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AN OVERVIEW ON EVALUATION OF SUITABLE SEED PROCESSING METHODS FOR INCREASED PRODUCTION AND SUSTAINABILITY

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ABSTRACT

In developing countries, Agriculture is crucial to maintaining economic stability and food security. Seed quality becomes an important part of agricultural productivity by directly affecting crop yield and sustainability. This study evaluated different seed systems to determine which one is best for improving seed vigor, vigor and overall crop performance. This study evaluated the effectiveness of mechanical, chemical and biological studies in improving seed sustainability and quality. Evaluate the capabilities of mechanical systems including cleaning, sorting and classification, eliminating pathogens and improving seed uniformity. Chemical treatments such as primers and coatings are evaluated for their ability to protect seeds from contamination and improve germination. The potential of biotechnology to support permaculture practices and improve soil health is being examined. This process involves the use of beneficial bacteria and organic treatments. The research used a variety of laboratory and field experiments to compare and evaluate different methods. Germination rate, seedling vigour, agronomic yield and environmental impact are important considerations. The results showed that good results in terms of seed quality

and sustainability can be achieved by combining all methods, chemical and biological, in a good strategy. The study concludes by noting that although no method can be considered universally effective, the strategies integrated according to the specific needs of each crop and the local environment show the greatest promise.**Keywords:** Seed processing, agricultural productivity, sustainability, mechanicalprocessing, chemical treatments, biological approach, germination rate, crop yield,environmental effect.

1. INTRODUCTION

Cultivation and subsistence farming continue to grow due to their important role in nutrition, food security and income (Abukutsa-Onyango, 2010). They are more profitable than other vegetables due to the increasing demand (Abukutsa-Onyango, 2010). The biggest problem in nightshade vegetable production is the lack of quality seeds. Low yields are due to poor quality; for example, in Kenya, the potential yield from nightshade is 30 tonnes but farmers are harvesting less than two tonnes per hectare (Elizabeth & Adeniji, 2015). The way seeds are processed has a great impact on the quality of the seeds. Louwaars and De Boef claimed that the 2012 seed shortage was due to lack of understanding of solanum functions. Solanaceous crops with succulents are best done using wet fermentation method. According to Ekhuya, Wesonga and Abukutsa, 2018, wet seed fermentation cleanses the seeds from bacteria in the body as it cleanses 4 8, August 2024 August and eliminates carbohydrates that inhibit seed germination. Good seeds improve their quality. Seed quality is measured by the method approved by the International Seed Testing Association (ISTA rules). The most common physical test used to determine seed quality is the germination test (Odeyemi, Ajayi and Olakojo, 2010). Seed evaluation can also help in predicting their performance in the field (MiloÅ¡evià, 2010). Good soybean seeds produce plants that are always available, slow growing and less affected by external factors, which makes the growth and evaluation of seeds very important (MiloÅ¡evià, 2010). In Kenya, farmers produce their seeds without following traditional methods, which does not result in a consistent seed production process. affects the quality of seeds and suggests effective methods for the production of clean African nightshade seeds. Seed quality evaluation enables the assessment of the seed status of farmers in Kenya. According to Sthapit, Ram, Pashupati, and Pratap (2008), poor seed production leads to decline, affecting family income and food security. Ninety percent of African nightshade seeds used by farmers come from informal seeds in Kenya (Ghosh, Singh, Magsumbol, Kamboj, & Goldberg, 2016). In Kenya, few farmers use proven seeds due to their scarcity, high cost and lack of awareness of their importance (Sthapit et al., 2008).

2. MATERIALS AND METHODS

Agroecological sites and seed collection

A total of 120 seed samples were collected from farms for this study. The seed preparation process was noted at the time of collection.

Farmers save seeds using the following methods: wet and dry seed treatment, dry seed fermentation and wet seed fermentation. Farmers have slightly adapted to poor practices but always followed important principles such as irrigation and fermentation. Farmers have described the following methods for seed preparation.

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In wet planting, the seeds are extracted and fermented in water for two to four days. The seeds are then washed and dried. In dry seed fermentation, the seeds are extracted and fermented without the use of water and stored in polythene or woven bags for five to fourteen days. This is followed by the discoloration of the seeds and the removal of the chaff. Wet seed processing involves washing and drying the seeds after they have been removed from water to remove the pulp. The process of making dried seeds is to remove the seeds and dry them with straw. Also, some farmers do not make seeds because they think it is labor-intensive and time-consuming.

Seed quality tests

To determine the purity of each sample, 10 g were repeated three times. Pure seeds, other seeds, defective, discolored, shriveled and insect-damaged seeds were separated from the seed samples. Determine the percentage after measuring each product independently. After weighing two empty boxes, put the seeds in them and subtract the weight of the boxes. Then, the seeds were crushed into small pieces and dried in an oven at 103°C for 17 hours. After cooling for 15 min in the incubator, the sample was measured to determine the moisture content of the dry sample (Taylor, 2014). Subtract the weight of the seed material before drying (initial weight) and the weight after drying (final weight), divide by the original weight of the seed material, and multiply by 100 to determine the moisture content. Fifty seeds each were spread on absorbent paper in a plastic box (11.0 × 11.0 × 3.5 cm) in 3 replicates, and the paper was moistened with 2.5 times the weight of water and exposed to 20–30 °C. ., 8 h of light and 16 h of darkness. The initial and final germination percentage, seedling emergence, vigor index, and length were evaluated in germination chambers on the 7th and 14th days after sowing the seeds according to the experimental procedure (International Seed Testing Association [ISTA], 2014). Seedling height (cm) x germination rate is used to calculate the seedling vitality index (Dezfuli, Sharif-Zadeh, & Janmohammadi, 2008).

Field experiment

Seeds are sown in separate plots and processed using various techniques like wet seed treatment, dry seed treatment, dry fermentation. For each experimental plot, a randomized complete block design (RCBD) was used with four treatments (seed treatments) and four replications. Split plant preparation is used for treatment.

1. Agricultural trial plans

The size of the plot is 3 x 3 square meters, two seeds per mound, and the distance between seeds is 60 x 30 cm. Control the plant by two passes of manual tillage and additional irrigation when necessary. All projects are carried out according to agricultural methods without the use of pesticides to ensure compliance. Field seed examination as a conventional treatment. For each treatment, ten plants were collected from each plot using different labels. Plants were harvested when grown and fruits were cut and prepared according to standard procedures. The following methods were adapted and adopted using local knowledge collected by farmers during seed evaluation and standard procedures as specified by (Colley, Alex, & Linda, 2015; Desai, Kotecha, & Salunkhe, 1997; ISTA, 2014).Wet seed processing

Dry seed processing

Dry seed fermentation

Wet seed fermentation processing

Seed purity

Following the procedure outlined in 2.3, seed samples were divided into four categories: pure seeds, other crop seeds, inert matter, discoloured, shrivelled, and insect-damaged seeds.

Seed quality tests

Pearson correlation coefficients were used to determine the seed making process for quality traits of seeds and quality assessment of seeds was done on finished seeds using various methods. The information collected was used to determine the best seed processing techniques used by farmers to produce clean African nightshade seeds.

Data analysis

Tables and graphs are provided to illustrate the data. Statistical analysis was performed based on the mean values of the cultivars and seed quality tests using statistical software version 9.2 (SAS; 2002). The best method for manipulating genes was determined by correlation using principal component analysis (PCA) and Pearson correlation coefficients. Least significant difference (LSD) was initially used to separate the means ($p < 0.05$).

3. RESULT

Seed growth tests

Moisture content (MC) has a significant difference between processing methods ($p < 0.05$). While MC decreased by 8.6% in the dry seed application, it increased by 11.1% in the dry seed application. Seed fermentation improved the

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germination rate, germination index, and emergence rate (89.2%, 18.2%, and 91.2%, respectively). Compared to the application of dry seeds, these sowing indicators were lower at 80.3%, 11.2% and 82.4%, respectively. In contrast, wet seed fermentation takes less than three days to reach 50% germination, while dry seed fermentation takes more than four days. In addition, the germination power of dry seeds is 0.70 and that of fresh seeds is 0.86.

Seed vitality index (main germination parameter) is the highest 347.9 in fresh seed fermentation and the lowest 303.1 in dry seed treatment.

Seed purity and growth tests obtained for field experiment

The purity tests of seeds were collected and carried out in field trials. The purity of wet fermentation process is 96.3%, with the lowest content of foreign matter, discolored seeds, other seeds and pests. The seed purity of fermented dry seeds is 72%, with a high content of inert matter, discolored seeds, insects and other crop seeds.

4. CONCLUSION

Despite the increasing demand for vegetables and limited supply, few farmers grow seed vegetables. The problem is also exacerbated by the lack of production and business understanding. Nightshade seed production is a local skill and an industry neglected by the agricultural extension government. The disadvantage of seeds is that farmers tend to prepare seeds quickly by drying, soaking, etc. In order to achieve high yields in nightshade vegetables, growing good seeds is the first priority.

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