EVALUATION OF SEED QUALITY OF COLLECTED SPIDERPLANT (*Cleome gynandra* L.) ACCESSIONS IN VARIOUS REGIONS OF KENYA

D. Odongo, J. Wesonga and M. Abukutsa-Onyango
Department of Horticulture, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya
E-mail: davieodongo@gmail.com

Abstract
Spiderplant is an important African Indigenous Vegetable especially in Kenya with its popularity fast spreading due to its nutritional and medicinal values. Optimum stand establishment and maximum yield potential of spiderplant is majorly determined by the quality of seed. Physical and physiological seed quality components are used in seed testing. The physical purity and percentage germination are some of the most influential aspects. Most farmers depend heavily on 'farmer-saved' seeds which are of low quality due to seed handling and storage. The aim of this study was to determine the percentage purity and percentage germination of Spiderplant accessions from various regions of Kenya. Surveys were conducted to collect germplasm from Western Kenya. A total of 35 accessions were collected from farmers and 5 accessions from AVRDC. A purity test was conducted to establish the fraction of pure seed. A sample of seeds with impurities was weighed, and then the two fractions were separated and pure seed weighed. A germination test experiment involving four replicates of 100 seeds each for all the accessions were set up in completely randomized design in a growth cabinet. Germination tests showed that all accessions had >80% germination, with the highest being 100% while the purity test was >70% with the highest being 100%. Therefore the results reflect proper seed processing, handling and storage by the farmers, hence high germination percentage and percentage purity.

Key words: Seed handling, African indigenous vegetables, germplasm, purity test, germination test

1.0 Introduction

The evaluation of Spiderplant seed purity and percentage germination provide an indication of seed physiological potential. High quality seed is of tremendous direct benefit to the seed consumers and seed producers. Among the advantages consumers get from such seed include tolerance to stressful production conditions, uniform emergences and uniformity of the crop stand, hence increased yield and additional economic return (Bewley and Black, 1994).

Different parameters are tested to evaluate the seed quality; these include physical and physiological seed quality components. The physical purity and percentage germination are some of the most influential aspects. Thus the actual planting value of seed can be determined only when the purity analysis and germination tests are considered together (Chweya and Mnzava, 1997). Germination test should be conducted immediately after harvest to determine whether the seed should be stored and for a second time before planting to determine their viability since seed quality deteriorate during storage. (International Seed Testinng Association (ISTA), 2005;Sunil Chandra et al., 2009).

In Kenya, informal seed system is the key source of spiderplant (*Cleome gynandra* L.) seed for small-scale farmers. The farmers grow these vegetables for fresh leaves and seed production leading to improved food security and livelihoods. They either save their own seed or exchange among themselves aiding in conservation of bio-diversity and locally adapted germplasm (Bates, 2012; Sperling and McGuire, 2010). The traditional varieties are as a result of these farmer selections and exchanges. They are well adapted to the local conditions and selected according to the preference of the farmers/ consumers (Abukutsa-Onyango, 2007b). In contrast, formal seed system is constituted of separate activities to provide new varieties, maintain their purity, certify the seeds and distribute them to farmers, usually through officially recognized seed outlets.

Daniel and Adetumbi (2004) reported that 60% of vegetable farmers' in Western Nigeria sourced seeds from their previously saved harvests, while about 30% buy seeds from commercial dealers. About 33% of these farmers select seeds based on high potential crop yield.
The aim of this study was to determine the percentage germination and percentage purity of Spiderplant accessions from various regions of Kenya.

2.0 Materials and Methods

The study was conducted in a laboratory in Jomo Kenyatta University of Agriculture and Technology (JKUAT) in 2014. JKUAT is located in Juja, central Kenya under the geographical coordinates 1^0 11' 0'' S, 37^0 7' 0'' E. The study involved collection and laboratory seed purity analysis and germination tests of forty accessions of

Spiderplant. The 40 accessions of spiderplant seeds used in this study were as follows; 35 accessions from farmers and agrovet shops in Siaya, Kakamega, Vihiga, Kisumu, Busia and Kisii Counties in Kenya and 5 form Asian Vegetable Research Centre (AVRDC) in Arusha. The collections were made between March and November 2014.

2.1.1 Purity Analysis

The working sample (50g), for each accession, was placed on the clean surface of a purity work board and examined to determine whether it is spiderplant seed (authentic samples of the same variety). The sample was separated into different components, that is, pure seed, inert matter and other seed. Each sample was divided into four replicates.

Each of the components was weighed using an analytical balance to determine if there is a gain or loss between the weight of the original samples and the sum of all the three components.

The pure fraction was weighed and calculated to a percentage using the formula below:

$$\% \text{ Purity} = \frac{\text{Weight of pure seed}}{\text{Total weight of sample}} \times 100$$

2.1.2 Germination Test

Each of the forty accessions were divided into four replicates of 100 seeds sown in petri dishes lined with whatman filter paper, moistened with distilled water and put in a growth chamber at a constant temperature of 27^0C. The experiment was laid in Completely Randomized Design (CRD) replicated three times.

The Petri dishes were examined daily to count seeds that have germinated. Seeds with visible, protruding radicles were considered as germinated and discarded after counting. Germination counts were made daily from the third day after planting until the fourteenth day.

Germination percentage was calculated as the number of seeds germinated divided by total number of seeds sown multiplied by one hundred (100).

3.0 Results

a) Germination test

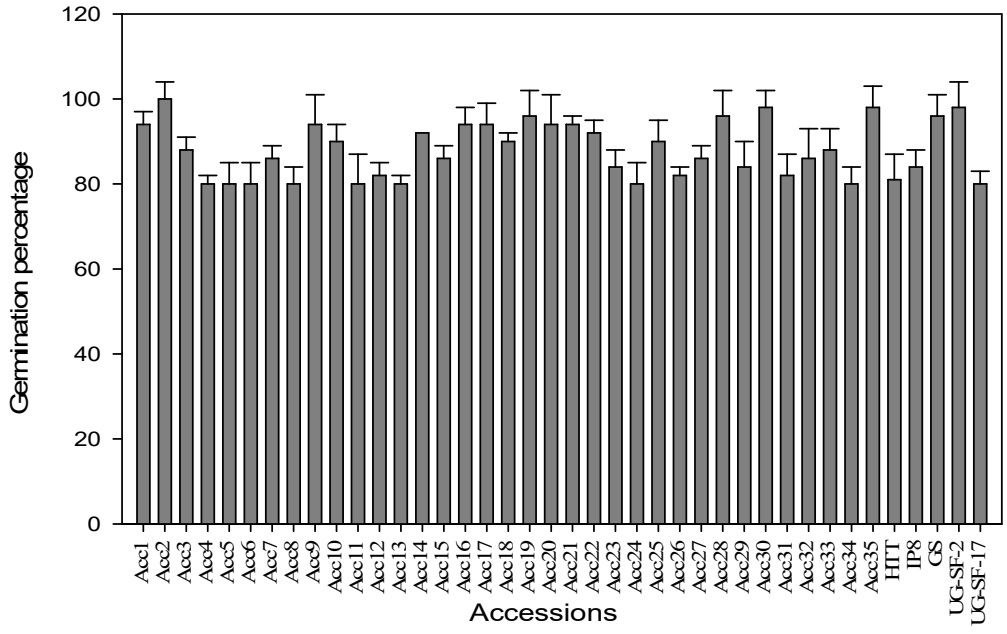

Figure 1: Germination percentage of forty accessions of Spiderplant seeds from different regions in Kenya

b) Purity Analysis

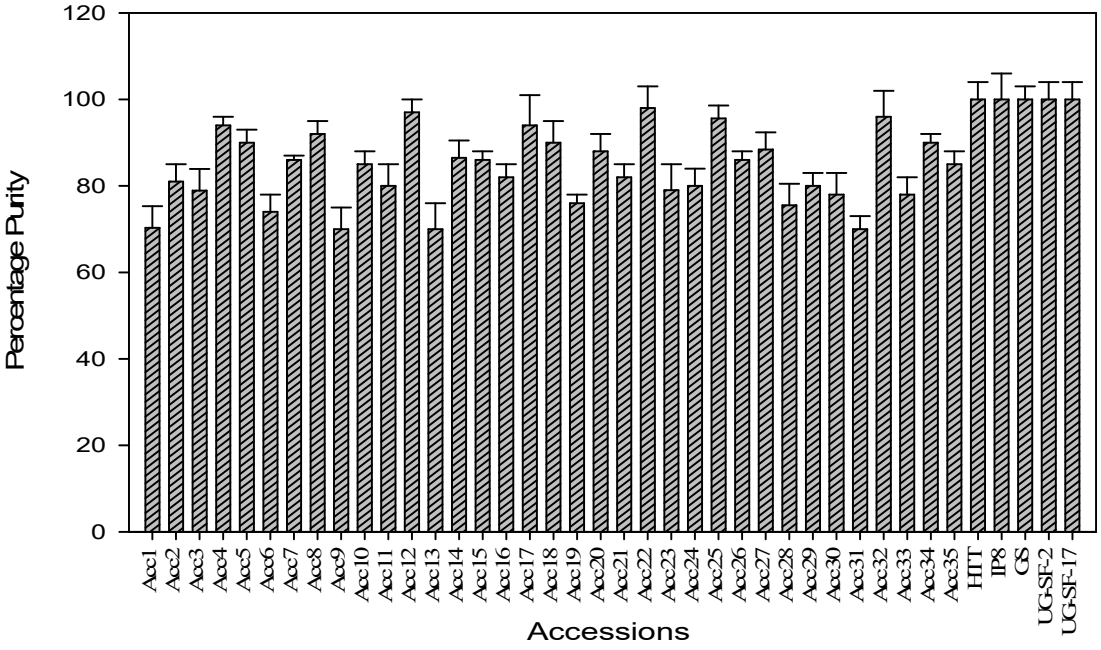

Figure 2: Percentage Purity of forty accessions of Spiderplant seeds from different regions in Kenya

4.0 Discussion

There was no significant difference (P≤0.05) in the germination percentage among the forty accessions. All the accessions had a germination percentage >80%. Accession 2, 9, 16, 17, 30, 35 and UG-SF-2 had the highest percentage germination. Accessions 4, 5, 6, 8, 11, 12, 13 24, 26 and 34 had the lowest percentage germination (Figure 1). There was a significant difference (P≤0.05) in the percentage purity of the forty accessions. All the accessions had percentage purity >70%. Accessions 4, 8, 12, 18, 34, HTT, IP8, GS, UG-SF-2 and UG-SF-17 had significantly higher percentage purity. The lowest percentage purity was shown in accession 1, 9, 14, 19, 28, 32 and 33. These were accessions collected from the farmers. The accessions collected from agrovet shops and AVRDC had the highest percentage purity of 100% (Figure 2).

These results differ from those reported in a survey conducted in western Kenya, which showed that only 12% of the 70 contact farmers to whom seed was distributed were able to produce quality seed for their use after training provided by the project which aimed at capacity building, conservation and evaluating the seed supply (Abukutsa-Onyango, 2010). The basis of germination test is the pure seed components, thus purity analysis and germination tests complement each other. The two parameters together determine the planting value of seed. Seed quality is considered superior, when the pure seed percentage is above 98, and other seeds and inert matter percentage as low as possible (Sunil Chandra et al., 2009; Baskin C.C. and Baskin J.M., 1998).

'Farmer saved' seed or farmer – to – farmer seed exchanges are very prominent hence sourcing seeds from commercial seed companies is very limited especially in the rural areas where women majorly play the role of seed production and processing. The quality of this seed is therefore of great importance for sustainable vegetable production and improved livelihoods.

5.0 Conclusion

There was no significant difference (P≤0.05) in the germination percentage among the forty accessions. All the accessions had a germination percentage >80%. There was a significant difference (P≤0.05) in the percentage purity of the forty accessions. All the accessions had percentage purity >70%.The results therefore were an indication of good seed quality, thus the production and processing methods of the farmers were of good standard.

Acknowledgements

The authors are grateful to HORTILEA SP6 project for providing the funds for germplasm collection and the necessary equipment for conducting the tests in the laboratory.

References

Abukutsa - Onyango, M., (2010). *African Indigenous Vegetables in Kenya: Strategic Repositioning in the Horticulture Sector.* Nairobi: JKUAT.

Abukutsa-Onyango M.O., (2007b). Abukutsa-OnyangSeed Production and Support Sustems for African leafy vegetables in three communities. *African Journal of Food, Agriculture, Nutrition and Development (AJFAND),* 7(3).

Baskin C.C. and Baskin J.M., (1998). *Seeds: Ecology, biogeography and Evolution of dormancy and germination.* San Diego, California: Acad Press.

Bates, R. e. a., (2012). Developing farmer seed enterprises to preserve and promote underutilized indigenous. *SEAVEG2012 Regional Symposium,* , 24-26 January , pp. 228-234.

Bewley J.D and Black M., (1994). *Seeds: Physiology of Devvelopment and Germination.* 2nd ed. New York: Plenum Press.

Chweya J.A. and Mnzava N., (1997). *Chweya J.A. and Mnzava N., 1997. Promoting the Conservation and UsPromoting the Conservation and Use of Underutilized and Neglected crops.* Rome, Itally, : International Plant Genetic Resources Institute.

Daniel I.O. and Adetumbi J.A., (2004). Seed Supply system for vegetable production at small-holder farms in South-Western Nigeria. *Euphytica,* 140(3), pp. 189-196.

International Seed Testinng Association (ISTA), 2005. *International rules for seed testing.* Bassersdorf CH-Switzerland: s.n.

Sperling L. and McGuire, (2010). Understanding and Strdngthening Infrmal seed markets. *Experimentak Agriculture,* 46(2), pp. 119-136.

Sunil Chandra et al., (2009). Soybean Seed Quality Evaluation. *Nature and Science,* 7(5).