

## FLOWER VARIATION IN ZINNIA

BY

CHARLOTTE J. GRANT

*University of Illinois, Urbana*

During an experimental investigation on the development of *Zinnia* under three soil moisture ranges—wet, moist and dry—certain flower variations were observed.

According to catalog description the Red Riding Hood variety of *Zinnia* possesses double flower heads with scarlet rays. This description should certainly apply to the terminal head of the main stem, and according to reported observations to branch flowers as well. In twenty-three greenhouse plants of this variety none showed scarlet rays in the axial head (at the top of main stem), and only two plants gave consistent orange color in all the flowers developed on one plant. In all other plants, different flower heads had different colors although never more than one color to a particular flower head. As many as four different colors have been found among the flowers of a single plant. Fourteen colors have thus far been found on the twenty-three plants.

Microscopic examination of frechand sections of the rays showed a distribution of color in the following manner: orange or yellow chromoplasts in the upper papillose epidermis, red pigment dissolved in cell sap, present in varying amounts or entirely lacking in the upper epidermal cells; chloroplasts abundant or few in the mesophyll. Thus, yellows with a greenish cast were due to an abundance of chloroplasts in the mesophyll. Scarlet ray color results from a combination of red sap (apparently dilute spectrum red) with orange chromoplasts. Apparently the influence of the chromoplasts is less than might be expected. The various shades of orange depend upon abundance of chromoplasts in the upper epidermis and chloroplasts in the mesophyll.

Some variation in doubling was apparent and in six heads disc flowers were wholly lacking. But excluding from consideration these variations one is puzzled to account for the presence of differently colored flowers on a single plant. Is this an inherent variation involving genetic differences originating in the buds which produce the several axillary branches with their terminal flower heads? Can it result from the rather peculiar environmental conditions? Can it be an expression of difference in carbohydrate nutrition for the several branches on a plant? Or can it be a combination of several of suggested influences?

The lack of uniformity in color of heads on the same plant, and among plants of the same environmental series together with absence of correlation between sequence of development of heads on one plant with change in color are indications of inherent variation within the individual plants. On the other hand the frequency of color variation is many times higher than is characteristic for somatic mutations.

The soil used, a sandy loam of pH 5.3 was found low in phosphates and nitrates. This might be considered a possible environmental influence on flower color. But if soil conditions are unfavorable to normal color development why should not all the flower heads of a plant develop alike?