DEVELOPMENT AND EVALUATION OF AN AUTOMATED SEED DRYER SYSTEM

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ABSTRACT

In developing countries, 30–40% of agricultural production is lost post-harvest, with paddy being particularly vulnerable. Reducing moisture content is essential to extend shelf life and prevent microbial growth, which is traditionally achieved through sun drying. However, sun drying is highly dependent on weather conditions and labor availability. This study aimed to develop and test an automated temperature-controlled seed dryer as an alternative drying method to improve efficiency, maintain a controlled environment, and minimize post-harvest losses. The experiment was conducted in two phases. In the first phase, the automated seed dryer was tested across three temperature ranges (30–35°C, 35–40°C, and 40–45°C) and three drying masses (1.0 kg, 0.5 kg, and 0.25 kg) using a Factorial Complete Randomized Design (CRD). In the second phase, the performance of the automated seed dryer was compared with solar drying and open sun drying, using a fixed drying mass of 1.0 kg. Results showed that temperature did not significantly affect the drying rate in the automated seed dryer ($p = 0.489$), but drying mass had a significant impact ($p = 0.024$). The 0.25 kg mass exhibited the fastest drying rate (11.5853 kg/h), significantly higher than the 1.0 kg and 0.5 kg masses. The optimum condition for drying in the automated seed dryer was observed at the 0.25 kg drying mass and a temperature range of 40–45°C, where the drying process was most efficient, with rapid moisture reduction. In the comparison of drying methods, open sun drying was the fastest, reducing the moisture content of 1.0 kg of paddy to 14% in 2 hours, followed by the automated seed dryer in 2.4 hours and the solar dryer in 3 hours. ANOVA analysis showed significant differences in drying time across the methods ($p < 0.05$). The moisture ratio (MR) analysis indicated that the solar dryer had the highest MR (0.901), followed by the automated seed dryer (0.881) and open sun drying (0.860). In conclusion, the automated seed dryer demonstrated consistent and controlled drying, particularly for smaller drying loads, offering a reliable alternative to traditional methods for improving post-harvest efficiency.

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