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ENHANCING CASHEW (*Anacardium occidenatale*) SEEDLING GROWTH: THE ROLE OF POLYTHENE BAG SIZE ON GERMINATION AND DEVELOPMENT

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ABSTRACT

This study investigated the impact of various polythene bag sizes on the germination and growth of cashew seedlings. Three polythene bag sizes (small: 6x9 inches, medium: 8x12 inches, and large: 10x15 inches) were used as treatments, with 15 replications each. The experiment was conducted in a completely randomized design at the Research and Experimental Station, College of Horticulture, Dadin-Kowa, Gombe State, Nigeria. Results showed that the small polythene bag size had the shortest germination day (16.25 days) and highest germination percentage (37.0%) with no significant difference were observed among the treatment in term of germination date and germination percentage. In addition, the large polythene bag size promoted better seedling growth, with significant improvements in plant height, number of leaves, and leaf area. However, no significant difference at ($p<0.005$) was observed among treatments regarding Plant height at PH1and PH2, but significant difference were observed at PH3 with values shows 22.25, 25.25, 28,00 34.50 for T1, T2, T3 and T4 respectively. Also significant difference at ($p<0.05$) was observed among treatments regarding number of leaves and leaves area except for LA2 and root length where no significant difference were observed. The study recommend that, cashew farmers should use larger polythene bags 10x15 inches for optimal seedling growth and monitor nursery conditions to enhance germination and growth.

Keywords: Polythene Bag Size, Germination, Seedling Growth, Nursery Management

INTRODUCTION

Cashew (*Anacardium occidentale*) is a tropical evergreen plant, belonging to the family of *Anacardiaceae*, known for its nuts and flesh that are consumed worldwide. The family comprises of about 60 genera and 400 species of trees and shrubs with resinous bark, and grows most abundantly in the tropics in both eastern and western hemisphere (Ohler, in Eradasappa *et al.* 2022). It is a hardy crop which grows well on marginal land and therefore seen as an ideal crop for soil conservation and afforestation, especially in savannah areas. It grows greater than 12m high and has a spread of 25m. It has extensive root system and this enable it to tolerate a wide range of moisture level and soil type (Odeyemi *et al.* 2024). Thus, the plant is well adapted to seasonally wet and dry tropical climates and has the capacity to grow on well-drained, light textured soils with minimum inputs as it applied to Sudan savannah vegetation zone in Nigeria.

The cashew trees are distributed across tropical, sub-tropical and temperate regions in the world. The region where cashew mostly grow, lies between latitudes 27° N in Southern Florida and 28° S of South Africa; and also in low latitude regions, near the equator, between the parallel 15° N and 15° S, in coastal areas, typically tropical South America, Africa and Asia (Swamy, 2023). The plant is a native of tropical America from Mexico to Peru and Brazil and of the West Indies as well, and it has become naturalized in coastal areas of many tropical countries. In early 70s, Africa is the continent with the largest producer of raw Cashew nuts accounting for 67.5% of world production. It then, subsequently declined to 35.6% by 2000, with Nigeria, Tanzania and Mozambique being the largest producers. Portuguese explorers were introduced a cashew nut to Nigeria between 15th and 16th Century purposely for erosion control and afforestation scheme in South Eastern Nigeria. It then became a popular crop planted on a large scale principally for afforestation and erosion prevention in coastal area of Nigeria particularly South-Eastern areas of Udi, Mbala, Oghe, Oji, Isuochi and Kingie by the defunct Eastern Nigeria Development Corporation (Adejo, *et al.* 2024*)*.

Cashew has an investment, industrial, medicinal, and export potentials. Products from cashew fruits include; liquor, vinegar, juice, juice concentrate, beverage, pickle and jam products. According to Ramadhan *et al. (*2018) Cashew is increasingly becoming the nut of choice given its health benefits and the hype it currently enjoys on the global market. This translates as an increase in demand and ultimately high prospects for producing countries. Cashew nut shell contains in edible nut shell liquid (CNSL) while the nut contains cashew nut kernel oil (KNKO) which is sweet edible oil. The pressed kernel cake from (CNKO) extraction process is suitable for the production of human and animal feed (Odeyemi *et al*. 2024). The cashew apple is eaten fresh or mixed in fruit salads and it is also used in the preparation of juice. Cashew apple can be distilled to produce alcoholic beverages and wine (Mohanty *et al*. In Pooja *et al.* 2022). Cashew nut possesses high medicinal potency (Zarqa *et al.* 2021) indicted that cashew nut shell liquid (CNSL) contains high proportion of phenolic compound which is an essential industrial raw material for production of vehicle brake lining compounds, water proofing agent, preservatives, acid proofing cement, industrial floor tiles and for manufacturing paints and plastics materials. Also, dried residues left after the extraction of juice from cashew apple which constitutes about 30-40% of apple weight, can serves as cattle feed. Zarqa *et al*. 2021), further asserted that, cashew plant presented an essential health benefit. The researchers established that, the cashew tree's leaves, apple and bark possess the herbal health benefit which include; killing Bacteria and Jams, stopping diarrhoea, increasing libido, reducing fever blood Sugar and pressure. Cashew also has an obesity and gallstone fighting property. High magnesium content in cashew nut provides healthy borne and good teeth structure, while the presence of copper produces energy and antioxidant defences.

Cashew is often planted by seed; two seeds are planted per hole at 15cm apart and at a depth of 3 to 5cm with the stalk

end pointing upwards (Asikin *et al. 2024*). The process of planting more than one seed at stake and thinning out weaker seedlings after wards causes wastage of seed which is the main planting material, thus nursing of seeds before transplanting into the field is inevitable as other tree crop. Tree crops nursery is typically done in polythene bags of specific sizes also Variation in how best the germination and seedling growth can be improve using different polythene bags size at nursery to reduce seed dormancy is one of the area of research interest (Abubakar et al.2023) Cashew seedlings are very sensitive to transplanting shock. The use of poly bags reduces disturbances to the roots of seedlings. It also cuts down the handling costs of individual seedlings. There are different types of poly bags. Some bags have the bottom end closed and are provided with drainage holes. Other bags, known as poly sleeves, are available in different colours, sizes and forms as readymade plastic plant bags with an open bottom. These poly sleeves are cut from a continuous roll (Ramadhan *et al.*2018).

These polythene bags are often perforated to prevent waterlogged soil and promote healthy root growth. Although, there is no consensus among the scholars as to which size of the nursery bags is uniformly recommended for proper seed germination and seedling growth (Odeyemi *et.al* 2024). According to Nasrat *et al.* (2021), different countries use different polythene bags size for nursery practice. However, as for cashew nursery in Nigeria, the recommended polythene bag size is usually around 6x9 inches to facilitate good drainage (Abanum *et-al. 2022).* Despite the recommendation, many farmers are currently not using the above polythene bags specification for cashew nursery, instead, they often use comparably larger size and some are using smaller size than the recommended size with little scientific information on what effect do this practice will have on the nursing seedling. It is established that, larger size polythene bags have the disadvantage of requiring plenty soil that requires more labour to fill and demands more resources for transporting to the field. They also occupy a large nursery space and require more water for watering in contrast to smaller polythene bags. Different sizes of polythene bags have an effect on the germination, emergence, and growth of cashew seedlings (Abanum *et al. 2022)*. Research have revealed that, smaller bags enhances root growth, but potentially restricted stem growth due to limited soil volume, medium bags balances root and stem growth with optimal nutrient uptake while larger bags increases stem growth, but potentially reduced root growth due to excessive soil volume. Another study conducted by Nasrat *et al.* (2021), revealed that, small polythene bag can faster germination due to increased temperature and moisture retention, medium polythene bag proved optimal germination with balanced temperature and moisture while large polythene bags slower germination dues to reduced temperature and moisture loss. It is very important to determine the polythene bag size which will have the same effect as the one in use. This call for the need to assess the potentials of other polythene bag sizes in relation to germination ability of the cashew seeds and other growth attributes. The objective of this study is therefore to determine the most appropriate polythene bag size for the nursing of cashew that ensures germination and maximizes the growth of cashew seedlings while reducing the space, cost and labour requirement in cashew nursery practice.

MATERIALS AND METHODS

Study Area

The study was conducted at the research and experimental station of the college of horticulture Dadinkowa Gombe state. The area is located in Savannah region of northern Nigeria. It lies between lat. 10 ad 11° N and lo 11 and 12° E. The topography is between 450- 500m above the sea level. The vegetation of the area is Sudan Savannah with the temperature ranges between 22- 32°C and the annual rainfall of 800-1000mm. The dominant soils is alfisol, inceptisol and entisol with pH ranges from 5.5-6.5 i.e slightly acidic to neutral (IITA,2018) with nutrient availability moderate to low fertility.

Experimental Design and Treatment

Experimental research design specifically Complete Randomise design (CRD) was adopted for this study. The experiment was done with three varying polythene bag size, classified as small, medium and large as a treatment. The sizes of the polythene bags are; (6x9 inches), (8x12 inches) and (10x15 inches) for small, medium and large respectively. These polythene bags were perforated at the bottom and used as a nursery container. Each size of the three polythene bag represent a treatment hence T1(6x9 inches) Small size polythene bag T2 (8x12 inches) Medium size polythene bag T3 (10x15 inches) large size polythene bag. In each treatment there were (15) polythene bag given total of 45, which were replicated 3 times produced the whole sum of 135 polythene bags in the experiment.

The Seed for planting was obtained from national horticultural research institute Dadin-kowa Gombe State. Open pollinated Brazilian dwarf cashew which is the most commonly found variety was used. The seeds were selected based on sinker and floater methods (Mandal, 2000) and those seed which sink in water were used only for the experiment. From the seed so selected after soaking for 24 hours, one seeds were sown par polythene packets and (15 seeds per treatment). All the cultural practices required which include Regular weeding, watering, removal of side branches and plant protection measures were done as when due.

Data Collection

Data collection were began with the Observations on the germination period (days taken from first germination to last germination 12-12 days) and were recorded and germination percentage was calculated. Under each treatment, five (5) plants were randomly selected for data collection. The number of leaves were counted by hand, for leaf area with leaf area meter, stem girth with a veneer calliper, plant height and root length with a ruler. The selected plants were pulled out ten (10) week after germination and observations were recorded for root development.

Data Analysis

Data was subjected to analysis of variance (ANOVA) with Gen Stat Discovery Edition 3 software and the treatment means separated by least significant difference (LSD) test.

RESULTS AND DISCUSSION

Result

The table below presents the effects of different size of nursery polythene bags on the germination and growth of cashew seedlings over a 9-week period. Treatment 1 had the highest germination percentage (37.0%) and shortest germination day (16.25). Treatment 4 had the tallest plants at week 9 (34.50 cm). Also Treatment 4 had the most leaves at week 9 (25.75) and Leaf Area. Treatment 4 had the largest leaf area at week 9 (58.0 cm^2). For Root Length No significant difference was observed among treatments.

Table 1 effect of different size nursery polythene bags on the germination and growth Growth cashew

Treatment	Number of Weeks after Sowing											
	GD (days)	GP (%)	PH1	PH2	PH3	NL1	NL2	NL3	LA1	LA2	LA3	RL
1	16.25	37.0	14.75	20.00	22.25	7.00	9.50	19.25	23.2	25.0	72.8	16.75
2	18.75	25.2	16.00	23.00	25.25	6.50	12.00	21.00	22.2	24.8	33.0	16.00
3	17.00	23.2	18.75	21.00	28.00	7.25	17.50	25.25	18.2	30.5	36.8	19.00
4	19.25	22.0	18.75	25.75	34.50	9.50	15.75	25.75	42.2	31.0	58.0	19.00
LS ($p < 0.05$)	*	*	NS	NS	*	*	*	*	*	NS	*	NS
LSD	2.266	11.24	4.815	3.638	4.887	1.366	5.102	4.635	11.81	7.70	37.22	3.829

Key:
GD = Germination day, GP= Germination percentage, PH1 = Plant height at week 3, PH2 = Plant height at week 6, PH3 = Plant height at week 9, NL1= Number of leaves at week 3, NL2= Number of leaves at week 6, NL3= Number of leaves at week 9, LA1= leaves area at week 3, LA2= leaves area at week6, LA3= leaves area at week 9 and RL= Root length

Discussion

Base on the result in Table 1, T1 small polythene bag (6x9 inches) supported the early germination (16.25 days) than the other treatments which appeared to be 18.7, 17.00 and 19.25 for T2, T3 and T4 respectively. Both the analysis of Days to germination and germination percentage showed some significant difference at ($p>0.05$) among the treatments. This can be attributed to the size of the polythene bag as reported by Nasrat *et al.* (2021) who asserted that, Small polythene bag can faster germination due to increased temperature and moisture retention while large polythene bags slower germination dues to reduced temperature and moisture loss. The Treatment 2 had inconsistence performance in both germination and growth across the parameter and treatment 3 had slower germination and growth. Larger polythene bags (Treatment 4) promote better growth and development of cashew seedlings evident from the result generated from all the analysed growth parameters. This finding is in line with Abanum *et.al (2022)* which posited that, smaller bags enhances root growth, but potentially restricted stem growth due to limited soil volume, medium bags balances root and stem growth with optimal nutrient uptake while larger bags increases stem growth, but potentially reduced root growth due to excessive soil volume. Significant difference at ($p>0.05$) was observed among the treatments in most of the growth parameters except for (PH1) and (P2), (LA2) and (RL).at regard to root length (RL)

CONCLUSION

The study investigated the effect of different size of polythene bags on the germination and growth of cashew seedling. The result shows that size of polythene bags can significantly affects germination and growth of cashew seedling. Large polythene bags (treatment 4) significantly improved cashew seedling growth, including plant height, number of leaves and leaves area. Treatment 1 had the shortest germination day and highest germination percentage indicating optimal seedling establishment. No significant difference was observed among the treatment. Therefore, Cashew farmers should adopt the larger polythene bags size (treatment 4) for better seedling growth and should ensures monitoring and adjust the nursery conditions to optimise germination and growth.

REFERENCES

Abubakar, K. D., Musa, D. D., Garba, N. H., & Mubarak, I. A. (2023). The effect of different pre-sowing treatments on breaking seed dormancy in baobab (Adansonia digitata L.) plant. FUDMA Journal of Sciences, 7(1), 207-211. *DOI: https://doi.org/10.33003/fjs-2023-0701-1289*

Abanum N.B., Ede O.M., Olufemi A., Arinze O.V. (2022), Cashew Seedlings Nursery Production in University of Abuja Nigeria and its Response to Different Organic Amendments. African Journal of Agriculture and Food Science 5(2), 1-15. https://doi.org/10.52589/AJAFS-YXT9XB3S.

Adejo, E.G., Adejo, P.E., Eti-Ukwu, A.I., Ajibade, Y.E. and Usman, A.M. (2024) Analysis of adoption of cashew management techniques by cashew farmers in Zone B Agro-ecological zone of Kogi state ADAN J. Agric. 2024, 5: 41-49 © *Association of Deans of Agriculture in Nigerian Universities (ADAN)* ISSN 2736-0385 https://doi.org/10.36108/adanja/4202.50.0150

Asikin M, Nirwana N, Wahvullah W. Mahmud M. & Ummu K. (2024), Analysis of the Success and Vigour of Cashew Seedlings Through Direct Seed Planting (*Anacardium occidentale* L.) for Sustainable Land Management *WASIA Journal* https://doi.org/10.62142/k2c42y88

Eradasappa, E., Venkat Rao, B. and Aswathy Chandrakumar (2022), Cashew Production and Post-Harvest Technologies. Hyderabad: National Institute of Agricultural Extension Management (MANAGE), Hyderabad & ICAR- Directorate of Cashew Research, Puttu Karnataka, India.

Swamy.K.R.M. (2023),"Origin, domestication, taxonomy, botanical description, genetics and cytogenetics, genetc diversity and breeding of cashew (Anacardium occidentale L.)". *International Journal of Development Research,* 13, (04), 62406-62429.

Manda!, R. C. (200), *Cashew Production and Processing Technology.* Agrobios (India) Publishers, Ludhiana. pp.22-31.

Nasrat B., Golam M. C., and Muhammad A. H. (2021),The Selection of Nursery Polybag Size on Effect of Growth and Quality of Khaya Anthotheca (Meliaceae) Seedlings under Nursery Condition in Bangladesh *journal of Forest and Environmental Science* Vol. 37, No. 2, pp. 141-147, June, 2021 https://doi.org/10.7747/JFES.2021.37.2.141

Odeyemi, E. F., Olorundare B. O., Ajewole, A. O., Atanda J. F., Ogunsowo, A. O., Raji, M. O., Akinola, C. O., Adesokan, M. A., Mustapha, K., Arowolo, S. T., Atolagbe, T. E., Yusuf, T.I. and Jayeola, C. O. (2024) A Review of Value-Added Products from Cashew Fruits in Nigeria in the Last Two Decades. *Journal of Research in Forestry, Wildlife & Environment Vol.16 (4):*

Olubode O.O, Joseph-Adekunle T.T, Hammed L.A and Olaiya A.O, (2017) Evaluation of production practices and yield enhancing techniques on productivity of cashew (*Anacardium occidentale* L.) I*nternational Journal of Tropical and Subtropical Horticulture* https://www.researchgate.net/publication/327139600

Pooja R., Sadashiv N, Bhoomika H.R., Shashikala S. and Ganapathi M.(2022) Germination andSeedling Vigour Studies in Cashew (Anacardium occidentale L) Varieties Biological *Forum – An International Journal 14(4): 1000-1003(2022)*

Ramadhan B., Bernard A., Emmanuel A., and Dwomoh S., (2018), Cashew Nursery Management And Grafting Technical Manual. Ghana, Ghana Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) 12p. I www.giz.de

Zarqa l, Muhammad A, Muhammad M S, Marium Ahsan Muhammad D, Aamir S, Muhammad T. Kl, Hina A, 2Fahad S, 5Muhammad Riaz *(2021)* Medicinal Uses of Cashew (Anacardium occidentale): Review *Journal of Science Technology and Research (JSTAR) Volume No.2, Issue No.1 (2021)* https://www.researchgate.net/publication/351607246