

3rd International Conference on

Magnetism and Magnetic Materials

October 22-23, 2018 | Rome, Italy

Enhancement of germination in maize (*Zea mays* variety: Ganga safed) by magnetic field signal transduction

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Maize (*Zea mays* variety: Ganga safed) seeds treated with static magnetic field (SMF) strength of 200 mT showed enhanced germination and seedling vigor. This stimulation leads to better growth of plants and improves the yield of the plant under field conditions. The initial biochemical events soon after treatment of seeds with SMF have been analyzed. SMF treatment induces production of reactive oxygen species (ROS) and nitric oxide (NO) besides enhancing the activity of amylase enzyme. Inhibitors of NO like sodium tungstate (ST) and N-nitro-L arginine methyl ester hydrochloride (L-NAME) inhibit the promotion of seedling growth by SMF. Similarly diphenyleneiodonium (DPI), an inhibitor of NADPH-oxidase enzyme which generates ROS, also inhibits SMF promoted seedling growth. On the contrary, sodium nitroprusside (SNP), a donor of NO, promotes SMF stimulated growth. The biochemical signal transduction of SMF for the promotion of germination and seedling growth is through the production of ROS and NO. ROS can directly degrade the stored food materials like starch in the seeds. NO is a known germination stimulator and an activator of amylase enzyme. The receptors of the magnetic field in the seeds which stimulate the production of these radicals are yet to be ascertained.

Recent Publications

1. Sunita Kataria, Lokesh Baghel and K N Guruprasad (2017) Pre-treatment of seeds with static magnetic field improves germination and early growth characteristics under salt stress in maize and soybean. *Biocatalysts and Agricultural Biotechnology* 10:83-90.
2. Sunita Kataria, Lokesh Baghel and K N Guruprasad (2017) Alleviation of adverse effects of ambient UV stress on growth and some potential physiological attributes in soybean (*Glycine max*) by seed pre-treatment with static magnetic field. *Journal of Plant Growth Regulation* 36:550-565.
3. A Fatima, S Kataria, L Baghel, K N Guruprasad, A K Agrawal, B Singh, P S Sarkar, T Shripathi and Y Kashyap (2017) Synchrotron-based phase-sensitive imaging of leaves grown from magneto-primed seeds of soybean. *Journal of Synchrotron Radiation* 24:232-239.
4. Pinke Patel, Guruprasad Kadur Narayanaswamy, Sunita Kataria and Lokesh Baghel (2017) Involvement of nitric oxide in enhanced germination and seedling growth of magneto primed maize seeds. *Plant Signaling and Behaviour* 12(12):e1293217.
5. M B Shine, S Kataria and K N Guruprasad (2017) Enhancement of maize seeds germination by magneto priming in perspective with reactive oxygen species. *Journal of Agriculture and crop Research* 5(4):66-76.

Biography

K N Guruprasad is a Director of Shri Vaishnav Institute of Science, SVVV, Indore, Madhya Pradesh, India. He has worked in the area of photobiology and magneto-biology for over 30 years and has published over 85 research papers in journals of international repute. His work on improvement of crop yields by magnetic field treatment is gaining importance in the field of agriculture as a non-invasive physical method that can enhance the performance of crop plants.

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