7th Asia-Pacific Conference on Plasma Physics, 12-17 Nov, 2023 at Port Messe Nagoya

Effect of Dielectric Barrier Discharge Plasma on Rice (*Oryza sativa* L.) Seed Priming

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In the Philippines, rice is an important crop and is considered as a staple food. However, yield, high cost of input, low price of *palay*, lack of post-harvest facilities, climate change, are some of the continuing challenges for farmers.[1] Alternative technologies are being sought to address some of these challenges. Atmospheric plasma is currently being explored with its application to agriculture. During the pre-harvest stage, decontamination, germination, and growth improvement are observed. Meanwhile, in the post-harvest stage, preservation and decontamination are common use of atmospheric plasma.[2]

In this study, plasma technology is explored for agricultural application. The effect of plasma treatment on *Oryza sativa* L. seed germination was investigated using a custom-designed dielectric barrier discharge (DBD) system. The system was composed of two glass slides acting as the dielectric barrier with a surface-to-surface gap of 5 mm. Aluminum electrodes were attached to the outer surface of the glass, where the neon power supply was connected. Plasma treatment was conducted in an argon-filled chamber kept at atmospheric pressure. The rice seeds were placed between the dielectric barriers when exposure to discharge was done. NSIC Rc 222 or *Tubigan 18* from the International Rice Research Institute was used for testing. Seeds were exposed to plasma at different times (5, 10, 20, and 30 s). The effect of plasma treatment to the seeds was evaluated using germination parameters (germination percentage, germination speed, and vigor index) after 7 days.

The maximum temperature of the custom-designed DBD system was classified as nonthermal and allowable for the rice seeds with a moisture content of 15% or less.[3,4] The plasma treatment process improved the wettability of the seed surface. There was a decrease in apparent contact angle to the plasma-treated seeds compared to the untreated seeds. Moreover, surface roughness of the seed has decreased due to the removal of nodes causing the surface to become more hydrophilic. In connection with this, water absorption was improved with the increase of wettability. There was a slight increase in the germination percentage for 5, 10, 20s exposure time. Germination speed has increased for the 5 and 20s exposure time. Lastly for the vigor index, there was a significant difference with the 20s treatment time. However, results showed that prolonged exposure of the seeds in the used system becomes detrimental to the rice seeds. This work is supported by DOST-SEI & ERDT for the research grant and was conducted in PMIL at DMMME as the workstation for testing.

References

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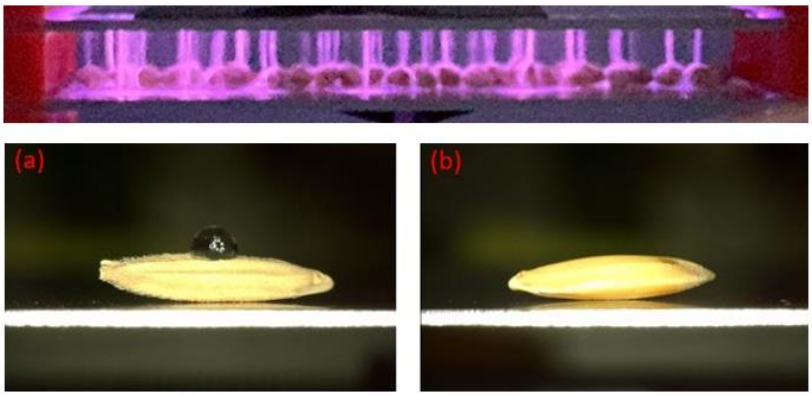

Figure 1. Actual DBD of the plasma system and the images of actual seeds that were tested for wettability (a-untreated, b-30s exposure time).