Acta Biologica Szeged 17 (1—4), pp. 119—122 (1971)

CHANGE IN THE PIGMENT CONTENT OF AUTUMN WHEAT 1201 FROM BÁNKÚT

ANNA B. GARAI, I. ROJIK and MÁRIA HORVÁTH

Genetic Group, Attila József University, Szeged

(Received June 10, 1970)

Introduction

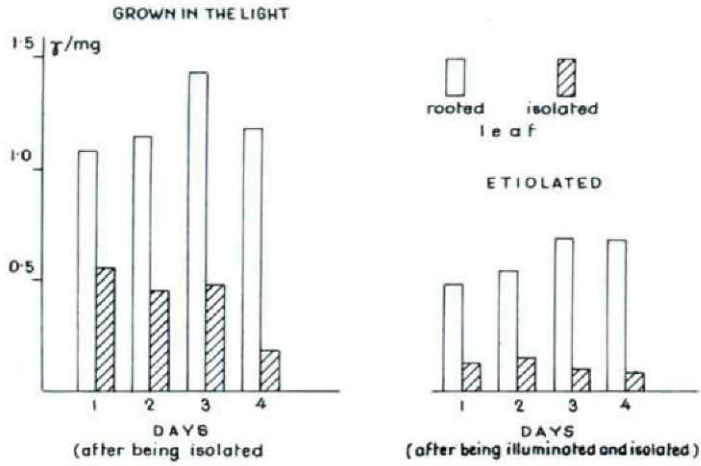
The quantity of the pigment components of wheat seedlings is in correlation with the length of the daily illumination. According to WOLF's experiments (1964), chlorophyll-a and -b content reached its highest value at a 20-hour long photoperiod, but at a 22-, 24-hour illumination it slowly decreased. A lighting of shorter time (eight hours) changed the ratio of chlorophyll-a and -b. At an illumination of six hours, the quantity of chlorophyll decreased to 80 per cent. In etiolated plants, the ratio of the quantities of chlodophylls and carotenes changes rapidly on even a short lighting period. In addition to the quantitative increase of the chlorophyll components, the increase of protein content may also be demonstrated (SMITH, 1963; GODNEV, KAHNOVICS, 1961). The quantity of pigment components is influenced in various ways by the quality of light. In plants grown in red light the accumulation of green and later of yellow pigments is more pronounced. As a result of blue light, initially the accumulation of green pigments increases more parallel with it the protein-, total nitrogen- and ascorbic acid-content of leaves. The amount of chlorophyll-a and -b depends upon the quality and intensity of light. As a result of white light, chlorophyll-b nearly reaches the amount of chlorophyll-a, while irradiated with red and infrared, the level of chlorophyll-b falls comparatively behind the chlorophyll-a component. The increase of the amount of chlorophyll-b is stimulated by a short flash of light and strong light intensity (KAHNOVICS, 1963; AUGUSTINUSSEN, MADSEN, 1965).

The autumn wheat 1201 from Bánkút was grown etiolated and with light in an artificial plantgrowing device (HORVÁTH, LASZTITY, 1965). The experiment was performed with seven days old plants. With rooted control (etiolated and grown in light) we observed, taken as a function of time, the change after removing the root, the influence of red and blue foils and, at green plants, the effect of darkness on the pigment components. The pigment determinations were carried out according to the method of KOSKI (1951), improved by FRENCH (1960).

Experimental results and discussion

In the first leaf of an isolated wheat seedling grown in light the amount of pigments is after a time reduced, which is in connection with the protein

decomposition. After the root is removed, the hydrolysis of proteins takes place very rapidly, and parallel with this the amount of the chlorophyll-a pigment component decreases. In etiolated, isolated and intact wheat seedlings as a consequence of illumination the amount of chlorophyll increases for a time but later on it decreases rapidly. In rooted etiolated plants, as a result of the continuous illumination, chlorophyll-a and -b and carotene accumulate unhindered.



Graph 1. Change in the quantity of chlorophyl-a in case of an intact and isolated wheat seedling of 7 days (reconing γ/mg).

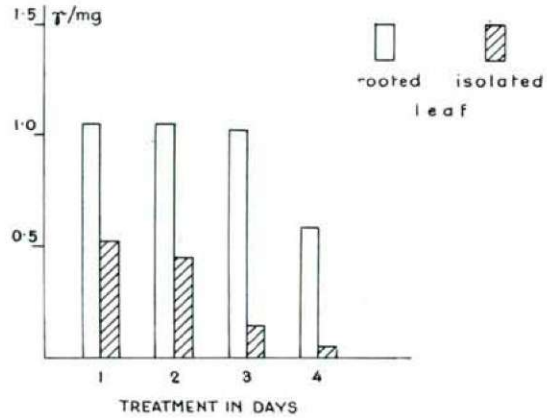
In graph 1 the change of chlorophyll-a is emphasized both in intact and isolated wheat seedlings grown in light and in rooted and isolated wheat seedlings exposed to an etiolated illumination. After removing the roots, from the pigment components chlorophyll-a is decreasing the most expressedly and, after being illuminated, this is the component which accumulates. In the detached leaves the decrease of the amount of chlorophyll-a shows some parallelism with the protein hydrolysis starting very quickly (HORVÁTH, LASZTITY, 1966; 1967).

As we put the isolated and intact wheat seedlings, grown in the light, into the dark, we saw at the rooted plants that they do not suffer a loss quickly while having a supply of nutriment, or carbohydrate. The etiolation of their leaves is much slower than that of detached ones. The latter ones perish very fast.

In graph 2 we stress the quantitative change of the chlorophyll-a component.

The graph shows that the chlorophyll-a content of the green rooted plants remains on the same level in the dark for three days and on the fourth day it decreases almost by half. In detached leaves, the effect even of a single dark day shows a decrease of about 50 per cent as compared to the rooted plants, and on the fourth day, the chlorophyll-a content can be demonstrated only in traces.

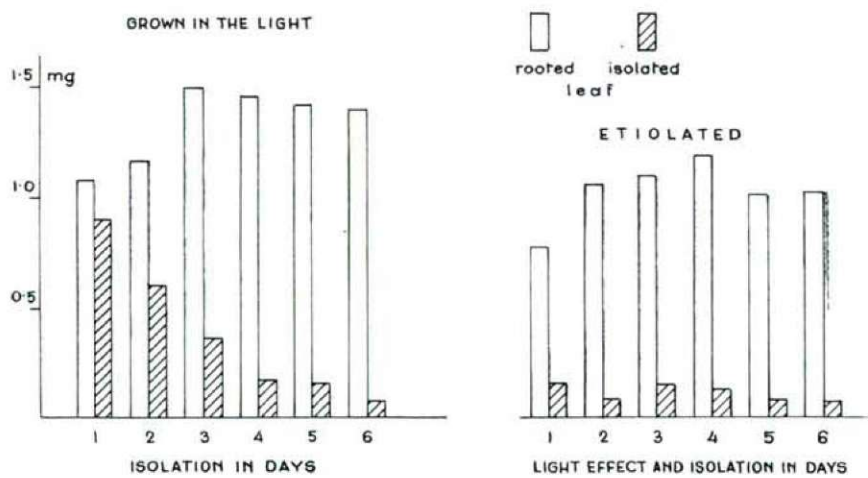
We have observed the change in pigment components of rooted and detached plants, grown in the light and etiolated, as a result of red and blue



Graph 2. Change in the chlorophyl-a content of an intact and isolated wheat seedling treated in the dark (Isolated on day 7, reckoning γ/mg).

foils, taken as a function of time. The covering with red foil caused an increase of the green pigment amount of rooted plants. The influence of red light was connected with a more intensive cell-division and pigment augmentation. The effect of blue foil is similar in case of yellow pigments. In the detached leaves, the destruction was similarly shown in the course of time. The change in chlorophyll-a is demonstrated in graph 3, as a result of red foils in rooted and detached wheat leaves, grown in the light and in etiolated rooted and detached ones.

In green rooted plants, the accumulation of chlorophyll-a can be observed while the growth of leaves by cell-division endures, and in the third day we



Graph 3. Effect of red foil on the change in chlorophyl-a of an intact and isolated wheat seedling. (Isolated on day 7, reckoning γ/mg).

obtain a very high value as a result of red light. Later on, the amount is comparatively decreased by the growth through lengthening. In the detached leaves, the decrease of chlorophyll-a component is starting more slowly, on the sixth day it hardly yields a measurable value.

In the etiolated rooted plants the accumulation of the chlorophyll-a amount is of similar rate but fewer nutrients being available than at the green rooted plants, it can be found in a smaller amount. In the detached etiolated leaves the destruction is very fast.

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Address of the authors:
ANNA B. GARAI
Dr. I. ROJIK
DR. MÁRIA HORVÁTH
Genetic Group, A. J. University,
Szeged, Hungary