WATER TREATMENT USING PLASMA OF UNDERWATER DIAGRAM DISCHARGE TO STIMULATE germination OF BARLEY seeds [[1]](#footnote-1)\*)

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1Naumova I.K., 1Subbotkina I.N., 1Galkina O.V., 2Titov V.A.

1Ivanovo State Agricultural Academia, Russia, Ivanovo,
2G.A. Krestov Institute of Solution Chemistry of the RAS, Russia, Ivanovo, irinauma@mail.ru,
 tva@isc-ras.ru

In recent years, the possibilities of using low-temperature plasma in solving the problems of agricultural production, as well as the preservation of food products and improving their quality, have been actively studied. In particular, it has been shown that the use of water after plasma treatment improves germination and accelerates the development of plants. Possible reasons for this stimulating effect include the accumulation of active oxidizing particles in water, the dissolution of nitrogen oxides, the destruction of pathogenic microflora, and a number of other factors. The term "plasma activated water" (PAW) has appeared in the literature [1, 2].

In this paper, we studied the effect of plasma activated water on the germination of spring barley seeds and on the dynamics of the further development of plants. For water treatment, a diaphragm discharge was used, which was excited in tap water at an alternating voltage at the electrodes of 500 - 780 V (*f* = 50 Hz). The amplitude values of the discharge current were 10 - 100 mA. The treatment time was varied from 5 to 30 minutes. The changing in an electrical conductivity of water, pH value, and an accumulation of hydrogen peroxide during the plasma treatment were controlled.

Seeds were soaked in the plasma activated water before germination at a temperature of 20 - 22 °C for three days, the number of seeds in each cup was 50 pcs. In addition, PAW was used to irrigate the soil before sowing seeds and during periods of germination and growth of plants. The degree of seed swelling, germination, and the dynamics of the leaf surface development were controlled by comparing them with control samples using water without plasma treatment.

The experiments showed that water after plasma treatment intensifies the biochemical processes in plant cells, increases seed germination and accelerates the formation of green mass (see Table). In contrast to an air discharge with a liquid cathode (water), the using of an underwater diaphragm discharge results in a significantly smaller change in water acidity at comparable concentrations of hydrogen peroxide.

The dynamics of germination and formation of the leaf surface of spring barley when using plasma activated water

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| --- | --- | --- |
|  | Germination (%) | Leaf surface area, m2(results of field tests) |
| Soaking | Planting into the soil |
| The control | 92 | 79 | 3,1 |
| PAW | 97 | 86 | 4,2 |

References

1. Rifna E.J., Ratish Ramanan K., Mahendran R. *//* Trends Food Sci Technol. 2019. V. 86. P. 95.
2. Thirumdas R., Kothakota A., Annapure U., Siliveru K., Blundell R., Gatt R., Valdramidis V.P. // Trends Food Sci Technol. 2018. V. 77. P. 21.
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Lt/ru/FK-Naumova.docx) [↑](#footnote-ref-1)