Acta Biologica Szeged *18* (1—4), pp. 131—133 (1972)

THE EFFECT OF THE SODIUM SALT OF 2,4-DICHLORO-PHENOXYACETIC ACID ON THE MITOCIC GROWTH OF YELLOW CORN

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(Received November 29, 1971)

Introduction

Dikonirt, the sodium salt of 2,4—dichlorophenoxyacetic acid, investigated by us, is a herbicide used for weeding first of all the cereals, mainly wheat, rye and autumn barley, to a lesser extent yellow corn, that exerts its effect on dicotyledons but is pernicious in a higher concentration even to monocotyledons. We have felt an impulse therefore to investigate the behaviour of yellow corn towards Dikonirt. Wuu and GRANT (1966a) demonstrated chromosome aberrations induced by pesticides and herbicides at the mitosis of the barley-root tip in the second generation after the treatment. He treated the barley seedlings with a (herbicide) solution 500 p. p. m. Lorox and an abnormal meiosis was demontsrated in the pollen metrocytes with cytologic investigations (WUU, GRANT, 1966b). The post-emergent

Dikonirt treatment is of deleterious effect in a higher concentration on mitosis resp. growth of horse-beans *(Vicia faba)* and peas. The cause of deleterious effect is the retardation of root growth (ROJIK, H. MÉSZÁROS, LONTAI, 1969). Changes were demonstrated in the mitotic division of *Allium cepa* as a result of 2,4-dichlorophenoxyacetic acid by CROKER (1953).

Materials and Methods

Our experimental plant was yellow corn MV 530. The first part of the experiments consisted of field experimentation in two repetitions. The Dikonirt used for the treatment was ingested into the soil mixed with river sand simultaneously with sowing. We have applied two kinds of treatment: with 1,25 g Dikonirt/sq. m and 20 g Dikonirt/sq. m. Beside the plots treadted there were control of similar extent. We have observed the time of shooting and growing, as well as the time of tasselling.

In our laboratory experiments we have treated the crop from field experimentation preemergently with various Dikonirt solutions (0,105 p. c., 0,067 p. c. and 0,027 p. c.). The seeds were caused to germinate at 23°C, made wet with Dikonirt solution but the controls only with running tap water. The root tips were stained with carmineacetic acid after Carnoy's fixation. The experiments were repeated three to five times. The Tables are demonstrating the results of one repetition.

Results and their discussion

The control sown in the field experimentation, and the 1,25 g Dikonirt/sq. m — treated yellow corn, shot up three days after being sown. At the treatment with 20 g Dikonirt/sq. 2 the seeds became brown, damped off. In these plots,

four veeks from the first sowing, we carried out a second sowing that gave a good germination, showing no impairment at all. The plants treated with lower concentration grew slower, in some leaves twisting could be observed. In their age with two-three leaves, they have shown some backwardness in growth as compared to the control. We have got on with investigating the crop ingatherred and divided into three groups. In one of them, the crop of control ws yellow corn, in the second one that of the yellow corn treated, while in the third one it was the crop of the yellow corn from the second growing. In all the three groups we have investigated the cell-division of the root tip of the first-generation treated seeds germinated for three days on tap-water filter-paper, as well as the mitosis after being treated with 0,105 p. c. Dikonirt (Table 1).

Table 1. Development of mitosis in seeds after Dikonirt effect (first generation) and after a retreatment for three days

Variants	Number of investigated	Cells dividing	Percentage of mitosis	Number of cells matephase	Metaphase in the percentage of mitosis
1. Control	9347	4090	43	180	4.40
2. Seeds germinated in tap water and treated with 1,25 g Dikonirt/sq. m	7080	3062	43,2	118	3,85
3. Seeds germinated in tap water and treated with 20 g Dikonirt/sq. m	6330	2717	43	109	4,05
1. Control germinated in 0,105 p. c. Dikonirt solution	5770	1982	34	23	1,16
2. Seeds germinated in 0,105 p. c. Dikonirt solution and treated with 1,25 g Dikonirt/ sq. m.	5650	1905	33	24	1,25
3. Seeds germinated in 0,105 p. c. Dikonirt solution and treated with 20 g Dikonirt/ sq. m	*5620	1900	33	26	1,36

* Seeds coming from re-sowing

The cell-division of the root tip of the yellow corn untreated was compared to that treated with 0,027 p. c. and 0,067 p. c. Dikonirt, as they were five to six days old. The results are summed up here in Tables (Table 2).

The data of Table 1 and 2 are showing unequivocally the effect of Dikonirt on the growing by mitosis, on the basis of data obtained in the third, fifth and sixth days of germination. The percentile decrease in division, as compared to the control, and under the concentrations applied, is shown well. It could be observed as a result of treatment that the cells became of smaller size, the plasma is granulous, chromosome ruptures can be seen. Investigating the pollen meiosis, the chromosome anomalies are more frequent in case of the treated plants.

Table 2. Mitosis in seedlings of five to six days old yellow corn treated with Dikonirt of different concentration

	Age of plant in days	Number of the cells investigated	Percentage of mitosis			
			Prophase	Metaphase	Anaphase	Total mitosis
Control	5	6026	48,86	1,17	1,12	51,70
Treated with a 0,067 p. c. solution	5	6781	24,17	0,54	0,52	25,24
Treated with a 0,027 p. c. solution	5	4247	35,60	0,94	0,72	37,27
Control	6	6142	49,39	1,53	1,28	52,11
Treated with a 0,067 p. c. solution	6	6999	24,91	0,57	0,44	26,07
Treated with a 0,027 p. c. solution	6	3995	25,85	1,00	0,70	27,56

Summary

It is shown by our results that a treatment with preemergent Dikonirt has some effect on the growth of yellow corn by mitosis. At the field experiments and germination, the growth of the treated plants is slower, expressed well with the decrease in mitosis.

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