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Original Research Article

Effects of Seed Provenance on Daily Seed Germination, Cumulative Seed Germination and Germination Percentage of *Jatropha Curcas L.* in Sokoto State, Nigeria

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Abstract: The effects of seed provenance on daily seed germination, cumulative a seed germination and germination percentage of *Jatropha Curcas L.* was studied in the 2019 at the fruit and vegetable teaching and research Farm of Department of agricultural Science, Shehu Shagari College of Education Sokoto, Nigeria. The study area comprised of four senatorial zones of Sokoto state, Nigeria covering Sokoto Central Zone with Sokoto South, Wamakko, Kware and Binji Local Government Area. The Sokoto West Zone with Bodinga, Yabo, Shagari and Tambuwal Local Government Area. Sokoto East Zone with Gwadabawa, Goronyo, Isah and Sabon-Birni Local Government Areas. Seed accessions collected were dried properly and fumigated with nuval chemical and stored in polyethene bags. Uniform seed treatment was given to all the accessions prior to sowing, by soaking the seeds in water for 12 hours and subsequently sown directly on the field. They were laid out in a split plot design with three replications. Spacing was within the main plot, while seed germination was allocated the sub-plot. Data were recorded on percentage establishment, Daily seed germination, cumulative seed germination and germination percentage after the establishment count. Significant means were separated using the Duncan's New Multiple Range Test (DNMRT). The highest daily germination (3.33a) was recorded at the seed accession (SE1), followed by the SE2 (P>3.00a) and the least being the SE4 (p<1.00C) whereas on the cumulative germination however, the seed accession at SE1 had the highest (P>17.67a) followed by those of accessions SC1 and SW4 (who were at par (P<14.33bc) and the least that form the accession of SC4 (P<5.33f). The seed accession at SE1 had the highest (P.>88.33a), followed by the SC1, and SW4 which were statistically at far (P.<71.67). Whereas the least being that at the accession SC3 (P.<46.67e). Consequently the seed at accession SE1 are therefore recommended for *Jatropha* cultivation in the semi-arid zone of Nigeria.

Keywords: Physic nut, seed provenance, seed germination, germination percentage.

INTRODUCTION

Jatropha nut also referred to the physic nut, purge nut or pignut, is derived from a Greek word, which means 'Doctor' and trophe, which means nutrition (Hella, 1996). It is a perennial shrub which originates from the Central America (Aponte, 1978), which later spread to other tropical and sub-tropical countries as wild plant.

Jatropha grows on wide range soil types (Srivastova, 1999) but it requires a well-drained soil and it is adaptable to low fertility, alkaline soil, marginal lands and degraded soils (Open Shawn, 2006). Therefore can be grown with competing with food production (Heller, 1996; Grimm, 1996; RF 1998). Although not a native to Africa, Mabeka *et al.*, (2001), Hannin (2008) and Kumar and Sharma (2008) reported that it is fairly well established in many parts of the continent (Tanzania, Mali, Zimbabwe, Botswana, Malawi, South Africa, Nigeria, Ghana etc) as a live defence/hedgerow and for medicinal purposes, in Nigeria Jatropha is found growing as a live fence/hedgerow or as a wild plant with different local names, which show that it is spread throughout the country. In Hausa language, it is called Bini da zugu or ci ni da zugu, kmal-kwalaje in Fulfulde, lapa-lapa in Yoruba, kashain Nupe okwenwe in Igbo or neheogba (Ado and Abubakar, (2008).

Depending on the species, germination response of seed varies according to geographical and environmental factors viz latitude, elevation, soil moisture, soil nutrients, temperature, kind and diversity of plant cover, degree of habitant disturbance of the soil where the plant matures (Heller, 1996; Ginwal *et al.,* 2005). Kaushik *et al.,* (2007) studied variability in the seed trait of 24 curcas accession and observed significant differences in the seed germination and seedling growth of the *Jatropha*. Despite the economic importance of *Jatropha*, its potentials in commercial production remains under exploited due to absence of improved technologies. Therefore, there is a need to develop agronomic technologies for mass propagation and improved productivity. The objective of the study is to determine the best seed accession/provenance of *Jatropha curcus L.* plant from the four local government areas of the three senatorial districts of Sokoto state, Nigeria, with respect to plant establishment, seedling vigor and speed of germination of the crop.

MATERIALS AND METHOD

Experimental Site

The trial was conducted during the 2019 cropping season at the fruits and vegetable teaching and research farm at latitude 13°7" longitude 5°12" E, 278m ASL.), Department of Agricultural Science, Shehu Shagari College of Education Sokoto in the Semi-arid Sudan Savanna) agro-ecological zone.

Treatment and Experimental Design

Treatment consisted of 16 different accessions to Jatropha laid out in a completely randomized designed with three replications.

Cultural Practices

Jatropha seeds were collected from 16 live hedges of the plant in Sokoto State. Drawn from four local government areas in each of the three senatorial districts of the state. Comprising Sokoto South, Wamakko, kware and Binji Local government area (Sokoto Central); Bodinga, Yabo, Shagari and Tambuwal local government areas (Sokoto West) and Gwadabawa, Goronyo, Isah and S/Birni Local government areas (Sokoto east). The sample-seed accessions collected were sundried properly and fumigated with the nuval chemical stored in bags and leveled to maintain identity. A uniform seed treatment was given to all the accessions' seed samples prior to sowing on the field, by soaking the seeds in water for 12 hours and later were sown directly in the field.

i. **Land Preparation**: The experimental land was ploughed manually using the hand hoe and leveled with a rake, 15 rows of ridge at 0.5m apart were constructed.
ii. **Planting:** Seeds were planted in June 2019 through dibbling 2 seeds per hole at a spacing of 0.5 x 0.5cm were later thinned to one plant per stand.
iii. **Weeding:** Weeding was carried out at one month after sowing by using a hand hoe.
iv. **Watering:** Watering was carried out after every two weeks using watering can.
v. **Fertilizer Application:** Fertilizer was applied at one month after planting (45kg N, 60kg P2 05, 150kg K20/ha (Kaushik, 2007 through ring application method at a depth of 5cm and 15cm away from the plant (Anon, 2006).

Soil Sampling and Analysis

To determine the physico-chemical properties of the soil at the experimental site, soil samples were randomly collected at 0 – 50cm and 50 – 100cm depth. The samples were subjected to routine analyses.

Data Collection

i. **Germination Index:** was calculated as described in the association of seed analyst (AOSA, 1991), by the following formula:

$$\text{Germination index} = \sum (6T/Tt) \text{ or } \left(\frac{\text{No of germinated seeds}}{\text{Days of first count}}\right)$$

$$\left(\frac{\text{No of germinated seeds}}{\text{Days of first count}}\right)$$

ii. **Seedling Vigour Index**. This was calculated using the following formula:

$$\text{Seedling vigour ined (SVI)} = \frac{\text{Seedling length (cm) x germination seedling}}{100}$$

iii. **Speed of Emergence**: This was calculated in accordance with the following formula:

$$\text{Speed of emergence} = \left(\frac{\text{No of seedling emerged at 5 days after sowing}}{\text{No of seedlings emerged at 15 days after sowing}}\right) \text{X } 100$$

iv. Establishment Count: Stand count was taken at one month after sowing by counting all the plants in each treatment at one month after planting.

Data Analysis

The data collected were subjected and analysis of variance (ANOVA) procedure completely block design (RCBD) using statistical analysis system (SAS, 2003), wherewith, the significant differences in the treatment means were separated using the Duncan's New Multiple Range Test (DNMRT).

RESULTS AND DISCUSSION

Result of the effects of seed provenance on daily seed germination, cumulative seed germination and germination percentage of *Jatropha* is presented on table 1. Significant (P<0.05) was found among the different seed accession in all the parameters observed. Thus, the result did indicate the SE1, SW4, SC2 and SE3 recorded significant days to first germination than all the others whose germination started on the 2nd day, which ended up on the 8th day and those at SE3, SE4 which germinated on the 9th day after planting. The significant variation observed in the cumulative seed germination and germination percentage may be attributable to the significant differences observed earlier on the seed weight as reported by Rawat *et al*.,(2006) and Dunlop and Barnett (1983) who reported that speed and completeness of germination are on a function of the seed size and weight which and influenced largely by food reserve in the seed (Trpathi and Khan 1990; Khan and Shenkar, (2001)., or it could be as a result of genetic variability among the seeds or due to fact that the specie receives different amount of rainfall and the distribution in these areas (Vakshasya *et al.,* 1992) and temperature and soil types (Salkia *et al.,* (2009).

Table 1: Effect of seed provenance on daily seed germination and germination percentage of *Jatropha curcas L*

Accession	Source	Daily Seed Germination/20 Seeds								Cumulative Germination	Germination Percentage (%)
		Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9		
SC1	S/S	1.67bc	3.00b	1.67ab	1.33bc	1.33ab	2.67a	1.67a	0.00c	14.33bc	71.67bc
SC2	Wmk	2.00ab	2.00cd	1.67ab	1.33bc	2.00ab	2.33ab	1.00a	0.67bc	13.33bcd	68.67bcd
SC3	Kware	0.00d	1.00d	0.67b	1.31c	1.00bc	3.00a	1.67a	0.00c	9.33e	46.67e
SC4	Binji	0.00d	1.00d	0.67b	0.00c	0.33c	0.67b	2.00a	0.67bc	5.33f	26.67f
SW1	Bodinga	1.33bc	1.67cd	1.67ab	1.33bc	2.33ab	2.33ab	2.00a	0.33bc	12.67cd	63.33cd
SW2	Yabo	1.33bc	2.00cd	1.67ab	1.33bc	2.67a	2.33ab	1.33a	0.00c	12.67d	58.33d
SW3	Shagari	1.33bc	2.00cd	1.67ab	2.00ab	2.00ab	2.00ab	1.67a	0.00c	12.67cd	63.33cd
SW4	Tambuwa	2.00ab	2.33bc	2.00ab	2.33ab	2.00ab	3.00a	1.00a	0.00c	14.33bc	71.67bc
SE1	Gwadabawa	2.67a	4.00a	2.67a	3.00a	2.67a	3.33a	1.00a	0.00c	17.67a	88.33a
SE2	Goronyo	1.00c	2.33bc	2.00ab	2.99ab	2.33ab	3.00a	2.00a	0.67bc	15.33b	76.67b
SE3	Isah	2.00ab	2.00bcd	1.00ab	2.33ab	1.67abc	2.00ab	2.33a	1.33ab	14.00bcd	70.00bcd
SE4	S/B	1.00c	2.00bcd	1.33ab	2.67ab	1.67abc	2.00ab	1.33a	2.00a	13.33bcd	68.67bcd
SE±		0.258	0.310	0.564	0.430	0.455	0.584	0.463	0.344	0.755	3.776
Sig. Level	*	*	*	*	*	*	*	*	*	*	

Means in a column followed by same letter(s) are not significantly different (P>0.05) Ns = Not Significant * = significant at 5% level Ns = Not Significant MAP = Month after Planting

CONCLUSION

Seed provenance has significant influence on the daily seed germination, cumulative seed germination and germination percentage of *Jatropha*. Therefore, the seed accession at SE1 is therefore recommended for the study environment.

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