

and 8 were cockerels. Furthermore, our pedigree records show that these varicolored offspring did not necessarily come from the same parents, but that in many instances the same parent in the same hatch produced one or more of all the above combinations of color. Not one of the 12 Plymouth Rock parents throughout the hatching season gave a uniformly colored progeny. This color variation existed among the birds of both sexes. The barred plumage was lighter than standard, and although the bars were distinct, the light bars between the darker ones were somewhat grayish in color so that a slaty effect was given to the whole.

The Leghorn with the white and the Plymouth Rock with the red ear lobe afforded another combination of characters. The white predominated in both crosses, the average amount in the ear lobe of the Plymouth Rock-on-Leghorn progeny being 75 per cent, while of the Leghorn-on-Plymouth Rock progeny it was only 66 per cent.

This crossing of fowls which produce different-colored eggs resulted in every instance, except one, in progeny that laid light-brown eggs. The color was a blending of the white and the dark-brown colors. One pullet, the exception, from the Plymouth Rock-on-Leghorn cross, has laid white instead of pigmented eggs.

The check pens produced purebreds in every instance.

The data taken on these observations strongly indicate an influence of the direction of the cross in cross-breeding White Leghorns and Barred Plymouth Rocks. The influence of the male is upon (1) size of the eggs; (2) size of the day-old chick; (3) nature of the feathering of the chick; (4) size of the offspring; (5) shape of the offspring; and (6) the style of feathering and furnishings of the offspring. The influence of the female is exerted on the less apparent characters: (1) on the rapidity of development and rate of maturing; and (2) on the prolificacy.

COLOR INHERITANCE IN THE PETUNIA.

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Petunias are common flowering plants that are chiefly grown for the variety of color which the different ones show. We find a great many color combinations in this group of plants. The study of such colors and their inheritance ought naturally to make a very

interesting and, as I have found, very instructive work. It is also a line which, so far as I am aware, has not been touched by theoretical plant breeders, although practical breeders have done much toward improving the petunia color, as well as improving other qualities of the plant.

If we examine different kinds of petunia flowers, we will find that certain ones have pure colors. By that, I mean they have only a single color which is quite uniformly distributed over the various parts of the flower. In other flowers we will observe that the color of one portion of the flower may be quite different and distinct from that of another. For instance, the pollen of one flower may be very dark, the bell (which is the name I give to the expanded portion of the flower) of the same flower may be white, the tube yellowish, and the veins of a fourth color. In some cases, I have noticed what seemed to be a correlation in the color of one part of the flower with the color of the other parts. But in general, although I have not yet completed my results along this line, I believe, in most of the flowers, the color of the different portions is distinct. In a detailed color study, each one of these color areas of the petunia must be considered. However, as my space is limited I will mention a few things regarding color studies that I have made with the bell portion of the flowers, which, in so far as the general appearance of the flower is concerned, is by far the most important part.

In studying heredity, it is always necessary to deal with pure types, and so with the petunia, although I have made various crosses of different colored flowers, yet I have mainly confined my work to reds (or, more exactly, violet-reds) and whites, as these seem to be more nearly pure petunia types. I have crossed the various reds and whites. The plants resulting have been inbred and a portion of their progeny also inbred, so that I now have records on third generation plants from eight different lines of red and white crosses; three where the white was the mother parent and five where the red was used as the mother parent. In any particular generation of crosses, I have found some variation between certain lines due to peculiar inherent tendencies in seemingly-similar plants. But in general results were the same where either the red or white was used as the mother parent.

In F_1 , when I crossed violet-reds and whites, I obtained an intermediate purple-purple red. Color was present in all of the offspring, but none of them, although I had over 600 F_1 plants, exhibited ex-

actly the violet-red color of the parent. There was some variation in the intensity of color in the plants, but some of the parent red color seemed to have been lost, as all of them had more of a noticeable purplish cast than the parent type.

I selected out from this F_1 lot of plants several which were very dark in color and also some of the lightest ones. These different plants were again carefully inbred, and from the resulting seeds which were planted I obtained 700 F_2 plants. These showed a noticeable variation, but again I was unable to find any having the purple-red parental color, although some were as light as the original white type. These plants of F_2 could be separated into three classes: (1) Dark colored ones, like darkest plants of F_1 ; (2) intermediate plants—color resembling lighter colored plants of F_1 ; and (3) whites.

Classifying my F_2 results, I found the following:

The lighter colored plants of F_1 produced—			The darker colored plants of F_1 produced—		
Dark.	Intermediate.	White.	Dark.	Intermediate.	White.
30	26	14	34	21	14
17	25	14	37	30	20
..	7	2	8	4	6
9	..	2	28	13	13
—	—	—	4	2	3
56	58	32	25	18	13
114			136	88	69
			224		

We at once see in the results a very noticeable variation in the ratio of the different plants, and in a few where we have a small number of plants we find only two types present. One thing worth noting in the results is the ratio of colored plants to white ones, the ratios being about the same in both dark and light inbred plants.

Typical plants were selected from these three F_2 types for inbreeding. Their progeny, which numbered 700 plants, might be summarized as follows:

Results from selecting white colored plants—			Results from selecting intermediate plants—			Results from dark col- ored plants of F_2 —		
Dark.	Intermediate.	White.	Dark.	Intermediate.	White.	Dark.	Intermediate.	White.
	17	6	28	17	15	9	28	1
	35	28	12	42	10	26	27	12
No dark	28	30	8	5	1	27	25	5
ones ap-	13	12	9	23	17	42	18	1
peared.	32	17	10	8	40	—	—	—
	18	40	—	—	—	104	98	18
	—	—	67	95	83	202		
	143	133	162					

In looking over these F_3 results, we notice that the white plants of F_2 did not produce any very dark offspring, as we might well expect, although they produced whites and intermediates in about equal numbers. The dark-colored plants and intermediate-colored plants of F_2 produced all three types again in F_3 , but the darker ones produced a greater percentage of dark-colored offspring and fewer light-colored plants than the intermediates.

Some of my results obtained, such as the above, are readily understood, but some others are rather complex and cannot be interpreted at present. But such complexities lend interest to the work, and I hope in the near future to be able to interpret some of these results which at present are rather vague.