«The glyphosate influence on cytogenetic and biochemical aspects of wheat (Triticum aestivum L) seedlings development»

E E Stupak, I G Migranova, E R Sharafieva, N N Egorova, S I Stupak and V I Nikonov
Problem statement

• Systemic herbicide glyphosate (N-(phosphonomethyl)-glycine) penetrates the untargeted plants through the root system from the soil, where it enters both immediately while processing and with the run-off waters from the neighboring fields.

• Soil particles adsorb herbicide to a significant degree, meanwhile glyphosate presence in the soil causes the decrease in the plant growth rate, leads to withering, chlorosis, higher penetrability of cell membranes in root tissues, disruption in the development of side roots.

• The aim of the present work was to study the influence of glyphosate on the bread wheat seedlings (Triticum aestivum L.) in penetrating through the root system.
• **Methods.** In the work we used the seeds of bread spring wheat of the variety “Omsk 35”. The seeds were grown in the distilled water in glyphosate solutions 100 and 50 μM thick at 25°C. Peroxidase activity in plants was identified by the rate of orthophenylenediamine oxidation. In order to determine the ratio of diene conjugates in the sample we carried out the extraction with the mixture of hexane with isopropanol. The mitotic index was calculated as the percentage of cells in different stages of mitosis to the general number of meristematic cells.

**Figure 1.** Assessment of the seeds *T. aestivum* germination 1 – normal seedlings, 2 – the growth stopped on the stage of the seedling development, 3 – no germination.

**Figure 2.** The influence of glyphosate on the seedlings *T. aestivum* development. a – root, b – coleoptile. 1 – distilled water, 2 - 50μM, 3 – 100μM.
Conclusions

- A dose-dependent decrease in the growth rate of seedlings in the presence of glyphosate was found, and even in normally developing seedlings damage to the root tips was observed. In particular, in seedlings, the integrity of the root cap was disrupted, degenerative changes of the rhizodermis and root hairs were detected. It has been shown that a decrease in the root growth rate during chronic exposure is largely due to the suppression of mitoses. In addition, high glyphosate concentrations had a general toxic effect, stopping the development of seedlings yet at the stage of primary roots growth through enlarging the cells. It was found that the antioxidant system of seedlings prevented the development of oxidative stress at the concentration of herbicide 50 μM, in particular, due to the activation of peroxidase. Placing seedlings grown on distilled water in 100 μM glyphosate solution induced lipid peroxidation. Chronic effects of herbicide in this concentration inhibited lipid metabolism in general.
Contacts

E E Stupak¹, I G Migranova², E R Sharafieva², N N Egorova¹, S I Stupak³ and V I Nikonov⁴

• 1 Ufa Institute of biology – Subdivision of the Ufa Federal Research Centre of the Russian Academy of Sciences, Pr. Oktyabrya, 69, Ufa, 450054, Russia
• 2 State Educational Institution of Higher Education "The Ufa State Petroleum Technological University", Kosmonavtov St. 1, Ufa, 450062, Russia
• 3 Federal State Budget Educational Institution of Higher Education "Bashkir State University", Zaki Validi St. 32, Ufa, 450076, Russia
• 4 Bashkir Research Institute of Agriculture – Subdivision of the Ufa Federal Research Centre of the Russian Academy of Sciences, Zorge St. 19, Ufa, 450059, Russia

E-mail: evgenia_stupak@mail.ru

INTERNATIONAL CONFERENCE
KRASNOYARSK, RUSSIA
20-22 June 2019

«Agribusiness, Environmental Engineering and Biotechnologies»
AGRITECH-2019