Further Experiments with the Mutant, Scarlet, from Drosophila Repleta.

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The mutant, scarlet, from Drosophila repleta, was first described by Hyde in the American Naturalist, 1914, Vol. 49, p. 183. This new eye-color was found to be a recessive Mendelian unit, giving a ratio of 3 to 1 in the F_2 generation. In order to familiarize myself with Mendelism, I undertook to determine whether or not the black-eyed flies of the F_2 generation were in the ratio of one homozygous to two heterozygous as the Mendelian formula demands.

The following tables give the results of the crosses between scarlet and the wild stock. All the F_1 flies had black eyes like those of the original wild parents. These were then inbred in mass culture, as is shown in Tables I. and II.

TABLE I.

F_2 Flies of the Cross, Scarlet Female by Wild Male.

Culture Number.	Wild Type, Females.	Wild Type, Males.	Scarlet, Females.	Scarlet, Males.
1	187	202	64	59
2	425	418	123	128
3	410	410	124	90
4	211	200	67	70
5	123	152	52	38
6	190	175	64	40
7	200	210	61	58
8	115	115	43	31
Total	1,861	1,982	598	534

TABLE II.

F_2 Flies of the Cross, Scarlet Male by Wild Female.

Culture Number.	Wild Type, Females.	Wild Type, Males.	Scarlet, Females.	Scarlet, Males.
1	447	456	120	146
2	714	692	186	203
3	284	292	68	92
4	445	415	108	123
5	193	171	64	65
6	215	220	75	77
7	122	110	32	38
8	562	462	155	142
9	326	304	108	112
10	228	262	105	69
11	195	178	66	63
12	149	157	51	53
13	341	302	87	116
Total	4,221	4,021	1,225	1,299

In the F_2 generation from the scarlet female (Table I), there was a total of 3,843 wild type flies and 1,132 scarlet, which is approximately a ratio of 3 wild type to 1 scarlet. In the F_2 generation from the scarlet male (Table II), there were 8,242 of the wild type and 2,524 of the scarlet, which makes a ratio of 3.22 wild type to 1 scarlet. The extracted scarlets have since bred true.

Crosses were made to scarlet with the F_2 wild type flies from both the original cross and its reciprocal. To insure virgin flies the sexes were separated every twelve hours. These back-crosses were made in pairs to determine how many of the flies of this generation were homozygous and how many were heterozygous. If the scarlet eye-color is a simple recessive unit, all the homozygous blacks mated to scarlet should give only wild type offspring, while the heterozygous blacks mated to scarlet should give equal numbers of blacks and scarlets. The results of these crosses are shown in Tables III to VI.

Table III gives the results of back-crossing to scarlet the F_2 female wild type flies from the original parents, scarlet female by wild male. This table shows that 82 such matings were made. Of these 82 females, 27 proved to be homozygous and 55 heterozygous, a ratio of two to one. Table IV, showing the reciprocal cross of Table III, gives 18 homozygous and 59 heterozygous. Table V gives the results obtained by back-crossing to scarlet the F_2 wild type female from the original parent cross scarlet male by wild female. Of these females, 25 proved to be homo-

zygous and 39 heterozygous. Table VI, the reciprocal cross of Table V, shows a result of 14 homozygous and 16 heterozygous males.

A sum total of all the results of Tables III-VI gives 84 homozygous F_2 flies and 169 heterozygous, making a ratio of one to two, which agrees with the calculated ratio.

I am indebted to Dr. R. R. Hyde for material and helpful suggestions.

TABLE III.

P_1. Scarlet Female by Wild Male. Results of Crossing Wild Type F_2 Female Flies to Scarlet Males.

Culture Number.	Wild Type, Females.	Wild Type, Males.	Scarlet, Females.	Scarlet, Males.
1	8	9	6	9
2	17	8		
3	17	15	13	15
4	24	31	19	16
5	21	17	25	17
6	17	8		
7	31	22	13	30
8	31	22	28	14
9	43	19	22	41
10†				
11	83	82		
12	102	94		
13	10	6		
14	28	14	12	20
15	27	36	35	40
16	52	38	37	30
17	19	9	15	8
18	48	33	30	35
19	23	21	19	26
20	78	76		
21	18	15	13	18
22	14	16	16	11
23	15	17	8	15
24	37+	37+	28+	28+
25	25	22	16	11
26	62	63		
27	37	30		
28	46	48		
29	61	69		
30	7	15		
31	30	35		
32	44	40	18	27
33	24	16	14	22
34	40	49	32	38
35	38	38	43	31
36	78	79		
37	30	22	20	29
38	58	35	30	29
39	34	32	39	39
40	26	31	24	34
41	39	33	23	27
42	78+	78+		
43	20	18	16	10
44	44+	44+	40+	40+
45	23+	23+	11+	11+
46	23+	23+	25+	25+
47	38+	38+	35+	35+
48	24+	24+	21+	21+
49	75+	75+		
50	19	19		
51	10+	10+		

TABLE III—Continued.

Culture Number.	Wild Type, Females.	Wild Type, Males.	Scarlet, Females.	Scarlet, Males.
52	46+	46+	...	...
53	37+	37+	27+	27+
54	12	10	8	7
55	25	19	27	15
56	6	5	3	8
57	16	13	13	16
58	67	55	...	...
59	17	17	17	22
60	18	20	25	21
61	23	18	16	18
62	8	4	3	8
63	33	33	...	...
64	12	13	...	...
65	5	2	2	...
66	4	3	2	3
67	7	5	8	5
68	19	13	...	...
69	89	90	...	...
70	56	56	...	...
71	73	65	...	...
72	18+	26+	18+	26+
73	42	28	28	15
74	23	31	19	21
75	24	22	17	25
76	63	63	...	...
77	27	33	40	25
78	29	25	27	15
79	49	57	...	...
80	29	34	23	35
81	43	39	44	35
82	20	23	24	15

Total: 27 homozygous and 55 heterozygous.
†Heterozygous.

TABLE IV.

P_1 Scarlet Females by Wild Males. Results of Crossing Wild Type F_2 Males to Scarlet Females.

Culture Number.	Wild Type, Females.	Wild Type, Males.	Scarlet, Females.	Scarlet, Males.
1	2	4	2	4
2	13	4	9	4
3	17	3	12	3
4	24	25	10	6
5	14	23	17	14
6	52	41	30	50
7	64	64	...	...
8	52	40	18	16
9	34	36	34	29
10	17	34	39	55
11	20	27	25	20
12	56	40	53	60
13	28	34	27	26
14	22	28	18	14
15	39	58	61	51
16	63	39	100	63
17	30	25	33	34
18	40	53	19	21
19	28	30	28	22

TABLE IV—Continued.

Culture Number.	Wild Type, Females.	Wild Type, Males.	Scarlet, Females.	Scarlet, Males.
20	86	92	...	...
21	136	149	...	...
22	24	42	31	22
23	94	105	...	...
24	24	37	...	...
25	20	19	20	21
26	23	31	19	24
27	24	29	32	40
28	36	31	40	43
29	85	123	43	46
30	46	34	41	45
31	43	38	33	34
32	54	40	39	55
33	55	71	28	39
34	77+	77+	...	...
35	20	15	16	21
36	45	45	41	47
37	63	23	23	26
38	55	14	20	24
39	47	57	59	37
40	134	107	...	...
41	27	32	21	26
42	52+	52+	55	47
43	102	95	...	...
44	20	22	35	26
45	120	91	...	...
46	22	19	21	22
47	120+	120+	...	...
48	26	22	19	24
49	93	96	...	...
50	43	37	32	32
51	62	52	...	...
52†	...	...	...	...
53	83	71	...	...
54	53	36	...	...
55	55	55	41	43
56	24	29	22	21
57	52+	52+	35+	35+
58	46+	46+	50+	50+
59	42	43	25	22
60	41	44	30	51
61	38+	38+	26+	26+
62	6	7	...	...
63	15	7	9	7
64	7	19	2	14
65	9	8	8	13
66	29	30	13	14
67	21	24	23	11
68	23	12	10	5
69	39	11	...	...
70†	...	...	...	...
71	26	25	20	9
72	27	29	16	14
73	40	23	...	...
74	20	15	13	10
75	9	6	5	5
76	5	7	8	14
77	18	23	...	...

Total: 18 proved homozygous and 59 heterozygous.

†Noted as heterozygous, but no count made.

TABLE V.

P_1 Scarlet Male by Wild Female. Result of Crossing Wild Type F_2 Male to Scarlet Female.

Culture Number.	Wild Type, Females.	Wild Type, Males.	Scarlet, Females.	Scarlet, Males.
1	50	52		
2	61	49	44	49
3	74	63		
4	5	10	6	5
5	27	10	20	12
6	26	28		
7	86	65		
8	93	83		
9	21	15		
10	34	30	40	43
11	19	14	16	15
12	11	10	13	12
13	45	53	33	40
14	42	48	54	54
15	46	49	37	41
16	29	21		
17	14	15		
18	28+	28+		
19	51	36	34	32
20	61	47		
21	2	9	12	11
22	17	19		
23	17	11		
24	87	88		
25	22	28	20	25
26	16	10	10	11
27	37	27	31	28
28	45	36		
29	31	38	31	27
30	38	26	26	31
31	20	16	19	21
32	78	70		
33	42	51		
34	34	46	39	38
35	84	72		
36†				
37	20	23	13	22
38	7	8	65+	65+
39	46	68	38	30
40	70	74		
41	31	35	32	41
42	38	23	21	12
43	10	6	5	5
44	32	41	17	28
45	3	4	6	4
46	10	12	18	6
47	30	7	19	10
48	23	20	22	18
49	7	3	6	3
50	3	2	8	4
51	60	66		
52	84+	84+		
53	24	21		
54	27	25	28	20
55	21	20	21	19
56	11	12		
57	14	11	10	9
58	5	1	2	5
59	14	5	6	4
60	25	34		
61	15+	15+	16+	16+
62	10	8		
63	15	13		
64	5	2	2	3

Total: 25 homozygous and 39 heterozygous.

†Noted as heterozygous, but no accurate count made.

TABLE VI.

P_1 Scarlet Male by Wild Female. Results of Crossing Wild Type F_2 Female to Scarlet Male.

Culture Number.	Wild Type, Females.	Wild Type, Males.	Scarlet, Females.	Scarlet, Males.
1	89	89	.....	.....
2	49	48	23	36
3	51	50	.....	.....
4	111+	111+	.....	.....
5	25	20	15	14
6	45	40	62	50
7	88	75	.....	.....
8	10	17	.....	.....
9	31	31	17	26
10	71	79	.....	.....
11	49	46	.....	.....
12	54	56	.....	.....
13	19	29	21	24
14	71	75	25	17
15	12	14	.....	.....
16	50	41	.....	.....
17	17	22	27	19
18	53	50	.....	.....
19	28	34	37	29
20	50	39	46	41
21	7	13	4	6
22	19	19	14	21
23	13	23	.....	.....
24	29	30	23	18
25	35	36	.....	.....
26	56	52	20	31
27	68	40	.....	.....
28†	.....	.....	.....	.....
29	30	31	21	26
30	26	24	21	23

Total: 14 homozygous and 16 heterozygous.

†Noted as heterozygous, but no accurate count made.