NOTE ON THE DETECTION OF SEGREGATION BY EXAMINATION OF THE POLLEN OF RICE.

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(With Plate XXI.)

_Gluttonous Rice._

For several years a study has been in progress on the inheritance of the (so-called) _glutinous_ character typical of a small group of cultivated varieties of rice. These varieties differ from the ordinary _starchy_ type in that the grain becomes gelatinous when cooked in water, so much so that if boiled in the ordinary way the result is a sticky mass resembling glue.

Glutinous grains can be distinguished by their appearance since the endosperm is dead white, giving a fracture like porcelain, whereas in starchy grains it is always more or less translucent.

Microscopic examination of sections of the endosperm shows no marked difference between the two types, the cells in both cases being filled with the highly compound starch grains characteristic of rice. The action of iodine, however, brings out a very sharp distinction—the starch grains of ordinary starchy varieties take on the usual deep blue colour, whereas those of glutinous varieties become reddish in dilute iodine, passing through wine colour to dark brown as the strength of the solution is increased. The same difference is seen when grains are broken across and dipped into iodine solution.

The production of a reddish colour with iodine is characteristic of amylodextrine, a rare form of starch that occurs in mace, and it is presumably the presence of this form of starch that gives to glutinous rices their special character.

_Inheritance._

In inheritance the glutinous character behaves as a simple recessive to starchy but, since double fertilization takes place, the endosperm is a fertilization product and the usual complication of results is obtained.

Thus when flowers of a glutinous plant are fertilized with starchy pollen they produce grains with starchy endosperm. An _F_1 plant, selfed,
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bears a mixture of starchy and glutinous grains. These give rise in \( F_2 \) to three groups of plants, bearing respectively—all starchy grains, all glutinous, and a mixture of starchy and glutinous as in \( F_1 \). Those bearing all starchy or all glutinous grains breed true to these characters in \( F_2 \), whereas those which bear the mixture give the three groups again in \( F_2 \).

The mixture of grains on an \( F_1 \) plant should give a simple 3 : 1 ratio of starchy to glutinous. This ratio is approached fairly nearly in the numbers recorded, though there is always a slight excess of starchy. For nine plants, each giving about the same ratio, the following total figures were obtained:

<table>
<thead>
<tr>
<th>Grains</th>
<th>Starchy</th>
<th>Glutinous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of 9 plants</td>
<td>5,292</td>
<td>1,587</td>
</tr>
<tr>
<td>Expectation 3 : 1</td>
<td>5,159 : 1,720</td>
<td></td>
</tr>
</tbody>
</table>

In \( F_2 \) the three groups of plants would be expected to give a 1 : 2 : 1 ratio of starchy : mixture : glutinous. In the families so far raised there is a very considerable departure from this ratio as shown by the following figures:

<table>
<thead>
<tr>
<th>Grains</th>
<th>All starchy</th>
<th>Mixture</th>
<th>All glutinous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of 81 families</td>
<td>9,211</td>
<td>13,729</td>
<td>5,021</td>
</tr>
<tr>
<td>Expectation 1 : 2 : 1</td>
<td>6,990 : 13,980 : 6,990</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It appears most probable that the single factor explanation of the difference between starchy and glutinous is correct but that some disturbing influence affects the ratios in \( F_2 \). There are a number of possibilities in this direction and some of these are being investigated. Certain preliminary results suggest that differential germination and dying-off may be responsible.

**Pollen Dimorphism.**

In searching for some explanation of the \( F_2 \) ratios an examination was made of the pollen on \( F_1 \) plants. With a view to distinguishing the two genetic types the pollen was treated with iodine. The result was most satisfactory—two distinct types became evident, one giving the dark blue reaction of ordinary starch and the other the reddish reaction of amylopectin. With iodine solution of the right strength a very sharp distinction can be obtained since the starchy grains become dark blue whilst the others remain only yellowish.

Pollen from the two pure parents was then examined in iodine solution. The starchy parent gave only the blue type of pollen; the glutinous parent gave the reddish type.