# MODIFICATION OF THE IRRADIATION EFFECT IN BARLEY PLANTS DURING THE VEGETATION PERIOD

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ABSTRACT

Vegetation pot experiments with spring barley, cultivar *Obzor* were carried out. The plants were grown under controlled conditions and in the phase of "*stem extension*" were irradiated with Cs-137 gamma rays at a dose of 5 Gy and dose intensity of 2 Gy/min.
On the day following the irradiation the plants were sprayed with synthetic growth regulators for the purpose of reducing the irradiation damage. Two types of protectors were tested: *4-Chlorophenoxyacetic acid* and *Phloroglucinol* – in concentration of $10^{-3}$ M. The degree of the irradiation damage and protection was recorded at the end of the vegetation period following some productivity indexes. The coefficient of protection of the applied modifiers was also determined.
It was established that in case of irradiation of spring barley with a dose of 5 Gy in the phase of stem extension, the reproductive organs were strongly damaged, which led to a considerable reduction of plant productivity.
The application of growth regulators after the irradiation improves to a different degree some of observed indexes, as a result of which the plant productivity is increased about 18% after treated with *4-Chlorophenoxyacetic acid.*

## INTRODUCTION

In case of increased environmental radioactivity a necessity arises for urgent evaluation of the radiation situation and on time implementation of protective activities. This imposes availability of preliminary data for varieties depending radiosensitivity of plants as well as looking for possibilities to reduce losses from irradiation. It is determined that radioprotective abilities of plant can be increased and losses of plant production decreased with the help of chemical substances applied before or after irradiation (M. Aliev, 1983; D.M. Grodzinskij, I.N. Gudkov, 1972).

The study aims survey of possibilities for modification of radiation damage with the help of growing regulators after irradiation of barley during vegetation.

## MATERIAL AND METHODS

Vegetation pot experiments with spring barley, cultivar *Obzor* were carried out. The experiments were done on Fluvisols/FAO soil in vegetative pots of 5 kg under controlled conditions. After the seeds sprout 15 normally grown plants were left in each pot. Irradiation was done in the most sensitive to radiation phase in cereal ontogenesis "*stem extension*" at a dose of 5 Gy and dose intensity of 2 Gy/min. On the day following the irradiation the plants were treated with two synthetic growth regulators: *4-Chlorophenoxyacetic acid (P-1)* and *Phloroglucinol* (P-2) – in a concentration of $10^{-3}$ M aiming modification of the radiation damage. The following variants were set: control, plants irradiated with a dose of 5 Gy in the phase of stem extension, irradiated plants treated afterwards with *4-Chlorophenoxyacetic acid*, irradiated plants treated afterwards with *Phloroglucinol,* plants treated with *4-Chlorophenoxyacetic acid* и *Phloroglucinol* only.

Plants were grown to phase of full ripeness. The influence of radiation and the tested modifiers was checked on different characteristics forming plant productivity – plant survival, sterility, height of plants, total tiller, average number and weight of the grains per one plant. The protection coefficient of the applied growth regulators ($K_3$) was determined also (Grodzinskij, Gudkov, 1973).

The experiments were carried out in 3 repetitions.

## RESULTS AND DISCUSSION

The obtained results show that acute gamma-irradiation with a dose of 5 Gy in the most radio-sensitive phase of ontogenesis strongly reduces the tested characteristics forming productivity.

The irradiation suppresses growth, thus decreasing the height of the irradiated plants. Some authors (Hillman, 1961) associate the suppressing of vegetation with the suppressing of aucsines synthesis and other physiologically active growth substances but according to others (Medvedev, 1970) the reason is accumulation of abnormal metabolites and inhibitors of growth. Stimulation of tiller for the irradiated variants compared to the control is observed. The survival index is not influenced by the irradiation because of the late phase in which irradiation was done and fading of growth processes. 100% outlasted plants are reported 23, 81% of which sterile. The number and weight of grains obtained average per plant decrease with 42.52% and 34.03% respectively compared to

the unirradiated control. The productivity of the irradiated plants strongly decreases – with 43,74% compared to the control.
The considerable reduction of barley productivity due to radiation is an evidence for strong suppression of the meiotic processes and injury of the generative organs during influence at this phase of ontogenesis. The results obtained correspond to the research of Grodzinski D.M. 1989, that in plant ontogenesis the stages of morphogenesis associated with the formation of generative organs characterize with lowest radioresistence.
The results show, that the application of *Phloroglucinol* has insignificant influence on the indices associated with productivity.

The growth regulator studied does not stimulate the tiller of the irradiated plants. The percentage of sterile plants decreases insignificantly – with about 2% for those treated with the radiomodificator. The average number of grains per plant increases with 17.45%, while the weight of the grains obtained increases with just about 6,25%. This impacts also on the productivity of the plants restored which increases with only 6% compared to the irradiated and untreated variants.
The treatment of plants with *4-Chlorophenoxyacetic acid* after irradiation insignificantly affects the height of the irradiated variants. The tiller is not stimulated and the average number of the grains obtained increases with 14,4%. The average weight of grains per plant increases with 18,4% compared to the variant without treatment. The sterility reduces with about 5%. As a result the plant productivity increases with about 18%. A relatively high protection coefficient – 1,36 is recorded in this variant as well.
The results obtained by us confirm the statement that the modifying effect of different substances causing decrease of damaging effect of radiation is strongest during the period of reduced radioresistance of plants, when the potential abilities for protection and recovery are to the greatest extend manifested / Grodzinskij, D.M 1973; Aliev I.M.1983/.
The following conclusions can be done regarding the results of our research on radiosensitivity of spring barley cultivar *Obzor* and growth regulators studied for reduction of irradiation damage:
1 Irradiation of spring barley with a dose of 5 Gy in the phase of "*stem extension*" strongly damages the reproductive organs, which causes considerable reduction of plant productivity.
2. The treatment after irradiation with the growth regulators studied improves to a different extent of some yield indices like sterility, number and weight of the grains obtained. Therefore the productivity increases with 18% after treatment with *4-Chlorophenoxyacetic acid.*

Application of *4-Chlorophenoxyacetic acid* considerably influences the productivity of the irradiated plants and therefore its use in the practice for irradiated sowing can be recommended.

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## SOME THERMOPHYSICAL CHARACTERISTICS OF MILK AND MILK PRODUCTS

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This article deals with thermophysical characteristics of milk and milk products. If we want to protect quality of food we need to know its physical properties. One of the most important are thermophysical parameters as temperature, thermal conductivity and thermal diffusivity. For thermophysical parameters measurements was used PS method and also Hot Wire method. In the first series of measurements we measured relations between thermal conductivity and thermal diffusivity in temperature range (5–25) C for milk. In the second series of measurement was measured relation between thermal conductivity and relative fat content for milk. There were also measured some thermophysical parameters of cheese, processed cheese and acidophilus milk. The results of measurements for milk samples showed that temperature stabilisation process and relative fat content have influence to variation of thermophysical parameters. All measured relations for milk samples during temperature stabilisation have linear increasing progress – fig. 2-3. Figure 4 shows that