STUDIES IN *DOLICHOS LABLAB* (ROXB.) AND (L.) THE INDIAN FIELD AND GARDEN BEAN—IV

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Received April 4, 1941

Seed Coat Colour Patterns

IN Part II* of these studies it has been recorded that there are four seed coat colours in *lablab* namely black, chocolate, khaki and buff, and that in black, chocolate and khaki, the colour may be manifested over the whole of the seed coat or be localised, the buff colour always existing in *wholeness*. It was noted that a basic factor K is necessary for the production of the colours black, chocolate and khaki and by itself this factor K produces the *Micropylar colour*. A factor B_f produces the buff seed coat colour and is capable of converting the *Micropylar colour* into a *Whole colour*. These two factors K and B_f are absolutely linked. In Part III† it was stated that in the seed coat colours black, chocolate and khaki, several kinds of localisations could exist as distinct heritable types. The present paper deals with the description and inheritance of these seed coat colour patterns.

There are five patterns representing different stages in the manifestation of pigment on the seed coat, from a mere spot on the micropyle to very nearly covering the entire seed coat. In these patterns the background colour is white and another colour which forms the pattern is distributed over this background colour symmetrically about the hilum (Fig. 1). In dealing with these patterns the factors inducing the patterns are alone discussed. The genes for a particular pattern being present they could manifest themselves in any of the three colours black, chocolate or khaki. Since it was found that all the five patterns could exist in each of the three seed coat colours black, chocolate or khaki, in the data presented, distinctions

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* Rangaswami Ayyangar, G. N., and K. Kunhi Krishnan Nambiar, *Proc. Ind. Acad. Sci.*, 1935, **2**, 74.

† Rangaswami Ayyangar, G. N., *et al.*, *Ibid.*, 1936, **4**, 411.

between these three colours have been omitted. The five patterns are described below:—

1. *Micropylar colour.*—In this pattern the colour starts as a spot on the micropyle, edges both sides of the raphe, joining again at the caruncle. From the caruncle there is a spur of colour ending in a fork. Below this fork there is an area of dotted colour which is broader towards the fork.

2. *Caruncular patch.*—When the caruncular spot and the forked spur get accentuated in colour, it results in the next pattern designated "*Caruncular patch*". In this pattern there is a patch of colour concentrated round about the caruncle. Below this patch there is an area of dotted colour as in the *Micropylar colour* pattern.

3. *Dorsal patch.*—In this pattern there is a patch of colour over the dorsal half of the seed which starts from the caruncle and proceeding towards the micropylar area stops short of it. There is a clear white area along the raphe.

4. *Marbled.*—In this the whole seed coat is interspersed with white and coloured irregular patches.

5. *Eye.*—Here the whole of the seed coat is coloured except an eye-shaped patch just around the micropyle. This white patch may sometimes extend upwards along the raphe.

The interaction of the following five factors produces the different seed coat patterns described above.

(1) *Factor* K.—This is the basic factor for the production of the colours black, chocolate and khaki on any part of the seed coat. By itself, this factor produces colour at the micropylar and caruncular zones.

(2) *Factor* C_p.—With the factor K, this produces a patch of colour over the caruncle resulting in the pattern *Caruncular patch.*

(3) *Factor* D_p.—With the factors K and C_p, this factor produces the *Dorsal patch* pattern. D_p has visible effect only in the presence of C_p.

(4) *Factor* M.—With the factors K and C_p, this factor produces the *Marbled* pattern. M also has visible effect only in the presence of C_p.

When all these three factors C_p, D_p and M are present along with the basic colour factor K, we get the next pattern, the *Eye.*

(5) *Factor* B_f.—Factor for *Whole colour*. By itself this factor produces a buff seed coat. In conjunction with the factors for any of the patterns B_f produces a *Whole colour*.

The interrelationships of these five seed coat colour patterns were studied by making suitable crosses. These are summarised and presented in the following pages, to illustrate their genetic behaviour.

In a cross between a *Micropylar colour* type and the *Caruncular patch*, the F_1 was the *Caruncular patch*. In the F_2 this segregated into *Caruncular patch* and *Micropylar colour* in the ratio of 3 : 1. A factor C_p in the presence of the factor K (*Micropylar colour* factor) gives rise to the pattern *Caruncular patch* (*vide* Table I).

TABLE I

Pure for K

Micropylar colour (c_pc_p) × *Caruncular patch* (C_pC_p)

F_1—*Caruncular patch* (C_pc_p)

F_2 Family No.	Caruncular patch	Micropylar colour
D.L. 1570	47	15
,, 1572	7	4
,, 1573	24	9
,, 1575	27	11
Total ..	105	39
Expected, 3 : 1 ratio ..	108	36

$P > 0 \cdot 5$

In a cross of another *Micropylar colour* type with the *Caruncular patch*, the F_1 obtained was the pattern *Dorsal patch*. In the F_2 this segregated into *Dorsal patch*, *Caruncular patch* and *Micropylar colour* in the ratio of 9 : 3 : 4. A factor D_p acting with C_p and K gives the pattern *Dorsal patch*. This factor is operative only in the presence of C_p. It has no visible effect with c_p (*vide* Table II).

TABLE II

Pure for K

Micropylar colour (c_p c_p d_p d_p) × *Dorsal patch* (C_pC_p D_pD_p)

F_1—*Dorsal patch* (C_pc_p D_pd_p)

F_2 Family No.	Dorsal patch	Caruncular patch	Micropylar colour
D.L. 1524	47	17	22
„ 1525	46	16	18
„ 1526	37	10	14
„ 1527	24	8	11
„ 1529	49	19	26
„ 1530	18	8	12
„ 1532	27	9	11
Total ..	248	87	114
Expected, 9 : 3 : 4 ratio ..	252·54	84·18	112·24

$P > 0{\cdot}5$

Simple segregations for *Dorsal patch*: *Caruncular patch* and *Dorsal patch*: *Micropylar colour* are given in Tables III and IV.

TABLE III

Pure for K *and* C_p

Caruncular patch (d_pd_p) × *Dorasl patch* (D_pD_p)

F_1—*Dorsal patch* (D_pd_p)

F_2 Family No.	Dorsal patch	Caruncular patch
D.L. 1281	54	18
„ 1282	109	33
„ 1283	227	63
„ 1284	104	38
Total ..	494	152
Expected, 3 : 1 ratio ..	484·50	161·50

$P > 0{\cdot}3$

TABLE IV

Pure for K *and* D_p

Micropylar colour (c_pc_p) × *Dorsal patch* (C_pC_p)

F_1—*Dorsal patch* (C_pc_p)

F_2 Family No.	Dorsal patch	Micropylar colour
D.L. 1085	156	47
,, 1086	141	48
,, 1111	262	78
,, 1112	156	61
Total ..	715	234
Expected, 3 : 1 ratio ..	711·75	237·25

P > 0·8

A factor M with the co-operation of the factors K and C_p produces the *Marbled* pattern (*vide* Table V).

TABLE V

Pure for K, C_p *and* d_p

Caruncular patch (mm) × *Marbled* (MM)

F_1—*Marbled* (Mm)

F_2 Family No.	Marbled	Caruncular patch
D.L. 1280	91	28
,, 1305	134	53
,, 1306	222	61
,, 1307	205	63
Total ..	652	205
Expected, 3 : 1 ratio ..	642·75	214·25

P > 0·3

The factor M has no visible effect except in the presence of C_p. With c_p only the *Micropylar colour* pattern is produced (*vide* Table VI).

TABLE VI

Pure for K, d_p *and* M

Micropylar colour ($c_p c_p$) × *Marbled* ($C_p C_p$)

F_1—*Marbled* ($C_p c_p$)

F_2 Family No.	Marbled	Micropylar colour
D.L. 1295	55	20
„ 1296	98	29
„ 1297	85	20
„ 1298	73	24
Total ..	311	93
Expected, 3 : 1 ratio ..	303	101

$P > 0 \cdot 3$

A recessive *Micropylar colour* pattern of the constitution KK $c_p c_p$, $d_p d_p$ MM from one of the above families (D.L. 1298) was crossed with a *Caruncular patch* and produced the *Marbled* pattern in the F_1.

When a *Dorsal patch* was crossed with a *Marbled,* the *Eye* pattern was obtained in the F_1. In the F_2 this segregated into *Eye, Dorsal patch Marbled* and *Caruncular patch* in the ratio of 9 : 3 : 3 : 1. Thus, factors D_p and M in the presence of K and C_p give the *Eye* pattern (*vide* Table VII).

TABLE VII

Pure for K *and* C_p

Dorsal patch ($D_p D_p$ mm) × *Marbled* ($d_p d_p$ MM)

F_1—*Eye* ($D_p d_p$ Mm)

F_2 Family No.	Eye	Marbled	Dorsal patch	Caruncular patch
D.L. 1083	477	155	134	49
„ 1277	43	12	14	4
Total ..	520	167	148	53
Expected, 9 : 3 : 3 : 1 ratio ..	499·5	166·5	166·5	55·5

Simple segregations of *Eye*: *Marbled* and *Eye*: *Dorsal patch* are given in Tables VIII and IX.

TABLE VIII

Pure for K, C_p *and* M

Marbled (d_pd_p) × *Eye* (D_pD_p)

F_1—*Eye* (D_pd_p)

F_2 Family No.	Eye	Marbled
D.L. 868	15	4
,, 896	10	4
,, 897	21	5
,, 1272	86	26
,, 1273	19	4
,, 1276	107	35
,, 1278	139	45
,, 1293	98	35
Total ..	495	158
Expected, 3 : 1 ratio ..	489·75	163·25

$P > 0 \cdot 5$

TABLE IX

Pure for K, C_p *and* D_p

Dorsal patch (mm) × *Eye* (MM)

F_1—*Eye* (Mm)

F_2 Family No.	Eye	Dorsal patch
D.L. 1087	196	56
,, 1088	174	58
,, 1113	194	60
,, 1114	163	58
Total ..	727	232
Expected, 3 : 1 ratio ..	719·25	239·75

$P > 0 \cdot 5$

The factors D_p and M are both inoperative without C_p (*vide* Table X). Thus C_p is essential for the production of the patterns *Eye*, *Marbled*, *Dorsal patch* and *Caruncular patch*.

TABLE X
Pure for K, D_p *and* M
Micropylar colour (c_pc_p) × *Eye* (C_pC_p)
F_1—*Eye* (C_pc_p)

F_2 Family No.	Eye	Micropylar colour
D.L. 1109	343	111
,, 1285	81	25
,, 1289	58	20
Total ..	482	156
Expected, 3:1 ratio ..	478·5	159·5

$P > 0·7$

It was shown that when a *Micropylar colour* pattern is crossed with a *Buff*, a *Whole colour* is produced in the F_1, and this segregates in the F_2 into *Whole*: *Micropylar colour*: *Buff* in a 2:1:1 ratio (due to the absolute linkage between the factors Kb_f and kB_f). It will be seen from Tables XI–XIV that the B_f factor is capable of extending each one of the other patterns into a *Whole colour*. When any of these is crossed with the *Buff* a *Whole colour* is produced in the F_1, which segregates in the F_2 into *Whole colour*, *pattern* and *Buff* in a 2:1:1 ratio.

TABLE XI
Pure for C_p, D_p *and* m
Dorsal patch (KK b_fb_f) × *Buff* (kk B_fB_f)
F_1—*Whole colour* (Kk B_fb_f)

F_2 Family No.	Whole colour	Dorsal patch	Buff
D.L. 1299	38	18	11
,, 1302	111	57	58
,, 1346	16	6	11
,, 1347	45	23	20
,, 1349	20	7	6
,, 1350	41	20	20
Total ..	271	131	126
Expected, 2:1:1 ratio ..	264	132	132

$P > 0·3$

TABLE XII

Pure for C_p, d_p *and* M

Marbled (KK $b_f b_f$) × *Buff* (kk $B_f B_f$)

F_1—*Whole colour* (Kk $B_f b_f$)

F_2 Family No.	Whole colour	Marbled	Buff
D.L. 890	6	3	4
Expected, 2 : 1 : 1 ratio ..	6·50	3·25	3·25

$P > 0{\cdot}3$

TABLE XIII

Pure for C_p, D_p *and* M

Eye (KK $b_f b_f$) × *Buff* (kk $B_f B_f$)

F_1—*Whole colour* (Kk $B_f b_f$)

F_2 Family No.	Whole colour	Eye	Buff
D.L. 895	25	12	12
,, 1317	27	16	15
,, 1319	106	52	49
,, 1377	19	10	7
,, 1378	15	8	7
Total ..	192	98	90
Expected, 2 : 1 : 1 ratio ..	190	95	95

$P > 0{\cdot}8$

TABLE XIV

Pure for C_p, d_p *and* m

Caruncular patch (KK $b_f b_f$) × *Buff* (kk $B_f B_f$)

F_1—*Whole colour* (Kk $B_f b_f$)

Note.—The F_2 of the above cross was unfortunately not grown.

In the preceding segregations the *Whole colour* had the genetic constitution Kk $B_f b_f$ and hence was always heterozygous. When the *Whole colour* has the constitution KK $B_f B_f$ it breeds true for wholeness of colour.

In the various patterns the factor B_f is absent. When the factor B_f is introduced, these patterns get converted into a *Whole colour*. In the F_2 these segregate for the B_f factor alone thereby giving rise to 3 : 1 segregation of *Whole colour*: *pattern*. Such segregations are given in Tables XV–XVIII.

TABLE XV

Pure for K, C_p, d_p *and* m

Caruncular patch ($b_f b_f$) × *Whole colour* ($B_f b_f$)

F_1—*Whole colour* ($B_f b_f$)

F_2 Family No.	Whole colour	Caruncular patch
D.L. 1363	140	46
„ 1370	43	15
„ 1460	37	10
„ 1461	32	13
Total ..	252	84
Expected, 3 : 1 ratio ..	252	84

TABLE XVI

Pure for K, C_p, D_p *and* m

Dorsal patch ($b_f b_f$) × *Whole colour* ($B_f B_f$)

F_1—*Whole colour* ($B_f b_f$)

F_2 Family No.	Whole colour	Dorsal patch
D.L. 1116	191	66
„ 1117	143	39
„ 1118	88	30
„ 1120	182	58
„ 1457	36	12
„ 1459	32	11
Total ..	672	216
Expected, 3 : 1 ratio ..	666	222

$P > 0{\cdot}50$

TABLE XVII

Pure for K, C_p, d_p *and* M

Marbled (b_fb_f) × *Whole colour* (B_fB_f)

F_1—*Whole colour* (B_fb_f)

F_2 Family No.	Whole colour	Marbled
D.L. 1482	82	23
„ 1485	103	41
„ 1488	75	34
„ 1493	55	13
Total ..	315	111
Expected, 3 : 1 ratio ..	319·50	106·50

$P > 0{\cdot}5$

TABLE XVIII

Pure for K, C_p, D_p *and* M

Eye (b_fb_f) × *Whole colour* (B_fB_f)

F_1—*Whole colour* (B_fb_f)

F_2 Family No.	Whole colour	Eye
D.L. 693	51	24
„ 1455	105	38
„ 1486	70	17
„ 1491	50	17
„ 1513	106	34
„ 1515	87	31
„ 1516	174	56
Total ..	643	217
Expected, 3 : 1 ratio ..	645	215

$P > 0{\cdot}8$

The following families segregate for the factors D_p and B_f, the factors K, C_p and M being pure. In this case segregations of *Whole colour*: *Eye*: *Marbled* in the ratio of 12:3:1 are obtained (*vide* Table XIX).

TABLE XIX

Pure for K, C_p *and* M

Marbled ($d_p d_p b_f b_f$) × *Whole colour* ($D_p D_p B_f B_f$)

F_1—*Whole colour* ($D_p d_p B_f b_f$)

F_2 Family No.	Whole colour	Eye	Marbled
D.L. 1436	407	102	37
„ 1483	64	15	4
„ 1486	51	17	7
„ 1487	44	13	3
Total ..	566	147	51
Expected, 12:3:1 ratio ..	573·00	143·25	47·75

$P > 0 \cdot 8$

In the following families segregations for the factors D_p and B_f occur, the factors K, C_p and m being pure. Here also a ratio of 12:3:1 is obtained between *Whole colour*, *Dorsal patch* and *Caruncular patch* (*vide* Table XX).

TABLE XX

Pure for K, C_p *and* m

Caruncular patch ($d_p d_p b_f b_f$) × *Whole colour* ($D_p D_p B_f B_f$)

F_1— *Whole colour* ($D_p d_p B_f b_f$)

F_2 Family No.	Whole colour	Dorsal patch	Caruncular patch
D.L. 1304	156	33	8
„ 1314	356	86	36
„ 1315	45	12	2
„ 1508	124	32	8
„ 1509	37	8	5
Total ..	718	171	59
Expected, 12:3:1 ratio ..	711·00	177·75	59·25

$P > 0 \cdot 8$

The following families segregate for the factors C_p and D_p, the factors K, M and b_f being pure. A 9:3:4 ratio of *Eye*: *Marbled*: *Micropylar colour* is obtained (*vide* Table XXI).

TABLE XXI

Pure for K, M *and* b_f

Micropylar colour (c_pc_p D_pD_p) × *Marbled* (C_pC_p d_pd_p)

F_1—*Eye* (C_pc_p D_pd_p)

F_2 Family No.	Eye	Marbled	Micropylar colour
D.L. 1290	98	42	47
,, 1291	135	30	50
,, 1292	121	39	47
,, 1294	66	25	33
Total ..	420	136	177
Expected, 9:3:4 ratio ..	412·29	137·43	183·24

$P > 0{\cdot}7$

From the data presented it will be seen that in the seed coat colour patterns the following genotypes are possible.

Micropylar colour ..	KK c_pc_p d_pd_p mm b_fb_f
	KK c_pc_p D_pD_p mm b_fb_f
	KK c_pc_p d_pd_p MM b_fb_f
	KK c_pc_p D_pD_p MM b_fb_f
Caruncular patch ..	KK C_pC_p d_pd_p mm b_fb_f
Dorsal patch ..	KK C_pC_p D_pD_p mm b_fb_f
Marbled ..	KK C_pC_p d_pd_p MM b_fb_f
Eye ..	KK C_pC_p D_pD_p MM b_fb_f
Whole colour ..	KK c_pc_p d_pd_p mm B_fB_f
	KK C_pC_p d_pd_p mm B_fB_f
	KK c_pc_p D_pD_p mm B_fB_f
	KK c_pc_p d_pd_p MM B_fB_f
	KK C_pC_p D_pD_p mm B_fB_f
	KK C_pC_p d_pd_p MM B_fB_f
	KK c_pc_p D_pD_p MM B_fB_f
	KK C_pC_p D_pD_p MM B_fB_f

Speckling

The patterns so far considered consist of localisations of a single colour over different regions of the seed coat. There is another kind of pattern in which the colour is broken up into a number of specks over a background colour of khaki (Fig. 2). This phenomenon has been termed *Speckling*. *Speckling* can exist both in the *Whole colour* and in all the five patterns mentioned before. In these patterns the *Speckling* is confined to the area normally pigmented in them, the rest of the area remaining white. Black and chocolate *Speckling* have been met with, the background colour in both being khaki. Khaki *Speckling* is not met with probably because when it occurs it is indistinguishable from the background colour which is also khaki.

From the experiences presented below it may be assumed that a factor S_p produces the solid colour. Its allelomorph s_p is responsible for *Speckling*. S_p has visible effect only in the presence of the factors for the chocolate and black seed coat colours.

In the following families segregations between *Whole colour* and *Speckled whole colour* occur. These represent the segregations for the factor S_p, the factors K and B_f being pure (*vide* Table XXII).

TABLE XXII

Pure for K *and* B_f

Speckled whole colour (s_ps_p) × *Whole colour* (S_pS_p)

F_1—*Whole colour* (S_ps_p)

F_2 Family No.	Whole colour	Speckled whole colour	
D.L. 1321	111	43	In black seed coat
,, 1322	150	42	do.
,, 1323	88	27	do.
,, 1324	68	24	do.
,, 1325	103	32	do.
Total ..	520	168	
Expected, 3 : 1 ratio ..	516·00	172·00	

$P > 0{\cdot}7$

The following families segregate for the factor S_p, factors K, C_p, D_p and m being pure. Simple segregations of *Dorsal patch* to *Speckled Dorsal patch* occur in this case (*vide* Table XXIII).

TABLE XXIII

Pure for K, C_p, D_p *and* m

Speckled Dorsal patch ($s_p s_p$) × *Dorsal patch* ($S_p S_p$)

F_1—*Dorsal patch* ($S_p s_p$)

F_2 Family No.	Dorsal patch	Speckled Dorsal patch	
D.L. 1354	51	21	In black seed coat
,, 1355	18	10	do.
Total ..	69	31	
Expected, 3 : 1 ratio ..	75	25	

$P > 0 \cdot 1$

The following families segregate for the factors S_p and B_f, the factors K, C_p, D_p and m being pure (*vide* Table XXIV).

TABLE XXIV

Pure for K, C_p, D_p *and* m

Dorsal patch ($S_p S_p$ $b_f b_f$) × *Speckled Whole colour* ($s_p s_p$ $B_f B_f$)

F_1—*Whole colour* ($S_p s_p$ $B_f b_f$)

F_2 Family No.	Whole colour	Speckled Whole colour	Dorsal patch	Speckled Dorsal patch	
D.L. 1308	81	20	29	9	In black seed coat
,, 1309	97	21	30	19	do.
,, 1310	155	50	52	18	do.
Total ..	333	91	111	46	
Expected, 9 : 3 : 3 : 1 ratio	326·79	108·93	108·93	36·31	

$P > 0 \cdot 1$

The following families segregate for the factors S_p, D_p and B_f, the factors K, C_p and m being pure (*vide* Table XXV).

TABLE XXV

Pure for K, C_p *and* m

Caruncular patch (S_pS_p d_pd_p b_fb_f) × *Speckled Whole colour* (s_ps_p D_pD_p B_fB_f)

F_1—*Whole colour* (S_ps_p D_pd_p B_fb_f)

F_2 Family No.	Whole colour	Speckled Whole colour	Dorsal patch	Speckled Dorsal patch	Caruncular patch	Speckled Caruncular patch	
D.L. 1448	187	41	37	10	12	2	In black seed coat
,, 1449	107	33	16	6	6	1	do.
,, 1450	90	33	13	6	12	1	do.
,, 1451	133	64	33	14	16	5	do.
Total ..	517	171	99	36	46	9	
Expected, 36:12:9:3:3:1 ratio ..	493·92	164·64	123·48	41·16	41·16	13·72	

$P > 0 \cdot 1$

In the following families segregations for the factors S_p and B_f occur in the seed coat colours black (KK PP C_hC_h) and chocolate (KK pp C_hC_h) resulting in a 27 : 9 : 9 : 9 : 3 : 3 : 3 : 1 ratio as shown below (*vide* Table XXVI).

TABLE XXVI

Pure for C_h, K, C_p, D_p *and* M

Black Eye (PP S_pS_p b_fb_f) × *Chocolate Speckled Whole colour* (pp s_ps_p B_fB_f)

F_1—*Black Whole colour* (Pp S_ps_p B_fb_f)

F_2 Family No.	WHOLE COLOUR		EYE		SPECKLED WHOLE COLOUR		SPECKLED EYE	
	Black	Chocolate	Black	Chocolate	Black	Chocolate	Black	Chocolate
D.L. 1517	23	7	5	2	4	1	..	1
,, 1518	32	4	10	2	15	1	5	1
,, 1519	41	16	12	2	10	3	4	2
,, 1520	30	11	9	7	7	3	1	2
,, 1521	40	17	16	7	20	2	7	..
,, 1522	20	6	5	3	3	3	2	..
,, 1523	32	7	11	3	8	2	2	..
Total ..	218	68	68	26	67	15	21	6
Expected, 27:9:9:3:9:3:3:1 ratio ..	206·31	68·77	68·77	22·92	68·77	22·92	22·92	7·64

The following family segregates for the factors S_p and B_f in conjunction with segregations for the seed coat colours black (KK PP C_hC_h) and khaki (KK PP c_hc_h). It was not possible to distinguish *Speckling* in the khaki seed coat colour. The numbers obtained agree with the theoretical expectation if we assume that khaki *Speckling* cannot be made out from khaki solid colour.

TABLE XXVII

Pure for K *and* P

Black Speckled Whole colour (C_hC_h s_ps_p B_fB_f) × *Khaki micropylar colour* (c_hc_h S_pS_p b_fb_f)

F_1—*Black Whole colour* (C_hc_h S_ps_p B_fb_f)

F_2 Family No.	BLACK				KHAKI	
	Whole colour	Speckled Whole colour	Micropylar colour	Speckled Micropylar colour	Whole colour	Micropylar colour
D.L. 1430 ..	33	7	10	2	14	5
Expected, 27:9:9:3:12:4 ratio ..	29·94	9·98	9·98	3·33	13·31	4·44

$P > 0{\cdot}8$

When a buff was crossed with the *Speckled Whole* seed coat, a solid *Whole colour* was produced in the F_1. In the F_2, this segregated into *Whole*, *Speckled Whole* and *Buff* in the ratio of 9 : 3 : 4 (*vide* Table XXVIII).

TABLE XXVIII

Pure for B_f, P *and* C_h

Black Speckled Whole colour (KK s_ps_p) × *Buff* (kk S_pS_p)

F_1—*Black Whole colour* (Kk S_ps_p)

F_2 Family No.	Black Whole colour	Black Speckled Whole colour	Buff
D.L. 1442	117	51	54
,, 1498	32	11	16
,, 1499	32	11	14
Total ..	181	73	84
Expected, 9 : 3 : 4 ratio ..	190·13	63·38	85·50

$P > 0{\cdot}3$

From one of the above families (D.L. 1442), selections of *Buff* and *Speckled Whole colour* were carried forward to the next generation. All the *Buffs* bred true while some of the *Speckled Whole colour* selections segregated according to expectation into *Speckled Whole colour* and *Buff* in a 3 : 1 ratio (*vide* Table XXIX).

TABLE XXIX

Pure for P, C_h, B_f *and* s_p

Buff (kk × *Black Speckled Whole colour* (KK)

F_1—*Black Speckled Whole colour* (Kk)

F_2 Family No.	Black Speckled Whole colour	Buff
D.L. 1500	31	9
,, 1503	32	9
,, 1558	20	5
,, 1559	28	9
,, 1560	21	8
Total ..	132	40
Expected, 3 : 1 ratio ..	129	43

$P > 0 \cdot 5$

The factor s_p has thus no visible effect on the buff seed coat also.

Summary

1. In the seed coat colours black, chocolate and khaki, five heritable types of localisations are met with namely, the *Micropylar colour*, the *Caruncular patch*, the *Dorsal patch*, the *Marbled* and the *Eye* patterns.

2. These patterns arise by the interaction of the five factors K, C_p, D_p, M and B_f. By itself, the factor K produces the *Micropylar colour*. K being present, the association of one or more of three factors C_p, D_p and M, produces the various patterns. Thus, with the C_p factor the pattern *Caruncular patch* is produced. In the presence of K and C_p, the factor D_p produces the *Dorsal patch* while the factor M produces the *Marbled* pattern. The combined presence of K, C_p, D_p and M results in the *Eye* pattern.

3. The factor B_f which by itself produces a buff seed coat is capable of converting any of the above patterns into a *Whole colour*. Factors K and B_f are absolutely linked.

4. A factor S_p produces the smooth and even distribution of colour over the seed coat. Its allelomorph s_p is responsible for *Speckling*. Thus with K and B_f, S_p produces a solid *Whole colour*, while s_p results in the *Speckled Whole colour*. The factors K, b_f, and s_p are necessary for the production of each of the *Speckled patterns*. *Speckling* can manifest itself in only two colours black and chocolate and is not perceptible when it occurs on a khaki or buff background.