6th international conference on plasma medicine

Bratislava, Slovakia
September 4–9, 2016

icpm6

BOOK OF ABSTRACTS

Edited by Karol HENSEL, Barbora TARABOVÁ, Katarína KUČEROVÁ,
Zuzana KOVAĽOVÁ, Mário JANDA, and Zdenko MACHALA

Title: 6th International Conference on Plasma Medicine (ICPM-6)
Subtitle: Book of Abstracts
Editors: K. Hensel, B. Tarabová, K. Kučerová, Z. Kovaľová, M. Janda, and Z. Machala
Cover design: L. Jeuffrault
Publisher: KEC FMFI UK, Bratislava
Printing: Neumahr s.r.o., Bratislava, 2016
ISBN 978-80-8147-066-0

The Effect of Cold Air Plasma Activated Water on Germination and Growth of Wheat Seeds

K. Kuļerová[1], M. Henselová[2], K. Hensel[1]
[1]Faculty of Mathematics, Physics and Informatics and [2]Faculty of Natural Sciences
Comenius University, Mlynská dolina, Bratislava 842 48, Slovakia
e-mail: katarina.kucerova@fmph.uniba.sk

Several studies proved that low-temperature plasma (LTP) generated in air has positive effect on seeds and plants. The plasma changes seeds affinity towards water, reduces phythopatogens from the seeds surface, stimulates germination and germ growth and induces changes in enzymatic activity of the seeds [1,2]. However, the effect of plasma activated water (PAW) on seeds germination and plant growth is less explored. The LTP generated in atmospheric pressure air in contact with water produces reactive species, which diffuse into water and induce various chemical reactions. Among them, NO_2^- and $NO_3^-$are the sources of nitrogen that is an essential macro element for plants, and H_2O_2 that can act as signal molecule activating growth genes. For LTP applications to enhance germination and growth of seeds and plants, however it is very important to find appropriate plasma dose, i.e. treatment time with respect to seed/plant type and used LTP source. We used positive DC driven self-pulsing transient spark (TS) discharge above circulating deionized water to activate water and make it a rich source of H_2O_2, $NO_2^-$and NO_3^-[3]. The spring wheat seeds (*Triticum aestivum L.*) *cv. Isgordius* were then imbibed in such PAW and then cultivated on filter-paper discs in Petri dishes watered by freshly prepared PAW (Fig. 1 -left). After 5-6 days of cultivation the growth parameters (germination, fresh and dry weight, shoot and root length) of seedlings were evaluated. The stimulation of germination and growth was evaluated with respect to various parameters (plasma treatment density, O_2/N_2 ratio in gas mixture, etc.). The maximum vitality of seedlings was observed for treatment density of 0.5 mL/min (e.g. 10 mL of water treated for 2.5 min) as shown in Fig. 1 - right. The results showed that water treated by TS with appropriate dose has a potential to act as environmentally friendly fertilizer.

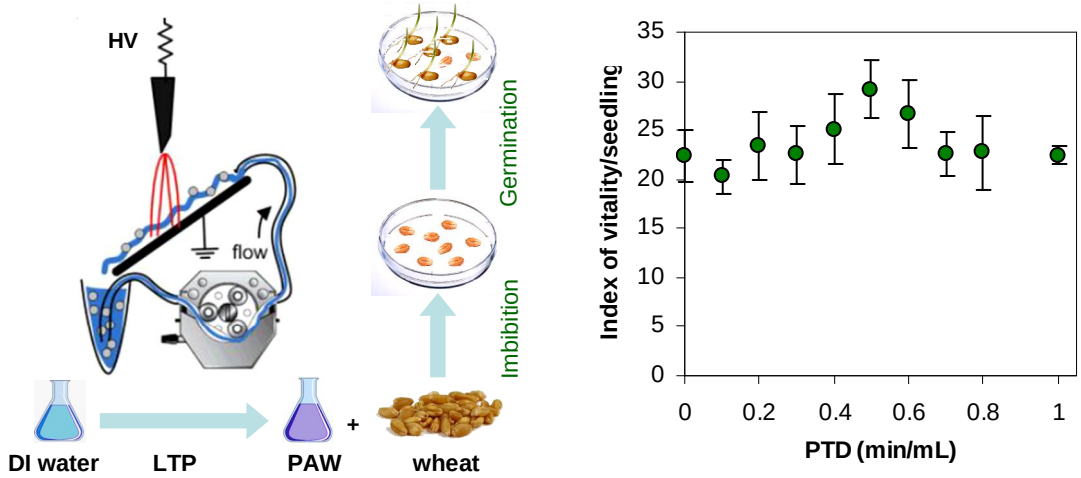

Fig. 1 Left: Scheme of the experimental set up and procedure. Right: Index of vitality (germination [%] x dry weight of seedling [mg] /100) as function of plasma treatment density (PTD = how long was 1 mL treated).

This work was supported by Comenius University Grant UK/244/2016 and SRDA APVV 0134-12.

References

[1] L.K. Randeniya, G.J.J.B. de Groot, *Plasma Process. Polym.*, **12**, 608-623 (2015).
[2] M. Henselová, et al., *Biologia*, **67**, 490-497 (2012).
[3] K. Hensel, et al., *Biointerphases*, **10**, 029515 (2015).