INFLUENCE OF ETHYLENE AND SOME DEFOLIANTS ON THE DYNAMICS OF THE CHANGE IN THE PROTEIN SPECTRUM IN COTTON PLANT SHOOTS

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The main trigger of the biochemical processes leading to leaf fall is ethylene. In leaves subjected to exposure to ethylene, together with the overall decrease in the amount of protein, the activity of a whole series of enzymes rises, both through transition to an active state of enzymes already present in the cells and through the formation of new ones [1, 2].

To investigate the molecular rearrangements responsible for the structural changes in an individual zone of the cotton plant, we have studied the change in the protein spectrum under the influence of ethylene and some defoliants — Dropp, butifos, khinozapin.

In the experiments we used three-day and two-week shoots from a cotton plant of the Andizhan variety. The cotton seeds were treated with concentrated sulfuric acid, steeped for 24 h, and germinated between moist sheets of filter paper at 27°C for two days. To obtain the two-week shoots, three-day shoots were grown in vessels with water under illumination for 10 days. The three-day and two-week shoots were placed in hermetically sealed glass chambers with a volume of 5 liters containing ethylene in a concentration of 9 mmole/liter. Control plants were incubated in chambers without ethylene. The time of exposure was three days at 25°C. The shoots were homogenized in 0.1 M Tris-HCl buffer, pH 7.5. The homogenate was filtered through coarse calico and centrifuged at 18,000 rpm for 30 min. The deposit was discarded. To precipitate the protein in the supernatant, ammonium sulfate was added to a concentration of 70%. The precipitate was separated off by centrifugation, dissolved in the initial buffer, and dialyzed against water. The protein fractions obtained were freeze-dried and were analyzed by electrophoresis [3].

As can be seen from Fig. 1, under the action of ethylene new polypeptides, as compared with the control, appeared in the three-day shoots, with M 17, 25, and 50 kDa.

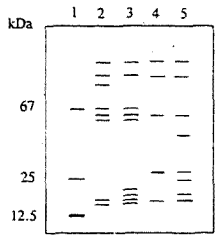

Fig. 1

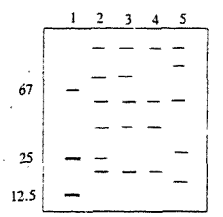

Fig. 2

Fig. 1. Electrophoretogram of the protein fractions of cotton plant shoots: *1*) markers; *2*) three-day shoots; *3*) three-day shoots with ethylene; *4*) two-week shoots; *5*) two-week shoots with ethylene.

Fig. 2. Electrophoretogram of the protein fractions from two-week cotton plant shoots: *1*) markers; *2*) shoots with Dropp; *3*) shoots with khinozapin; *4*) shoots with butifos; *5*) control.

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In parallel, we carried out the treatment of the two-day cotton plant shoots with Dropp, butifos, and khinozapin. The defoliants were applied to the surface of the plants by continuous spraying. The protein fractions were isolated after three days, and electrophoresis was carried out as before. After the treatment of the cotton plant shoots with the defoliants, the electrophoretogram showed the appearance of new polypeptides with M 17, 25, 50, and 70 kDa and the disappearance of polypeptides with M 75 and 80 kDa (Fig. 2).

Thus, it may be assumed that the influence of ethylene and defoliants on cotton plant shoots is associated partially with a change in the expression of the same genes. At the same time, the disappearance of polypeptides detected in the control is in agreement with literature reports on an intensification of the hydrolytic breakdown of proteins [4]. Attention is attracted by the similarity of the change in the protein spectrum on the treatment of cotton plant shoots with defoliants having different chemical structures.

Analysis of the results that we have obtained permits the assumption that the proteins formed in the cotton plant in response the action of ethylene and defoliants participate in the process of ageing and leaf fall.

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