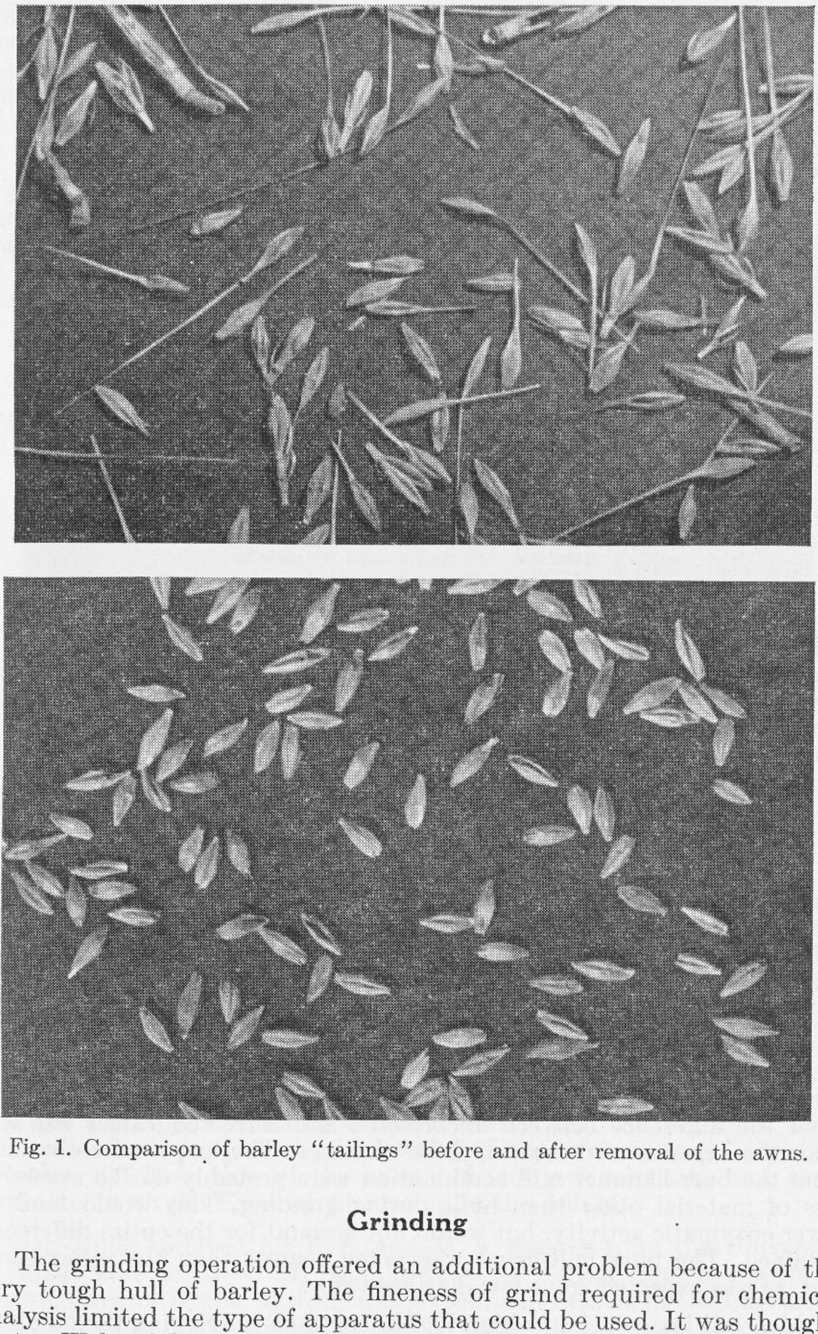

Fig. 1. Comparison of barley "tailings" before and after removal of the awns.

Grinding

The grinding operation offered an additional problem because of the very tough hull of barley. The fineness of grind required for chemical analysis limited the type of apparatus that could be used. It was thought that a Weber laboratory pulverizer (a small hammer mill) would do a more thorough job than a burr or blade type mill. The pulverizer is shown in

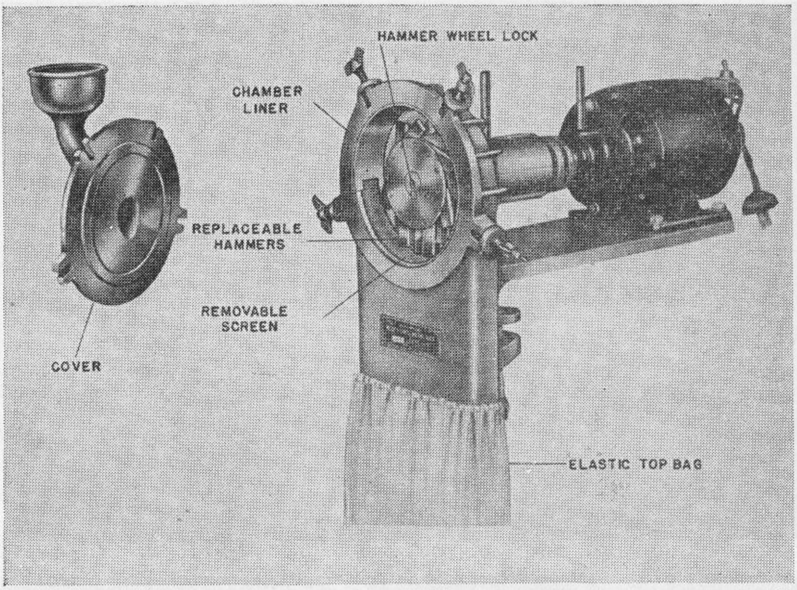

Fig. 2. Laboratory pulverizer used to grind barley samples.

Fig. 2. A screen having perforations of one millimeter in diameter is used, which gives the granulation most suited for laboratory tests on barley. One objection to the use of a mill of this nature, however, is the amount of cleaning which is necessary after each sample. The barley endosperm is much more adherent to the mill casing than wheat; therefore, the technique of cleaning the burr mill by running a small portion of the next sample through and discarding it is not suitable for the hammer mill.

Various types of grinders are available in this department, and it was decided to conduct a small study to determine the most suitable method for grinding barley samples. Two types of grinders were selected, using both whole kernels and cracked kernels (barleys that had been passed through the rolls of a Tag-Heppenstall moisture meter).

Table I gives the experimental data obtained by the different methods of grinding. The values listed are the means for four varieties, grown at four stations, and ground by four different procedures. The loss of moisture through grinding had no significant effect upon diastatic activity since the difference between uncorrected and corrected values was less than the experimental error of $\pm 3.6°$ Lintner. The low results obtained from the burr-hammer mill combination were probably due to excessive loss of material other than hulls during grinding. This would tend to lower enzymatic activity, but would not account for the entire difference obtained. The burr mill grind was much coarser than the other three and, as was expected, gave low diastase values.

Material loss was fairly high for the methods employing the hammer mill; however, this loss was consistent in all the determinations that were run. The main concern was to obtain maximum values for diastase, and from Table I the choice is between the first method, which is cracked kernels through the hammer mill or the second method which is whole kernels through the hammer mill. It was decided to select the latter, since it seemed advisable to run moistures on the ground material instead of using moisture results obtained on the whole grain.

Although the factors discussed above are often disregarded because they are seemingly unimportant, it is quite obvious that methods of sample preparation should become as standard as those employed for chemical or physical analysis. These technical problems are of interest to the barley grower because they ensure that decisions made regarding barley quality are based on sound facts.

Acknowledgement

The authors are indebted to Frederic J. Ferrin of the School of Chemical Technology for taking the photographs shown in Fig. 1.

TABLE I

Effect of Various Methods of Grinding Barley upon Material Loss, Moisture and Diastatic Activity

Method of grinding	Material loss	Moisture loss	Diastatic activity °L Uncorrected for moisture loss	Diastatic activity °L Corrected for moisture loss
	%	%		
1. Cracked kernels through the hammer mill..............	2.8	0.30	243.7	242.9
2. Whole kernels through the hammer mill..............	2.1	0.23	239.6	239.0
3. Whole kernels through the burr mill.................	0.7	0.13	223.0	222.7
4. Whole kernels through the burr mill, then through hammer mill..............	3.4	0.37	215.3	214.5

UNIVERSITY OF IDAHO MAN NAMED

Dr. Glenn C. Holm, previously with the University of Idaho, Moscow, on Nov. 1 assumed his new duties here as professor of bacteriology and veterinary science in the School of Agriculture and as veterinarian in the Experiment Station. He will teach bacteriology of animal diseases and the principal courses in veterinary science in the School of Agriculture and will do research on bacteriological aspects of animal diseases. He also will have care of the health of institutional flocks and herds connected with the Experiment Station at the college.

Dr. Holm received his B. S. and M. S. degrees from the University of Idaho and his D. V. M. from Iowa State College, and has been associate director of the Agricultural Experiment Station at the University of Idaho since 1947. He has published some 36 papers in the fields of bacteriology and veterinary medicine and is a member of state and national veterinary medical associations and fraternities.