

EFFECT OF ELECTRON IRRADIATION OF BARLEY SEEDS ON ENZYMATIC ACTIVITY AND DEVELOPMENT OF SPROUTS

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Under extreme conditions, the most important mechanism of resistance is the activation of a multi-level biochemical system of antioxidant protection, which includes a large number of components. Among them, a special place is occupied by antioxidant enzymes as a component of the cell signaling system.

In laboratory experiments, the effect of pre-sowing irradiation of barley seeds with low-energy electronic radiation on the activity of antioxidant enzymes, seed qualities and disease incidence of sprouts was studied.

Studies were conducted on spring barley (*Hordeum vulgare* L.) of the Vladimir variety. The seeds were irradiated in the dose range of 1 to 5 kGy at a radiation dose rate of 500 Gy/imp. According to the methodology described in the article Loy, 2019 [1]. The activity of enzymes was determined by the method described in the article Bitarishvili, 2018 [2]. In addition, morphometric indicators of the development of sprouts and the incidence of their diseases were determined.

Analysis of the data obtained showed that no statistically significant differences in enzyme activity between control and irradiation were found. However, at a dose of 5 kGy, there is a noticeable tendency to increase the activity of two enzymes - guaiacol peroxidase and ascorbate peroxidase (Table 1).

Table 1 – Activity of catalase, guaiacol peroxidase, ascorbate peroxidase in control and irradiated barley seedlings

Dose	Activity, ME					
	CAT		POX		APX	
	M	Q1; Q3	M	Q1; Q3	M	Q1; Q3
0 kGy (control)	230.849	225.172; 241.571	0150	0105; 0152	2943	2759; 3.035
1 kGy	201.835	198.051; 280.046	0.060	0.056; 0.286	3.127	2.851; 3.587
3 kGy	208.142	207.511; 219.495	0.128	0.122; 0.259	2.943	2.207; 3.127
5 kGy	208.142	203.096; 217.603	0.372	0.244; 0.389	3.127	3.035; 3.679

Note: the data is in the format "Median (Q1; Q3)».

Irradiation of seeds in doses of 1 and 5 kGy had a stimulating effect on the length of the sprout by 1.1 times and the root by 1.25 and - 1.1 times, respectively.

Electron irradiation in doses of 3 and 5 kGy completely suppressed the development of fusarium (exciter *Fusarium* spp.) on 7-day sprouts of barley, at the same time stimulated the development of helminthosporiosis (exciter *Helminthosporium sativum* Pam.) – the degree of damage increased in variants with irradiation by 1.4-2.1 times, the prevalence of the disease by 1.4-1.7 times compared with unirradiated control.

Thus, it has been shown that low-energy electron irradiation of barley seeds before sowing affects the morphometric indicators of the development of sprouts, the defeat of their fungal diseases and, at the level of tendency, the enzymatic activity.

REFERENCES

- [1] Loy N.N., Sanzharova N.I., Gulina S.N., Vorobiyov M.S., Koval N.N., Doroshkevich S.Yu., Chizh T.V., Suslova O.V. Influence of electronic irradiation on the affection of barley by root rot. IOP Conf. Series: Journal of Physics: Conf. Series **1393** (2019) 012107 doi:10.1088/1742-6596/1393/1/012107
- [2] Bitarishvili S.V., Bondarenko V.S., Geraskin S.A. Influence of γ -irradiation on the expression of genes encoding enzymes of abscisic acid metabolism in barley seed embryos // Ecological genetics. – 2018 – V. 16 – No 4 – P. 85–89.