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Effects of trivalent arsenic toxicity on germination, seedling growth and enzyme activity in Vigna radiata

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Arsenic (As) is a metalloid of severe environmental concern because of its extravagant toxicity and wide abundance in nature. At high concentration, arsenic interferes with plant metabolic processes and can inhibit plant growth and development through arsenic induced phytotoxicity. Seed germination rate and the early seedling growth are sensitive to arsenic toxicity. Hence toxicity of arsenic can be evaluated properly in early stages of plant development. Mung bean (Vigna radiata) is a very significant edible plant in India. The objective of this study was to investigate the in vitro effects of different arsenic concentrations on germination and change in peroxidase activities in Mung bean seeds and seedlings. The germination of Mung bean seeds was studied for 7 days in presence of arsenic tri-oxide solutions (0.5 ppm., 1 ppm., 1.5 ppm. and 2 ppm.). The sequestration of arsenic in different parts of the seedlings was estimated by using A Analyst 200 atomic absorption spectrometer (Perkin Elmer, MA, USA) fitted with a FIAS-100 flow injection system. The root and shoot lengths were measured to study the changes in growth patterns. In order to assess the oxidative stress, Guiacol peroxidase (GPX) activity was estimated in different parts of the seedlings (root, shoot and seed parts) and were expressed in enzyme activity/min./gm. fresh tissue. The germination percentage of the seeds was decreased gradually (control: 100%, 0.5 ppm. As: 95%, 1 ppm. As: 80%, 1.5 ppm. As: 25%, 2 ppm. As: 10%) after seven days of incubation with increase in the concentration of arsenic solutions. The lengths of the roots and shoots of the seedlings decreased significantly with the increase in concentrations of arsenic solutions. No root and shoot formation occurred in the seeds in presence of 2 ppm. arsenic solutions. On the other hand, peroxidase activity was highest in the roots, followed by the seed and shoot parts. One possible reason for that is the direct exposure of the root and seed part with arsenic solutions, whereas shoot part emerges out of the culture plate and thus was not under the direct exposure of arsenic. Change in peroxidase activity had shown an increasing pattern in the shoot parts, but in both the root and seed parts, the activity decreased with the increase in the concentrations of arsenic solutions upto 1 ppm., and then the activity increased further at the concentration of 1.5 ppm. The experiment, therefore, indicates that arsenic has the potential to affect the growth of Mung bean seed production in arsenic contaminated zones and can affect the agricultural economy.

Biography

Sayan Bhattacharya is a faculty in the department of Environmental Science, Asutosh College, Calcutta. For the last five years he has been engaged in his doctoral research in Department of Environmental Science in University of Calcutta. He has published 17 International Conferences proceedings and several National Conference proceedings, 6 book chapters and 4 international journal papers. He has received young researcher award from Govt. of India. He has more than 3 years of teaching experiences in 4 colleges and universities in West Bengal, India and has experiences as a reviewer in international peer reviewed journals.

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Novel approach in validation of adventitious virus removal by virus filtration

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Regulatory bodies for downstream purification processes are applied to demonstrate robust clearance of model adventitious viruses in time for execution of phase 3 clinical trials and product licensure. Model viruses selected for these studies represent a diversity of viral physicochemical properties, and the clearance methods which include orthogonal mechanisms such as clearance based on size alongside chemical inactivation. Virus filtration is a critical unit operation used in numerous purification processes of monoclonal antibodies (MAbs), recombinant proteins, and plasma-derived biopharmaceuticals. Virus filtration unit operations have been shown to be scalable, robust, and reproducible. Initial sizing of membranes involves, study on a small-scale filter followed by linear scale-up maintaining a constant ratio of process volume per square meter area. However, the ability of a virus filter to clear viruses is ultimately determined by validation studies involving virus-spike and clearance experiments. A representative feedstock is spiked with a preparation of model virus, this feedstock is passed through the filter, and viral clearance is determined after measuring recovered levels in filtrate using qualified/validated scale-down systems.

Keywords: Downstream Purification, Virus Filtration and Monoclonal antibodies.

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