Contribution ID: **145** Type: **Oral**

THE EFFECT OF X-RAY RADIATION AND ACCELERATED ELECTRONS ON POTATO YIELD

Tuesday 2 July 2024 15:30 (15 minutes)

Chulikova N.S.1, Malyuga A.A.1, Bliznyuk U.A.2,3, Borschegovskaya P.Yu. 2,3, Ipatova V.S.2, Zubritskaya Ya.V.2, Chibisova M.S.2 , Chernyaev A.P.2,3, Yurov D.S.2, Rodin I.A.4

1Siberian Federal Scientific Centre of Agro-BioTechnologies of the Russian Academy of Sciences, Krasnoobsk, Russia
2 Lomonosov Moscow State University, Physics Department, Moscow, Russia
3Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Moscow, Russia
4 Lomonosov Moscow State University, Chemistry Department, Moscow, Russia

*E-mail: natalya-chulikova@yandex.ru

Worldwide, there is an increase in demand for the use of radiation technologies for economic purposes. They can be introduced into agriculture to accelerate the development and increase crop yields, improve product quality, and destroy pathogenic microflora[1]. The technology of pre-planting irradiation of seed tubers is based on the ability of ionizing radiation to accelerate plant growth and development, and the possibility of improving crop quality is shown [2].The values of stimulating doses (from 3 Gy to 20 Gy) for most crops, as well as conditions affecting the effectiveness of pre-sowing irradiation, have been determined [3-5].
In this study, Gala potato tubers were irradiated from two opposite sides at the electron accelerator UELR -1-25- T-001 with a maximum energy of 1 MeV and the 1BSV-23 X-ray machine with a RAD 100-10 X-ray tube equipped with a molybdenum anode. The radiation doses ranged from 5 to 30 Gy.
It was found that the treatment of planting material with accelerated electrons and X-ray radiation in doses from 5 Gy to 30 Gy affected the phenology, phytosanitary condition of the agrocenosis and, accordingly, the productivity and quality of potatoes. Irradiation with accelerated electrons at doses of 10 Gy and 15 Gy increased the yield of healthy tubers (with respect to Rhizoctonia solani Kuhn.) by 33.8-43.9%, compared with the control, and doses of 5 Gy and 15 Gy were more effective in weight equivalent, where the yield of healthy tubers was 2.5-2.8 t/ha, but did not exceed the reference value.
X-ray radiation at doses of 15 and 30 Gy increased the yield of healthy tubers (with respect to Rhizoctonia solani Kuhn.) by 27.1-35.2%, compared with the control, and doses of 5 Gy and 25 Gy were more effective in weight equivalent, where the yield of healthy tubers was 2.8-3.0 t/ha, but in the first case it was not exceeded the control value.
This research was funded by the Russian Science Foundation, grant number 22-63-00075.
Bibliography
1. Sanzharova N.I., Kozmin G.V., Bondarenko V.S. Radiatsionnyyetekhnologii v sel'skomkhozyaystve: strategiyanauchno-tekhnicheskogorazvitiya (Radiation technologies in agriculture: strategy for scientific and technical development) // Innovatikaiekspertiza. 2016, Vol. 1(16), p. 197.
2. Chulikova N et al. Electron Beam Irradiation to Control Rhizoctonia solani in Potato // Agriculture. 2023, Vol. 13(6), p. 1221.
3. Khodjaev, T. A. The effect of neutron irradiation on the germination energy and germination of wheat seeds // Young Scientist. 2014, Vol. 3 (62), p. 48–51
4. Impact of Proton Beam Irradiation on the Growth and Biochemical Indexes of Barley (Hordeum vulgare L.) Seedlings Grown under Salt Stress / L. Oprica [et al.] // Plants. –2020. –Vol. 9, № 9. –P. 1234.
5. Potato Sprout Inhibition and Tuber Quality after Post Harvest Treatment with Gamma Irradiation on Different Dates / M. Rezaee [et al.] // J. Agric. Sci. Tech. –2001. –Vol. 13. –P. 829-842.

Section

Applications of nuclear methods in science, technology, medicine and radioecology

Primary author: CHULIKOVA N.S., Чуликова (СФНЦА РАН)

Co-authors: BLIZNYUK U.A. (Lomonosov Moscow State University, Physics Department, Moscow, Russia Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Moscow, Russia); BORSCHEGOVSKAYA P.YU. (Lomonosov Moscow State University, Physics Department, Moscow, Russia Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Moscow, Russia); CHERNYAEV A.P. (Lomonosov Moscow State University, Physics Department, Moscow, Russia Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Moscow, Russia); CHIBISOVA M.S. (Lomonosov Moscow State University, Physics Department, Moscow, Russia); IPATOVA V.S. (Lomonosov Moscow State University, Physics Department, Moscow, Russia); RODIN I.A. (Lomonosov Moscow State University, Chemistry Department, Moscow, Russia); YUROV D.S. (Lomonosov Moscow State University, Physics Department, Moscow, Russia); ZUBRITSKAYA YA.V. (Lomonosov Moscow State University, Physics Department, Moscow, Russia); MALYUGA A.A., соавтор (СФНЦА РАН)

Presenter: CHULIKOVA N.S., Чуликова (СФНЦА РАН)

Session Classification: Applications of nuclear methods in science, technology, medicine and radioecology