1. Partial desynaptic maize.

In one backcross progeny, \((0_7 \times In\ 3a) \times In\ 3a\), segregation for normal and partially sterile (59% ovule abortion, on average) plants was observed. Examination of the microsporocytes of the partially sterile plants revealed that the sterility is due to the premature separation (desynapsis) of several homologous chromosomes.

The partial desynaptic plants had been crossed with the normal testers. Meiosis and fertility of all the \(F_1\) plants were normal. Results of segregation for normal and partial desynaptic plants of eleven \(F_2\) progenies (Table 1) indicate that partial desynapsis is due to a recessive gene.

<table>
<thead>
<tr>
<th>Progeny No.</th>
<th>No. of normal plants</th>
<th>No. of partial desynaptic plants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8008</td>
<td>46</td>
<td>11</td>
<td>57</td>
</tr>
<tr>
<td>8010</td>
<td>141</td>
<td>41</td>
<td>182</td>
</tr>
<tr>
<td>9021</td>
<td>143</td>
<td>50</td>
<td>193</td>
</tr>
<tr>
<td>9022#</td>
<td>142</td>
<td>5</td>
<td>147</td>
</tr>
<tr>
<td>9023</td>
<td>106</td>
<td>25</td>
<td>131</td>
</tr>
<tr>
<td>9024</td>
<td>63</td>
<td>15</td>
<td>78</td>
</tr>
<tr>
<td>9025</td>
<td>143</td>
<td>38</td>
<td>181</td>
</tr>
<tr>
<td>9026</td>
<td>191</td>
<td>56</td>
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<td>250</td>
<td>80</td>
<td>330</td>
</tr>
<tr>
<td>9056</td>
<td>92</td>
<td>29</td>
<td>121</td>
</tr>
<tr>
<td>9057#</td>
<td>156</td>
<td>25</td>
<td>181</td>
</tr>
</tbody>
</table>

\# deviates from 3:1 ratio.

In order to test whether or not the new gene was allelic to the asynaptic mutant, \(as\), crosses were made between the partial desynaptic and asynaptic plants. All the \(F_1\) plants resulting from such crosses were normal. The \(F_2\) plants were classified into normal and sterile ones according to the seed set on the mature ears. If the new and asynaptic genes are not allelic, a ratio of 9 normal to 7 sterile plants should be expected. This is true in 11 out of 14 \(F_2\) progenies tested (Table 2).

Besides desynapsis, other abnormalities such as the formation of a plasmodial mass, uncoiling of chromosomes, chromosome breakage, etc. which have been described in asynaptic maize can also be observed in the microsporocytes of the partial desynaptic plants. However, the partial desynaptic maize differs from the asynaptic one in several aspects which are briefly described as follows:

For the asynaptic maize both Beadle (1930, 1933) and Miller (1963) have reported that the intensity of asynapsis varies from complete to very
Table 2
Segregation for Normal and Sterile Plants (Asynaptic and Desynaptic) in the F2 Progenies Resulting From Crosses Between Partial Desynaptic and Asynaptic Plants

<table>
<thead>
<tr>
<th>Progeny No.</th>
<th>No. of normal plants</th>
<th>No. of sterile plants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>9028</td>
<td>161</td>
<td>98</td>
<td>259</td>
</tr>
<tr>
<td>9058</td>
<td>37</td>
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<td>62</td>
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<td>9059</td>
<td>40</td>
<td>29</td>
<td>69</td>
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<td>9061</td>
<td>30</td>
<td>25</td>
<td>55</td>
</tr>
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<td>9062#</td>
<td>49</td>
<td>11</td>
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<td>9065</td>
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</tr>
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</tr>
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<td>9072</td>
<td>24</td>
<td>29</td>
<td>53</td>
</tr>
</tbody>
</table>

# deviates from 9:7 ratio.

low. The degree of desynapsis has been checked in many desynaptic plants. On the average, only 35% of PMC's have 2 or more univalents at MI, but the number of univalents never exceeds 10. Thus, the action of the partial desynaptic gene is weak as compared to that of a.

In the asynaptic sporocytes, Miller (1963) has shown that the intensity of asynapsis at zygotene or pachytene is similar to that at diakinesis or MI, indicating that the homologous chromosomes which failed to pair at diakinesis or MI did not pair at early prophase I. Several hundred pachytene configurations of 8 desynaptic plants have been checked carefully. In no case was a completely asynaptic bivalent observed. Only occasionally, a small region of a bivalent was not synapsed. The failure of pairing of chromosomes in the partial desynaptic plants, thus, occurs after the pachytene stage.

The abnormal spindle described by Beadle and Miller in asynaptic sporocytes has not been observed in the desynaptic maize.

Double foldback of a portion of a bivalent has been found at the pachytene stage in desynaptic maize. Its occurrence varied from anther to anther. More foldbacks were found in chromosome 4 than in other chromosomes. Since such foldback bivalents were rare, the direct relationship between foldback and desynapsis is doubtful.

Work is in progress to locate this gene in a specific linkage group.

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Part of this work was carried out in the Department of Botany, Indiana University while the writer was on the Visiting Research Scientist Program, sponsored by the National Academy of Sciences of the United States, 1961-1963.