TILLERING AND YIELD OF OAT PLANTS GROWN AT DIFFERENT SPACINGS

The extent of tillering is one of the factors affecting grain yields in cereals. To study the association between tillering, yield, and plant height, an experiment was conducted in 1950 and 1951 with the oat varieties Otte, Clinton, Nemaha, and Marion. Stand density was controlled by spacing plants 2.5 and 5.0 inches apart in 7-in rows. At maturity, plants were pulled and the number of grain-bearing and total tillers, height, and yield per plant were determined. Plant height was taken on the tallest tiller by measuring the distance from the uppermost node showing crown roots to the uppermost spikelet of the panicle. The rusts were minor diseases both years.

Highly significant differences were recorded in the average number of productive tillers between spacings within varieties. Otte developed the largest number of productive tillers in both years and spacings. Clinton was the lowest tillering variety in both seasons. The early varieties Otte, Nemaha, and Cherokee produced grain on 88% of all tillers formed while the later maturing varieties, Clinton and Marion, bore grain on 63 and 56%, respectively, of the total number of tillers developed on plants at the 2.5-inch spacings. However, the average total number of tillers formed was as great for late as for early varieties. Varietal differences in tiller number were less in the 5-inch than in the 2.5-inch spacing.

At the 2.5-inch spacing, regression of yield on number of tillers expressed in grams per tiller was within the range from 0.824 to 1.155 as recorded for Otte and Nemaha, respectively. At the wider spacing, the corresponding values were 1.117 for Otte and 1.580 for Clinton.

The intra-varietal comparisons within spacings indicated a positive association between tillering and plant height. This association was smaller under the wider spacing.

Coefficients of correlation between plant height and yield were determined for each tiller class within both spacings. Highly significant positive values were obtained in most of the tiller classes for each variety. For the modal class of 3 tillers per plant, $r$ values ranged from 0.491 to 0.622 at the 2.5-inch spacing and from 0.34 to 0.841 at the 5-inch spacing.

Based on the varieties grown over the 2-year period, 75% more grain was produced under the 5-inch spacing than under a spacing of 2.5 inches. The data indicated that 77% of the total yield increase in the widely spaced plants resulted from increased tillering, 16% from increased yield per tiller, and 7% from the interaction of both factors.

Inheri TANCE OF A WHITE FLOWER COLOR IN CRIMSON CLOVER, *Trifolium incarnatum*

Although several improved varieties of crimson clover are now available for use by farmers, they cannot be readily identified by plant characteristics. White-flowered plants often occur in stands of crimson clover, and if this characteristic could be utilized as a marker, varietal identification in the field would be simplified. Consequently, a study to determine inheritance of white flower color in common crimson clover might be helpful in a breeding program.

During the winter of 1952, 106 plants were grown in the greenhouse from open pollinated seed of a white-flowered plant found in a stand of common crimson clover. Seventy plants were white and 36 were red-flowered. Occurrence of red-flowered progeny indicated outcrossing and suggested that red was dominant to white flower color. White-flowered plants undoubtedly resulted from natural selfing. On the basis of this assumption, red-flowered plants were assumed to be heterozygous and white-flowered plants homozygous recessive for flower color. Self-fertilized heterozygous plants should then segregate and homozygous recessive plants should breed true for flower color. To study the inheritance of flower color, eight pairs of red and white-flowered plants were selfed and reciprocally crossed by hand. Seed of the $F_1$, $S_2$ and reciprocal backcross generations were planted in the greenhouse in the fall of 1953.

Data for flower color in the $F_2$, $S_2$ and reciprocal backcross populations are given in table 1. The segregation of flower color in the $F_2$ from heterozygous red $F_1$ plants gave a satisfactory fit to a ratio of 3 red to 1 white-flowered plants. This demonstrated that red flower color was dominant to white in $F_1$ and that inheritance in $F_2$ was simple. Since the $S_2$ plants from white-flowered parents bred true for flower color, the homozygous recessive can be assumed to condition white flower color.

Table 1.—Frequency distribution for flower color in $F_2$, $S_2$ and reciprocal backcross populations of crimson clover.

<table>
<thead>
<tr>
<th>Generation</th>
<th>Flower color</th>
<th>Ratio</th>
<th>Chi $^2$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Red</td>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$F_1$</td>
<td>109</td>
<td>29</td>
<td>3:1</td>
<td>1.169</td>
</tr>
<tr>
<td>$S_1$</td>
<td>26</td>
<td>26</td>
<td>1:1</td>
<td>3.96</td>
</tr>
<tr>
<td>BC</td>
<td>29</td>
<td>34</td>
<td>1:1</td>
<td></td>
</tr>
</tbody>
</table>

The segregation in the reciprocal backcrosses to the white-flowered plants gave a close fit to a 1:1 ratio thus substantiating the assumption that one factor pair was involved in the expression of flower color.

The symbols, $Cr$, $cr$ are suggested for this pair of alleles with the dominant gene necessary for red flower color and the recessive allele conditioning white flower color.

True breeding white-flowered types have been isolated, and plans are underway to develop a variety uniform for white flower color. The white-flowered types appeared as