THE RELATION OF LIGNIFICATION OF THE OUTER GLUME TO RESISTANCE TO SHATTERING IN WHEAT

O. A. Vogel

The problem of shattering of wheat is of greater importance to the wheat industry in the Pacific Northwest than in any other major wheat-producing area of the United States. In this area the harvest season covers a period of two to three months and a large portion of the grain often stands in the field two or three weeks after maturity. During this extended harvest season the standing grain is frequently subjected to hot winds of high velocity and low relative humidity, causing heavy losses of grain from shattering. Losses of 5 to 15% have been frequently observed among several of the commercial varieties in the Palouse and neighboring areas during recent years. Other varieties having greater resistance to shattering but growing under similar conditions lost comparatively little or no grain. However, the more resistant varieties are sometimes difficult to thresh and thereby produce an excess of cracked kernels and unthreshed single-grained tip spikelets, both of which are discriminated against in the grain trade.

In the present wheat improvement program attempts are being made to select strains and hybrids that possess enough resistance to prevent much of the shattering in the field and still thresh reasonably easy. In the course of this work it has become obvious that a better understanding of the nature of resistance to shattering is needed. This need has led to a study of the structural details at the breaking points in the basal portions of the outer glumes of the wheat spikelet. The outer glumes were chosen for this study because, from the standpoint of resistance to shattering, their primary function seems to be to help hold the other flowering parts in place.

MATERIAL AND METHODS

The four central spikelets from each of several typical heads of several varieties of wheat representing varying degrees of resistance to shattering were collected at six stages of growth, namely, late boot; flowering; early, medium, and stiff dough stages; and at maturity. The grains were carefully removed leaving intact the lemmas and outer glumes. The remaining portion of each spikelet of the five immature stages was killed in alcohol-formalin-acetic acid solution, dehydrated, and embedded in paraffin. The sections were cut 10 microns thick and stained with safranin and fast green. The effect of lignification of the outer glumes on shattering was determined by comparing the type and number of sections showing lignified areas at the breaking points.