

INHERITANCE IN *RICINUS COMMUNIS* L.

PART II.

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IN the first part of this paper¹ the writer demonstrated the existence of four Mendelian factors in the castor-oil plant. These factors are *B* (bloom), *S* (spines), *M* (mahogany), and *G* (green). Experiments on the interrelations of these four factors shewed that the following pairs of factors are independently inherited: *S* and *M*, *S* and *B*, *M* and *G*, and perhaps *G* and *B*. Factors *M* and *B* are repelled in the cross *Mb* × *mB*.

A further series of crosses was made with the object of clearing up certain outstanding points, and the results of these crosses will now be given.

Relation between the factors M (mahogany) and B (bloom).

The back-cross F_1 (*MbmB*) by double recessive (*mbmb*).

Family	<i>MB</i>	<i>Mb</i>	<i>mB</i>	<i>mb</i>
<i>RX</i> 2—4 × <i>Gb</i> 10	3	30	28	3
<i>RX</i> 2—4 × <i>Gb</i> 18	6	38	33	0
<i>RX</i> 2—2 × <i>Gb</i> 3	11	98	88	9
<i>RX</i> 2—4 × <i>Gb</i> 14	1	27	22	1
<i>RX</i> 2—4 × <i>Tb</i> 18	2	24	26	1
<i>RX</i> 2—4 × <i>Tb</i> 19	10	77	69	4
Totals ...	33	294	266	18

By Morgan's method of calculation the percentage of cross-overs is 8.3, and on the chromosome hypothesis the factors *B* and *M* are located on the same chromosome 8.3 units apart.

Relation between the factors B (bloom) and G (green).

The results of a previous series of back-crosses *BGbg* × *bgbg* indicated that *B* and *G* were either independently inherited or very loosely

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linked. The results from a further series of back-crosses are now available.

Family	<i>GB</i>	<i>Gb</i>	<i>gB</i>	<i>gb</i>
<i>RX 2-3</i> × <i>RG 3-1</i>	5	3	2	4
<i>RG 3-7</i> × <i>RX 2-3</i>	7	8	9	12
<i>RG 3-4</i> × <i>RX 2-3</i>	18	13	20	9
<i>RG 3-3</i> × <i>RX 2-3</i>	10	14	9	10
<i>RG 3-5</i> × <i>RX 2-3</i>	14	4	9	6
<i>RG 3-8</i> × <i>RX 2-3</i>	3	2	4	4
<i>RG 3-9</i> × <i>RX 2-3</i>	8	9	15	12
<i>RG 3-j</i> × <i>RX 2-3</i>	10	4	6	6
<i>RG 3-k</i> × <i>RX 2-3</i>	17	20	27	13
Totals ...	92	77	101	76
Expected ...	86.5	86.5	86.5	86.5

In this series of crosses the number of cross-overs is 178, and the number of non-cross-overs 168, an excess of the former. It may be concluded that *G* and *B* are independently inherited.

Relation between the factors S and G.

The relation between *S* and *G* was investigated in the back-cross *SgsG* × *sgsg*. The following were the results :

Family	<i>SG</i>	<i>Sg</i>	<i>sG</i>	<i>sg</i>
1	8	4	4	6
2	33	15	4	10
3	18	17	14	14
4	17	9	9	13
Totals	76	45	31	43

The factors *S* and *G* entered the cross from different sides, the cross being *Sg* × *sG*. The results from the above back-crosses are such as would be expected if *S* and *G* entered the cross from the same side and were linked. The small number of plants grown does not enable us to decide whether the excess of *SG* and *sg* is due to some accidental cause, or whether we are dealing with a new phenomenon. It would be difficult to imagine any mechanism which could give rise to more than 50 per cent. crossing over.

In the original F_2 results the two types Rose and Tinged were not separated, so that it is not possible to trace the ratio of the four phenotypes *SG*, *Sg*, *sG*, and *sg* in this generation. In the two colour classes green and mahogany, however, the proportions of spiny and spineless were distinguished thus :

Green Spiny <i>mSG</i>	Green Spineless <i>msG</i>
61	27
Mahogany Spiny <i>MSg</i>	Mahogany Spineless <i>Msg</i>
93	37

In both the above ratios there is an excess of the spineless form, and it would be justifiable to conclude that there is no repulsion between factors S and G . It is intended to study the linkage relation of S and G in a much larger series of back-crosses.

Relation between the factors M (mahogany) and G (green).

The F_2 results led to the conclusion that M and G were inherited independently, and this view is confirmed by the results of back-crosses of F_1 by double recessive, placed below.

Family	MG	Mg	mG	mg
1	7	12	10	5
2	9	5	8	7
3	15	11	15	12
4	56	36	39	34
5	26	17	14	28
Totals	113	81	86	86
Ratio	1.2	0.9	0.9	0.9

The only point arising out of these results is the excess of MG , which should form the subject of further experiment.

SUMMARY.

1. Factors M and B are linked, there being 8.3 per cent. cross-overs in the back-cross of F_1 by double recessive.
2. Factors G and B are independently inherited.
3. Factors M and G are independently inherited.
4. The relation between S and G is somewhat obscure, the percentage of cross-overs in the back-cross of F_1 by double recessive being considerably greater than the percentage of non-cross-overs.