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Nanobubble's characteristics and its application to agriculture

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The nanobubble (NB), defined as the ultrafine bubble (UFB) in ISO/TC281, has a potential effects on the promotion of physiological activity of living organism. However, its mechanism is still not clarified. In this study, NB's promotion effect on seed germination has been focused. Barley seed was selected as it is the world's fourth most important cereal crops behind wheat, rice, and maize. The seeds were submerged in the NB water and distilled water (control water) at 25 oC. Dissolved oxygen concentration (DO) of NB water was adjusted to the same as that of control water. The germination ratio of seeds submerged in NB water were higher than that in control water at each observation times. This was thought to be because of the generation of ROS ($\cdot\text{OH}$) in NB water provoking ROS

($\text{O}_2\cdot^-$) generation in seed which accelerates germination. The fluorescence response of APF to NB water was measured. It changed depending on the NB number density which decreased with storage time. This indicated that NBs could produce ROS and the amount of ROS had positive correlation with the NB number density. The amounts of superoxide radicals ($\text{O}_2\cdot^-$) in the seeds were also detected by using NBT staining. The results of absorbance data proved that the amounts of $\text{O}_2\cdot^-$ in seeds submerged in NB water was significantly higher than those in the distilled water. These results indicated that moderate level of exogenous ROS produced by NB water played an important role in promotion of seed germination.

Biography

Seiichi Oshita has graduated from The University of Tokyo and also received the PhD. He served as a Professor at The University of Tokyo since 2002. After the retirement on 2017, he continues to work at the Research Center for Food Safety at the same university as a Project Professor.

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