

Melatonin Application as a Mitigating Strategy for Arsenic Stress Amelioration and Enhanced Yield in Rice (*Oryza sativa* L.)

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Abstract : Arsenic stress in plants poses a significant threat to human health, which raises the need to mitigate this issue using sustainable methods. Melatonin (MT) is one such pleiotropic molecule that not only helps in arsenic amelioration but also in increasing the rice (*Oryza sativa* L.) yield, which is a staple food for many. This study investigated the effects of melatonin on the growth and yield of Rajendra Kasturi rice, a local variety cultivated under control and arsenic-stress field conditions. Melatonin was applied using two methods: seed priming at concentrations of 100 μ M and 500 μ M and foliar spray at 100 μ M. The results demonstrated that both seed priming and foliar application of melatonin significantly increased rice yield. The yield of all the MT-treated plants in the As-stress conditions was 41.7-68.9% higher than the untreated plants, and the yield of all the MT-treated plants among the control conditions was 5.6-44.6% higher than the untreated plants. Furthermore, these treatments appeared to promote proper rice growth even under stress induced by arsenic exposure. The fresh weight of shoot & root, shoot length, tiller number and protein content were observed to be elevated in the melatonin-treated plants under control and arsenic-stress conditions. The most important finding of this study is that melatonin can lower the burden in rice grains and enhance plant development in addition to yield. In order to lessen the toxicity of as by preventing its transfer to grains in contaminated areas, melatonin supplementation through seed soaking and spraying can be a workable technique to develop rice with minimal arsenic in rice grains.

Keywords : arsenic, melatonin, rice, yield

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