IS THE BLUE REGION OF THE SPECTRUM NECESSARY FOR CHLOROPLAST PIGMENT FORMATION IN THE BEAN PLANT

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In previous experiments (Rohrbaugh 1944) it was observed that bean plants grown under light sources which emitted little or no radiation in the blue and violet regions of the spectrum failed to develop chloroplast pigments in those leaves which developed after the first or second trifoliate leaves. The primary leaves and first trifoliate leaves seemed to be normally pigmented, but the later leaves appeared to be entirely lacking in chlorophyll and carotinoid pigments. Such leaves are white when viewed in ordinary daylight. The occurrence of chlorosis in leaves of plants irradiated mainly with the longer waves of the visible spectrum has been reported by Popp (1926), Johnston (1932, 1938), and Shirley (1929). Johnston (1938) believed that this chlorosis was in part due to the near-infrared irradiation. He reported that this condition was largely prevented if ammonium sulphate was added to the culture solution.

An experiment was designed to determine whether certain forms of nitrogen compounds would result in more normal pigment development in plants irradiated with light of longer wavelengths but without irradiation in the blue or violet region. Red-kidney-bean (*Phaseolus vulgaris*) plants were grown in quartz sand under a battery of pink fluorescent lamps equipped with a gelatin filter dyed with orange G. The preparation of the filter and the quality of the radiation emitted from such a light source was described by Rohrbaugh (1942). The plants were watered with complete mineral solutions which differed in the form of nitrogen added. Sodium nitrate, ammonium chloride, and urea were used singly and in different combinations.

All of the plants developed normal primary leaves. Pigmentation occurred in some but not all of the first trifoliate leaves. Many of the second trifoliate leaves, and nearly all of the third and fourth trifoliate leaves failed to develop pigment. The different forms of nitrogen did not appear to have any effect on pigment formation in these plants.

About one month after the emergence of the seedlings, some of the primary leaves began to wither and die. At the same time it was noticed that some new trifoliate leaves appeared and developed apparently normal pigmentation. Some of these new leaves formed from the terminal bud, but most of them developed from axillary buds. In no case were these new leaves observed to be green except on plants whose primary leaves had begun to disintegrate.

These experiments suggest that irradiation with light from the blue or violet regions of the spectrum may be necessary for the continued production

of the plastid pigments in bean plants. Such irradiation may not be necessary if certain substances which may be present in the seed are available. Thus seedlings grown in the absence of light from the blue end of the spectrum are able to develop normally pigmented leaves until such substances become depleted. After these substances are used, no further pigmentation occurs in the absence of such irradiation. It also seems quite possible that similar substances may be translocated out of the old primary leaves at the time of their degeneration and moved to new growing points where they may be used in the formation of more pigments in the young leaves.

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