REDUCTION IN YIELD OF WINTER WHEAT DUE TO REMOVAL OF HEADS AT HEADING TIME

HUBERT M. BROWN

To many who have observed the black masses of loose smut, *Ustilago tritici*, spores as they appear in a field of wheat at heading time, there doubtless has come the question, Will the reduction in yield due to the destruction of wheat heads by the smut be proportional to their percentage occurrence or will the remaining undestroyed heads be able to compensate in part for the destruction?

In the literature on loose smut no data were found dealing with the quantitative determination of the reduction in yield of grain due to this disease. The practical difficulties of obtaining sufficient seed with appreciable amounts of loose smut and of being certain that the loose smut infected seedlings would not be killed out during the winter, prompted an attempt to simulate the removal of wheat heads from production due to their destruction by loose smut. This simulation consisted of removing certain heads by cutting them from the culm shortly after heading had occurred. The experiment was begun in the fall of 1937 and continued through the crop of 1941. The data for the 4 years are presented here.

MATERIALS AND METHODS

The plan of the experiment involved the removal of certain wheat heads at heading time and the subsequent determination of the yields of grain. The layout for the 1938 crop included American Banner and Baldrock winter wheats. Each variety was planted in a set of four randomized blocks with 13 plots per block. No treatment was given one plot. The treatments given to the other 12 involved the removal of the heads in three rates, leaving 95%, 90%, and 80% of the heads; in two arrangements, heads cut singly or cut in bunches of five; and at two heights, cut high, between the head and the top leaf, or cut low, within 3 inches of the ground. (See Table 1.) The plots were three rows wide, with 1 foot between rows, and were cut to 16 feet long shortly before harvest. All the plots of a variety were planted with the same drill. All rows of a plot were given the same treatment. No record was made of the numbers of heads removed nor of those that matured.

During the next 3 years, 1939-41, a third variety, easily identified at heading time, was used to represent the varying percentage of loose smut. As American Banner and Baldrock are awnless, a bearded type, Red Rock, was chosen. The six mixture ratios of awnless (American Banner) to bearded (Red Rock) which were used were: 100:0, 95:5, 90:10, 85:15, 80:20, and 75:25%. These mixtures, hereafter designated by the percentage awnless, were randomized as in a Latin square. A second Latin square, using Baldrock instead of American Banner, was also planted. All plots were four rows wide, with 12 inches between rows, and were cut to 16 feet long shortly before harvest. As the varieties did not have the same kernel size, they were carefully screened and the proper amounts mixed together to give the desired mixture ratios by count. All plots of a square were planted with the same drill. At heading time, the bearded heads were removed by cutting them off just below the head and the number for each row recorded. Later, counts were made of the numbers of awnless heads. All six

---

1Part of these data were presented in a paper at the annual meeting of the Society held in Washington, D. C., in December 1941. Contribution from the Farm Crops Section, Michigan Agricultural Experiment Station, East Lansing, Mich. Journal Article No. 597 new series. Received for publication June 2, 1944.

2Assistant Professor and Research Assistant in Farm Crops.