

Statistical evaluation of the experimental data was carried out by the method of variance analysis using the computer program "Straz" (version 2.1 of the Information and Computing Center of the Russian State Agrarian University-Moscow Timiryazev Agricultural Academy, 1989-1991).

The data obtained indicate that these phytohormones have activated the grain germination process and thus can accelerate malting of barley, as well as the seedling development provided barley is grown for seeds.

However, over time, new generation of phytohormones appear [6]. Accordingly, the technologies of barley production for malting should be improved with their inclusion in order to obtain the highest yields of a particular cultivar and the best indicators of the product quality. Therefore, it is necessary to study the effectiveness of the new generation phytohormones application.

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RADIOPROTECTIVE PROPERTIES OF THE LAMIACEAE FAMILY

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Abstract: The article dwells on the analysis of the main radioprotective properties of the Lamiaceae family. It underlines the ability of *Mentha piperita*, *Coleus aromaticus*, *Origanum vulgare* to remove free radicals. Also states that oregano extract reduces the number of human lymphocyte micronuclei.

Keywords: radioprotective properties, *Mentha piperita*, *Coleus aromaticus*, *Clerodendron fortuneatum*, *Origanum vulgare*, γ -radiation, mortality, Lamiaceae, ¹³¹I.

The paper in question provides the analysis of the main radioprotective properties of the Lamiaceae family plants, namely *Mentha piperita*, *Coleus aromaticus*, *Clerodendron infortunatum* and *Origanum vulgare*.

Mentha piperita. Indian scientists, Samarth, Goyal, and Kumar have described the radioprotective properties of peppermint. The study conducted by Shimoi, Masuda, Shen, Furugori, and Kinai identified that 1 g/kg body weight of peppermint extract showed a protective effect against radiation-induced chromosome damage [1].

In their study, Samarth et al. irradiated mice with γ -radiation (from 4 to 10 Gy), while administering orally an aqueous extract of peppermint (1g per each kg of body weight), which increased the level of leukocytes, hemoglobin, erythrocytes and survival rate, in comparison with the control group [1].

Similarly, oral administration of peppermint extract (1g per each kg and 40 μ l per animal) increased serum phosphate levels. Administration of peppermint extract at 1 g/kg significantly altered the intestinal barrier. Pretreatment increased intestinal villus elevation, increased the number of mitotic cells, and reduced the number of dead cells in irradiated mice [1].

It is notable that only 17% of mice died in the menthol oil treated groups, while 100% mortality was observed in the irradiated group. Peppermint leaf extract increased the number of lymphocytes and megakaryocytes in the bone marrow [1].

Oral treatment of mice with peppermint leaf extract (1 kg/body weight) for 30 days showed normal testes and vas deferens epithelium morphology [1].

Coleus aromaticus. Satish Rao et al. reported that the leaves of the aromatic spur flower *Coleus aromaticus* have both antioxidant and radioprotective characteristics. Scientists have demonstrated that the hydroalcoholic leaf extract scavenges DPPH radicals by up to 80%. The radioprotective properties of the water-

alcohol extract of the spur flower were studied by irradiating fibroblasts (V79) of the Chinese hamster *Cricetulusgriseus* [2].

When irradiated for 1 hour, a dose of 0.5, 1, 2, and 4 Gy with gamma radiation, a significant radioprotective effect was found when cells were treated with an extract of 5 mg/ml. Researchers suggest the potential use of a water-alcohol extract of the leaves of the spur flower for chemoprophylaxis [2].

Clerodendron infortunatum. For the experimental group, the scientists used male *Swiss albino* mice aged 8-10 weeks and weighing 22-25 g. The hydroalcoholic extract was obtained from crushed *Clerodendrum* roots with the addition of 50% ethanol. An hour before irradiation, the animals were orally administered a hydroalcoholic extract of the plant. There were 10 groups of animals in total: 4 groups received 100, 200 and 300 mg/kg of extract and irradiated with 4 Gy, and 4 groups received 100, 200 and 300 mg/kg of extract and irradiated with 8 Gy. The last 2 groups were control groups. After the experiment, the mortality of animals was checked. The mice from the control groups and groups with a low dose received were killed in order to study leukocytes, splinocytes, and bone marrow cells, as well as a number of inner organs: liver, heart, kidneys, intestines and brain [3].

Researchers report that exposure to ionizing radiation causes dramatic changes in bone marrow cell count and total white blood cell count. However, with the introduction of an aqueous-alcoholic extract of *clerodendrum*, an increase in the cellular level is observed, preventing the depletion of bone marrow cells [3].

It should be mentioned that exposure to the hydroalcoholic extract significantly reduced mortality in the groups. Thus, at a dose of 8 Gy, mortality was 100% on the 17th day, while with the introduction of 300 mg/kg of *Clerodendrum* extract, 30% survival was observed after 30 days [3].

The resulting extracts contain a number of pharmaceutical compounds that have radioprotective properties. It was found that with the introduction of a water-alcohol extract of *clerodendrum*, the cellular antioxidant level is stabilized to a safe value, free radicals are released. Oral administration of an extract of *clerodendrum* to mice increased survival when receiving a lethal dose of gamma radiation [3].

Origanum vulgare. In the study, scientists studied the radioprotective properties of oregano *Origanum vulgare* by exposing human lymphocytes to the ^{131}I isotope. The blood samples were supplemented with oregano extract at a ratio of 12.5, 25, 50 and 100 mg/ml and incubated for 1 hour. Then, the samples were exposed to ^{131}I and also incubated. Then lymphocytes were cultured with a mitogenic stimulator to assess the formation of micronuclei in binuclear cells with blocked cytokinesis [4].

It turned out that the incubation of lymphocytes with ^{131}I causes additional genotoxicity, this was manifested in an increased number of micronuclei in human lymphocytes. Adding oregano extract at doses of 25, 50, and 100 mg/ml significantly reduced the frequency of micronuclei in the studied lymphocytes [4].

In each sample, 1000 binuclear cells were examined. The proportion of micronuclei in lymphocytes irradiated with ^{131}I was $12.46 \pm 1.17\%$, in the control group there were $1.03 \pm 0.2\%$ lymphocytes. The protective effect of oregano increased

proportionally with the increase in the concentration of the extract. Thus, the frequency of micronuclei encountered at doses of 12.5, 25, 50 and 100 mg/ml was $10.9 \pm 0.78\%$, $8.56 \pm 0.8\%$, $5.6 \pm 0.7\%$ and $3.73 \pm 0.35\%$ [4].

The maximum radioprotective effect and the decrease in the frequency of obtaining micronuclei were observed with the introduction of 100 mg/ml of oregano. Oregano extract has shown excellent scavenging activity against 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radicals [4].

The results of the study illustrate the protective role of oregano extract against radiation-induced genetic damage.

Oregano is an effective free radical scavenger. Lymphocytes incubated with oregano extract showed a decrease in micronucleus frequency.

In conclusion it should be underlined that the study of the radioprotective properties of the Lamiaceae family seems to be an extremely important aspect, since this information can be used in radiotherapy, radiodiagnostics, and the radiopharmaceutical industry.

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BESONDERHEITEN DES WACHSTUMS UND DER ENTWICKLUNG VON TRITITRIGIA CZIZINII TSVEL., NEUE GETREIDEARTEN

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Аннотация: Der Artikel stellt Studien zur neuen Getreideart Trititrigia vor. Es wurde ein Vergleich mit Winterweizen und Winterroggen anhand einer Reihe von