

Effect of Reduced Phosphorus Availability on in Phytic Acid Accumulation during of Soybean Seed Development.

*Varun Kumar, Amit Kumar Gupta, Alkesh Hada, Mansi Punjabi, Veda Krishnan, Monica Jolly and Archana Sachdev**

Division of Biochemistry, Indian Agricultural Research Institute, New Delhi, India

Abstract Phytic acid (myo-inositol 1, 2, 3, 4, 5, 6-hexakisphosphate or IP₆), a fully phosphorylated form of inositol, is a seed phosphorus storage compound representing almost 1.5% of soybean seed dry weight. The phytic acid phosphorus in soybean represents about 80% of the total seed Phosphorus. Developing seeds generally accumulate more phosphorus (P) than needed for nominal cellular functions. Higher plants assimilate this excess P into phytic acid and subsequently deposit it as mixed salts of macro and micro mineral nutrients, referred to as phytins. Several important physiological roles have also been proposed for higher accumulation of phytate in the seeds. It serves as a major store of phosphorus and myo-inositol for the growing seedlings, when broken down by the enzyme phytase. Phytic acid also has antinutritional properties as it chelates mineral nutrients thereby reducing their bioavailability. The present study was undertaken to evaluate the impact of external Pi availability on the phytic acid accumulation pattern in the developing seeds of soybean plants grown hydroponically and also link the physiological response of the plants to Pi starvation condition. The results in the selected mutants sorted as high, moderate & low phytic acid containing lines revealed that the phytic acid accumulation consequently increased with increasing external Pi levels. The 10 μ M Pi concentration was found to be the best for the accumulation of phytic acid level with negligible adverse effect on the physiology & morphology of plants including their root lengths, shoot lengths, number of pods, number of seeds, size of seeds and root-shoot dry weight. Moreover, it was found that phytic acid content was reduced to approximately threefold when plants were grown in nutrient solution having low level of phosphorus. The germination of the seeds having reduced threefold phytic acid was nearly as vigorous as that of control having 1.5% phytic acid. Nutritionally induced reduction of phytic acid showed a positive correlation with external Pi availability & the reduction upto threefold did not lead to any deleterious effect on the morphology of the plants & on the seed germination.

Keywords: Phosphorus deficiency, Starvation, Phytic acid, Phytase, Soybean genotypes
