GENETICS OF CHLOROPHYLL DEFICIENCIES IN
RED CLOVER (TRIFOLIUM PRATENSE L.)

II. YELLOW SEEDLING FACTORS

BY R. D. WILLIAMS, M.Sc.

Welsh Plant Breeding Station, Aberystwyth

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Eight factors determining the development of albinos in red clover are reported elsewhere in the current number of this Journal. These have been designated w1...w8. The present paper deals with seven factors designated y1, y2, y3, y4, y5, y6, y7, which govern the production of yellow seedling characters in red clover.

Phenotypically the main difference between the white and yellow seedling types is that the cotyledon leaves of the latter are more deeply coloured with yellow pigment. There is, however, no clear line of demarcation between the two groups, since some yellow types become pure white, and these differ from the albinos only in retaining the yellow pigment for a rather longer period, generally 3–4 weeks, before it bleaches. In other yellow types the cotyledons fade to pale yellow and then to a dull greyish colour, but never to pure white, before they die. The
cotyledon leaves of the yellow types are noticeably larger and therefore contain a bigger reserve supply of food than in the case of white seedlings, and no doubt this accounts for the fact that they are generally able to survive for a longer period than the latter.

I. GENETIC RELATIONS OF YELLOW AND WHITE SEEDLING FACTORS

To determine the identity of these various chlorophyll-deficient factors only the heterozygotes could be used, since the recessives were lethal in the seedling stage. Plants heterozygous for the seven yellow factors were intercrossed in all possible combinations with one another, and also with individuals heterozygous for most of the albino factors. These tests are shown in Table I in the paper dealing with the white chlorophyll deficiencies (p. 445 of this Journal). As will be seen by reference to this table, the F₁ seedlings resulting from these test crosses were without a single exception full green, indicating that the factors involved were genetically different.

II. y₁ y₁ GENOTYPE

This type was found in an F₃ progeny of a Montgomery cross. Its cotyledon leaves were at first of medium yellow colour (Ridgway XVI, 21' e), but after about 3 weeks these faded to pale yellow, and then to pure white. All y₁ y₁ seedlings were lethal in the cotyledon stage, and in all crosses, with one exception in which they were faintly tinged with green pigment, they were entirely devoid of chlorophyll.

The data on ten F₂, two F₃ and three F₄ progenies segregating for this type are summarized in Table I.

### TABLE I

<table>
<thead>
<tr>
<th>Generation</th>
<th>Pedigree no.</th>
<th>No. of progenies</th>
<th>Y₁</th>
<th>y₁</th>
<th>Total</th>
<th>Deviation from 3 : 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>F₂</td>
<td>162</td>
<td>1</td>
<td>1086</td>
<td>843</td>
<td>1929</td>
<td>7.75 ± 16.26</td>
</tr>
<tr>
<td>F₃</td>
<td>356</td>
<td>1</td>
<td>30</td>
<td>11</td>
<td>41</td>
<td>0.75 ± 2.77</td>
</tr>
<tr>
<td>F₄</td>
<td>610</td>
<td>2</td>
<td>941</td>
<td>583</td>
<td>1524</td>
<td>0 ± 9.00</td>
</tr>
<tr>
<td>F₅</td>
<td>675</td>
<td>3</td>
<td>922</td>
<td>439</td>
<td>1361</td>
<td>-3.00 ± 4.00</td>
</tr>
<tr>
<td>F₆</td>
<td>2556</td>
<td>1</td>
<td>94</td>
<td>45</td>
<td>139</td>
<td>6.93 ± 11.58</td>
</tr>
<tr>
<td>F₇</td>
<td>163</td>
<td>1</td>
<td>107</td>
<td>28</td>
<td>135</td>
<td>3.86 ± 6.25</td>
</tr>
<tr>
<td>F₈</td>
<td>856</td>
<td>1</td>
<td>478</td>
<td>171</td>
<td>649</td>
<td>5.75 ± 11.03</td>
</tr>
<tr>
<td>F₉</td>
<td>356</td>
<td>1</td>
<td>70</td>
<td>271</td>
<td>341</td>
<td>2.35 ± 7.31</td>
</tr>
<tr>
<td>Total observed</td>
<td>15</td>
<td>3357</td>
<td>1725</td>
<td>5082</td>
<td>4775</td>
<td>4.25 ± 9.92</td>
</tr>
</tbody>
</table>

Cal. (3 : 1) 3551.25 1122.75

χ² = 16.28, *P = 0.06.*