A GENETIC AND CYTOLOGICAL STUDY OF CERTAIN TYPES OF ALBINISM IN MAIZE.

By FRANK C. MILES,
United States Department of Agriculture, Washington, D.C.

Previous Investigations.

It has long been noted that white seedlings, and variegated ones as well, occasionally occur among many of our common plants, but only in recent years has any systematic study of the problem been made.

Baur (1, 2) in 1907 (later, in 1908) reported his study of the yellow-leaved type of Antirrhinum and Pelargonium. The yellow plants are not capable of assimilating carbon dioxide, and consequently they cannot live. This type of plant can exist only as a hybrid with a green race. The hybrid is an intensive yellow or "Aurea-Farbe," and in the second generation one-fourth of the plants are pure green which breed true in succeeding generations, two-fourths are of the "Aurea" type which segregate again in the next generation, and one-fourth are pure yellow plants which theoretically should breed true, a test, however, being impossible because the yellow plants always die in the seedling stage.

In 1909 Correns (6) reported examples of what has been called the "chlorina" type of plants in Mirabilis jalapa and in Urtica pilifera. Baur (3) later reported the same type in Antirrhinum. In these cases the colour stuff (including the xanthophyll and carotin as well as the chlorophyllin) seems to be reduced in intensity, and also appears to be diminished in quantity. In inheritance this "chlorina" character behaved as a simple Mendelian recessive.

In the same paper (6) Correns also reported a peculiar manner of inheritance of leaf colour in Mirabilis jalapa. He states that the leaves of the plants are irregularly spotted with yellowish white, a
Albinism in Maize

condition which he terms "albomaculata." Occasionally there may appear a plant which is either wholly green or wholly white.

Anatomically it appears that this variegation is due to the fact that in the whitish areas of the leaf the chromatophores are not green, but are more or less bleached. The boundary between the green portion and the white portion of a leaf is not sharp and distinct, but is gradual; the cells on the boundary may contain pale-green chromatophores, and even in the same cell the intensity of colour of the different chromatophores may vary. A pure green branch remains so, and one which is pure white remains white.

Seed from one of the green branches produces green seedlings which in further generations breed true. Seed from white branches produce white seedlings which soon die because of their inability to perform photosynthetic processes. Seed from a variegated branch produces some seedlings which are yellowish-white, some which are green, and some which are spotted or variegated.

In crosses Correns found that this variegated condition was inherited only through the mother. When a flower on a white branch was pollinated with pollen from a normal green plant, only white seedlings were produced. And in the reciprocal cross, when a flower on a green branch was pollinated with pollen from a flower of a white branch of the variegated plant, only green seedlings were produced. But the seedlings were known to be hybrids because of the behaviour of other characters, e.g., colour of the flowers. These green hybrids bred true to the green character in succeeding generations, while the other characters behaved as ordinary hybrids.

Baur (4) believes that in Primula sinensis he has a case analogous to that described by Correns in Mirabilis, but at the time of his publication he had not fully investigated it.

Soon after the account of Correns concerning the case of non-Mendelian inheritance in Mirabilis, Baur (5) described another peculiar form of non-Mendelian inheritance in Pelargonium sonale. Among these plants there sometimes occur bud sports which are fully white. Seeds from the flowers on a white branch produce pure white seedlings. Also the white-leaved form remains constant if grafted upon a green plant.

Reciprocal crosses between this white-leaved form and a constant green form gave seedlings which had a mosaic design of green and white. Baur makes it apparent that in the $F_1$ there was a vegetative segregation, the plants being composed of green and white mosaic areas.