4th International Conference on
Plant Science and Agriculture
March 09, 2022 | Webinar

The effects of molecular hydrogen seed priming on the germination of legumes

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Plant life is essential for human existence and increasing demands for nutritional produce in the current unstable climate inspires researchers to find novel and sustainable solutions to protect and enhance plant vitality and stimulate growth. Seed priming is used within the agri-food industry to control and enhance the germination of seeds. Such processes allow for more uniform and better germination of the treated seeds. Seed priming can enhance germination over wide-ranging temperatures, can augment cellular responses to numerous abiotic stresses and reduce incidence of disease in seeds.

Molecular hydrogen (H2) is now well documented as having anti-oxidant and cellular protective effects in numerous eukaryotic species, including plants and seeds. H2 is an electrochemically neutral, non-polar, diatomic molecule with a low molecular weight (2.016 g/mol). These important characteristics make H2 highly favourable for use as a seed priming agent allowing the molecule to diffuse through structural components of seed cells and membranes that occur around organelles, such as the nucleus and mitochondria. The distribution of H2 across cellular walls and membranes, is not affected by electrochemical gradients and the H2 molecule can readily pass through the hydrophobic phase of phospholipid bilayers. This allows molecular hydrogen to influence cytosolic reactions as well as fundamental organelle biochemistry and there is a growing body of scientific evidence that describes a myriad of cellular protective qualities of importance for the agri-food industry is that H2 is non-toxic and can be readily dissolved into an aqueous medium and applied to seeds, seedlings and mature plants, making it an effective, sustainable and inexpensive means of treatment.

Speaker Biography

Grace Russell is a PhD researcher in the dept. of applied science, at the University of the West of England, Bristol, UK. She lives and works in Somerset, UK, where she has been researching, writing and presenting her work throughout the recent pandemic. Her research interests centre around new and emerging restorative gases, molecular and oxy-hydrogen. Much of her academic focus has involved investigating the intricate molecular mechanisms, and downstream cellular effects associated with these gaseous compounds. Her recent work has culminated in numerous peer-reviewed journal publications, and a book: Molecular Hydrogen – an Ongoing Academic Journey.

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