QUALITY OF FARM SAVED RICE SEED IN MWEA IRRIGATION SCHEME, EFFECT OF PACKAGING MATERIALS AND SEED TREATMENT ON VIABILITY AND VIGOUR

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DECLARATION

This thesis is my original work and has not been presented for award of degree in any other university.

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GENERAL ABSTRACT

Use of low quality seeds, inappropriate packaging material and seed dormancy leads to poor seed germination, uneven crop stand and loss of vigour, limiting yields in rice. Recycling of farm saved seed whose quality is unknown leads to accumulation of pests and disease, which affect crop establishment, performance and yields. This study was carried out to determine rice production practices in Mwea Irrigation Scheme (MIS) and their effect on the quality of farm saved seed and the effect of packaging materials and seed treatment on viability and vigour in rice seeds. A survey targeting 60 rice farmers was carried out in all five units of MIS and 12 farmers were randomly selected for every unit. The data collected included, land size, varieties produced, sources of seed, frequency of using certified seed and reasons for not using it every time, seed pests and diseases and their management, seed handling and treatment, and other rice production constraints. Rice seed samples were collected from the farmers and subjected to purity analysis and data collected on seed discoloration, shrivelling, inert matter, pure seed and weed seed. Germination and seedling infection tests were conducted using paper towel method and data on seedling viability and infection was collected. Freshly harvested seeds of Basmati 370 and BW 196 were stored in room temperature and in cold room at 6^0C. The packaging materials evaluated were, polythene, gunny bags, poly sack, cheese cloth and khaki bags. Germination test on paper towel were conducted on monthly intervals for six months and data collected on germination, vigour and moisture content. Chemicals evaluated for breaking dormancy were 0.1M, 0.2M, 0.5M, 1M, 2M nitric acid and hydrogen peroxide, 1000ppm, 2000ppm, 5000ppm gibberellic acid and dry heat (50^0C) for 48 hours. Seeds were soaked in the solutions for 48 hours before conducting germination tests on paper towel. Data was collected on germination, seedling emergence rate, and vigour.

The study revealed that 70% of the interviewed farmers were small scale rice producers with less than two acres of land and that certified seed was the most (60%) commonly used. However, only 33.6% of the farmers used it every season. Majority (63.4%) of the farmer's indicated that the reason for not using certified seed was that it was not different from farm saved seed. The main pests and diseases found were rice stem borer/case worms (77.1%) and rice blast (57.6%) respectively. Chemicals were mainly used for pest and disease management. More than 95% of the rice farmers manually processed their seed and none of the farmers treated their rice seed. All seed samples from the farmers had physical purity which was below 98% and germination percentage higher than 80% which are the recommended rates by COMESA for certified seed generation 1. Pure live seed, seedling vigour and speed of germination index significantly varied among the units with Thiba having the highest percentages 91%, 13.2% and 26.6% respectively. Packaging materials had an effect on germination and vigour. Moisture content varied cross the packaging materials under the two storage environments. Polythene bag was found to be the best suited material for storing rice seeds in both temperatures. It had the highest germination percentage 87.1% and 52.6% for BW 196 and basmati 370. Most of the treatments used to break dormancy had a positive effect on dormancy. BW 196 had weaker dormancy compared to basmati 370 as indicated by higher percentage germination of 67.3% and 39.6% respectively. Gibberellic

acid at 5000ppm was found to cause the highest germination rate (95.7%). It was also the best treatment in Basmati 370 (93.3%), while 3M $H_20_2$and 5000ppm GA_3were the best in BW 196 (98.7%).Increasing concentration of nitric acid improved seedling emergence up to certain levels where it completely suppressed germination.

Different practices in rice production as practiced by farmers affect the quality and quantity of produce. Application of required practices and on timely basis can help improve the yields. Farmers did not pay attention to the importance of physical purity, hence its low percentage. Most farmers stored their seed in poly sacks which from the study was not the best suited packaging material. The two rice varieties exhibited seed dormancy; however, Basmati 370 had a stronger dormancy which could last up to three months. Therefore, awareness should be created to encourage adoption of certified seed by all farmers. Research should be undertaken to come up with varieties resistant to blast. Seed treatment should be encouraged as it helps reduce accumulation of pathogen during storage. In order to use freshly harvested seeds of Basmati 370, it's recommended to treat the seed with gibberellic acid to promote germination. Precautions should be taken when using the different chemicals as inappropriate concentrations suppress germination. Farmers are advised to store their rice seeds in polythene bags for better germination and vigour.

Key words: Rice, farm-saved seed, certified seed, dormancy, packaging materi