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Determine of the most suitable substrate and breaking dormancy methods in rice (Oryza sativa) seeds

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Introduction For the successful crops production, the period of planting seeds until the seedling establishment is great important, because it will have effect on the growth of the plant, the final yield and the quality of the seeds after harvest (Rowse, 1996).

The germination test determines the potential germination ability of a seed lot, and the results of this test can be used to compare the quality of different seed lots and estimate the rate of seed needed for planting. The germination test is useful due to the reproducibility of the test and providing information about the ability of a seed lot to germinate under favourable conditions. The seed germination test determines the percentage of normal, abnormal seedlings and dead or ungerminated seeds in a seed lot. Theoretically, when seed viability is maximum provided that seed dormancy is not a factor that inhibits germination, seed germination percentage will be around 100%.The seed germination test is accepted as a basic test to check the viability of seeds in all countries of the world and a standard for seed viability. The method of performing the seed germination test has been revised and modified many times so that this test can be performed at a high level of reliability and repeatability. (Anonymous, 2024).

Materials and methods The treatments of this research included seed rice cultivars included Hashmi, Fajr, Neda, dormancy breaking methods and substrates. The substrates included 1- sand 2- a mixture of 1/2 sand + 1/2 perlit 3- a mixture of 2/3 sand + 1/3 perlit 4- a mixture of 4/5 sand + 1/5 perlit 5- perlit and 6- between paper(BP), breaking dormancy treatments included: preheating, soaking in water, soaking in HNO3(1M), soaking in HNO3(0.5M), preheating + soaking in water and preheating+ soaking in HNO3(1M). After 14 days (Anonymous, 2024) normal seedlings were counted (Anonymous, 2018). The electrical conductivity of the used sand and perlit was measured and passed through from sieve with 2 mm meshes. According to the ISTA Rules, the electrical conductivity of the substrate should not be more than 40 millisiemens/m as well as more than 90% of the sand particles should pass through a 2 mm sieve (Anonymous, 2024). Four replicates of 100 seeds were planted in each media and kept in growth chamber at 25°C.

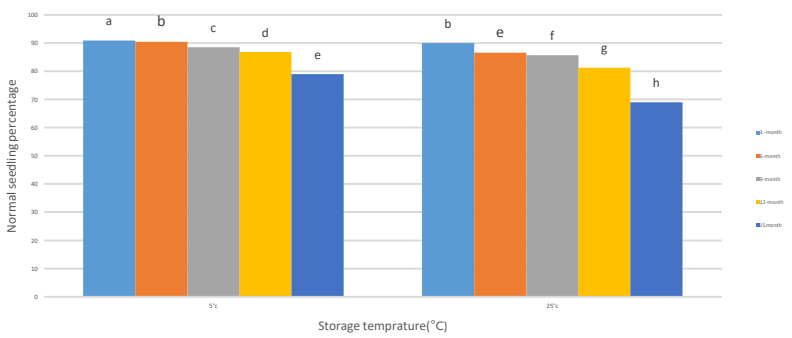

Figure 1- Interaction of storage temperature and duration on normal seedling percentage.

Results and Discussion The results of the average comparison show that the highest percentage of normal seedlings observed in the Fajar variety in sand culture substrate and sand + 1.5 perlit. In Hashemi cultivar, the highest percentage of normal seedlings was observed in BP and the minimum was in sand + 1.2 perlit and sand + 1.3 perlit. In Neda cultivar, the highest percentage of normal seedlings was seen in the sand and perlit substrate and the lowest was in BP. No significant difference was observed between perlit, sand + 1.5 perlit and sand + 1.3 perlit.

Comparison of the average interaction effect of breaking dormancy treatment and variety shows that in all three varieties, normal seedlings were observed in the control treatments, preheating and soaking in water, also in the treatments that were accompanied by the application of HNO3, the percentage of normal seedlings varied from 0 up to 7%, which is not acceptable compared to other breaking dormancy treatments (Figure 1).

Fajr variety did not need breaking dormancy treatment and its direct cultivation had the highest percentage of normal seedlings. In the Hashemi variety, the highest percentage of normal seedlings was observed in soaking in water, preheating + soaking in water and preheating treatments. As well as In Neda cultivar, the highest percentage of normal seedlings was observed in water soaking and preheating + water soaking treatments.

Therefore, Hashemi and Neda cultivars need dormancy treatment to increase the percentage of normal seedlings, and according to the results, 24 hours soaking in water is considered the most efficient method(Figure 1). In another research, 0.3 M nitric acid for 60 seconds was introduced as the best treatment for breaking dormancy (Tung and seranol, 2011).

Conclusion The results of this experiment showed that immersing rice seeds for 24 hours in 1 M nitric acid is not a suitable treatment for dormancy and leads to the loss of the seed embryo.

keywords normal seedling, breaking dormancy, substrate

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