integrity Research Journals

Journal of Agricultural Science and Practice
Volume 6(6), pages 174-178, December 2021
Article Number: 94D3FF041
ISSN: 2536-7072
https://doi.org/10.31248/JASP2021.314
https://integrityresjournals.org/journal/JASP

Full Length Research

Effect of different planting dates on the growth attributes of cultivars of cocoyam (*Colocasia esculenta* and *Xanthosoma sagitifolum*) in the rainforest zone of Anambra State, Nigeria

E. E. Okoli*, E. N. Ngonadi and M. C. Nwagbala

Department of Crop science and Horticulture, Chukwuemeka Odumegwu Ojukwu University, P.M.B. 6059 Awka, Anambra State, Nigeria.

*Corresponding author. Email: ee.okoli@coou.edu.ng; Tel: +2348030585103.

Received 10th October, 2021; Accepted 30th October, 2021

ABSTRACT: The experiment was conducted in 2019 at the Teaching and Research Farm of Department of Crop Science and Horticulture, Chukwuemeka Odumegwu Ojukwu University, Igbariam Anambra State. The aim was to establish the best planting date for cocoyam cultivars. The experiment consisted of three cultivars (Ede nkiti, Akili Nssuka and Ede oyibo) as main factor while planting dates (28th June, 28th July and 28th August, 2019) was sub factor. It was a 3 x 3 factorial combination laid out in a Randomized Complete Block Design (RCBD) with three replications. Three cultivars of cocoyam and 3 planting dates (28th June, 28th July and 28th August, 2019) constituted (9) treatment combinations. Data were collected on number of leaves at maturity, plant height (cm), leaf area (cm^2), stem girth, and number of corms. Data collected were subjected to analysis of variance (ANOVA) and significant mean were separated using Fisher's Least Significant Difference. The highest number of leaves was recorded in the month of June which gave a mean number of leaves of 3.92, followed by July and August, which gave 3.24 and 3.00 respectively. So, number of leaves recorded for June showed that June was significantly different from the month of July and August. Plant height was highest in the month of June. The highest number of corms was recorded in the month of June as 26.2 followed by August then July, 18.0 and 17.8 respectively. The analysis of variance showed that the interaction between cocoyam cultivars and months of planting dates was not significant with regard to the number of corms of different cultivars of cocoyam.

Keywords: Cocoyam, corm yield, cultivar, growth attributes, planting dates.

INTRODUCTION

Cocoyam which ranks third in importance and extent of production after yam and cassava is of major economic value in Nigeria and refers to two members of the Araceae Family, namely *Colocasia esculenta* (L) Schott and *Xanthosoma sagitifolum* (L). They are staple foods for many people in developing countries of Africa, Asia and the Pacific (Agueguia et al., 1992).

In Nigeria *Colocasia esculenta* has seven cultivars namely (Coco India, Nworoko, Odogolo, Nadu, Nkong, Edenkiti and Akili Nsukka). These are used for soup thickening. While *Xanthosoma sagitifolum* has three cultivars such as Ede Ugwu, Ede oyibo, and Okoriko, these are non-irritation cultivars in the throat when eaten boiled or roasted, this clearly distinguished them from *Colocasia esculenta* cultivars. Cocoyam is a well adapted food crop across many agro-ecological zones of Sub-Sahara Africa. In the last three decades, Africa has consistently accounted for an increasing percentage of global cocoyam production, which currently stands at about 18 million tonnes per annum (FAO, 2012). The continent accounted for 74% of global cocoyam production (approximately 50% of global output) occurring in the West

and Central African sub-region. The average production figure for Nigeria is 4.8 million tons which accounts for about 37% of total world output of cocoyam. Cocoyam is, an important food crop in Sub-Saharan Africa, (SSA), particularly in Nigeria, Ghana and Cameroon. However, the increasing production in the region has depended largely on peasant farming rather than increasing crop yields per unit area of land (Manner and Taylor, 2010).

Nutritionally, cocoyam is superior to cassava and yam in the possession of higher protein, mineral and vitamin content in addition to having more digestive starch. Okoli and Okoronkwo (2020) reported that the development of highly nutritious crops will improve the nutritional status of the region and generally the standard of living of farmers in South-eastern Nigeria. Cocoyam is highly recommended for diabetic patients, the aged, children with allergy and for other persons with intestinal disorders. Boiled cocoyam corms and cormels are peeled, cut up, dried and stored or milled into bread and pudding for beverages. The peels can also be utilized as feed for ruminants (Dimelu et al., 2008).

Planting date is a major cultural farming operation that can affect crop performance and yield seriously. Indigenous knowledge of rural farmers in the South-east of Nigeria indicates that the crop is best planted in June. Reasons for that planting period are not clear. Reasons being offered include that being a less important crop, yam is always given preference. Others indicate that the crop prefers reduced insolation commonly obtainable between May and July each year. Some indicate it is just a matter of convenience. There is therefore need to determine the best period for planting cocoyam in the rainforest agro-ecosystem. Thus, the objectives of this work were to examine and find out the best period for cocoyam planting and to select the variety of cocoyam with optimum growth attributes under such climatic conditions.

MATERIALS AND METHODS

The experiment was carried out at the Teaching and Research Farm of the Department of Crop Science and Horticulture, Chukwuemeka Odumegwu Ojukwu University, Igbariam, Anambra State which lies between latitude 06° 14'N and longitude 06° 45'E and altitude 139 m above sea level. The research was a 3 x 3 factorial experiment laid out in a Randomized Complete Block Design (RCBD) in three replicates (cultivar x varying planting dates). The three cultivars of cocoyam planted were sourced from National Root Crop Research Institute (NRCRI), two cultivars were from the genus *Colocasia spp* known as Akili Nsukka and Ede nkiti and one from *Xanthosoma spp* known as Ede Oyibo in Igbo language. The land used for this experiment was cleared manually and tilled very well and prepared into fine tilt. The planting was done in ridges with planting depth of 15 cm and planting spacing of 1.5 m inter-row and 0.5 m intra-row. The plot was kept weed free throughout the experimental period using hoe.

Data collection

Records was taken on number of leaves at maturity while plant height at harvest was measured from the ground level to the point of first attachment of the leaves in (cm). Leaf area was the product of the leaf length and width in (cm^2). The girth was measured (cm) and number of corms was counted after harvest. This was carried out by the method outlined by Steel and Torrie (1980).

Statistical analysis

Data collected were subjected to analysis of variance (ANOVA) using GENSTAT release 10.3 statistical software. The means were separated using Fisher's Least significant difference (F-LSD) at 5% probability level as described by Obi (2002).

RESULTS

The result of number of leaves at maturity presented in Table 1 showed that the number of cocoyam leaves produced in the month of June were significantly different from the records of July and August. The highest number of leaves was recorded in the month of June as 3.92 followed by July and August, 3.24 and 3.00 respectively. The lowest number of leaves was recorded in the month of August as 2.60. The number of leaves produced by the three cultivars examined was not significantly different. The analysis of variance showed that the interaction between cocoyam varieties and months of planting dates was not significant.

The result of plant height at harvest presented in Table 2 indicated that plant height in the month of June was significantly higher than the plant height of July and August. The highest height was recorded in the month of June as 6.56 cm followed by July and August, 5.58 cm and 4.50 cm respectively. The lowest plant height was recorded in the month of August as 4.38 cm. The result of plant height among the three cultivars examined was not significantly different. The analysis of variance showed that the interaction between cocoyam varieties and months of planting dates was not significant.

The leaf area of the three cultivars of cocoyam presented in Table 3 revealed that there were no significant differences amongst the various dates of planting. The highest leaf area was recorded in the month of June as 58.9 cm^2 followed by July then August, 53.2 and 51.2 cm^2 respectively. The lowest leaf area was recorded in the month of August as 28.8 cm^2. The result of cocoyam leaf area recorded for Ede Nkiti cultivar examined was

Table 1. Effect of different cultivars of cocoyam and planting dates on number of leaves at Maturity.

Cultivar	June	July	August	Mean
Ede Nkiti (Colocosiaspp)	3.64	3.24	3.00	3.293
Akili Nsukka (Colocosiaspp)	3.92	2.94	2.94	3.267
Ede Oyibo (Xanthosoma spp)	3.26	2.94	2.60	3.053
Mean	3.727	3.040	2.847	

N.S = Not significant. LSD (0.05) for Cocoyam variety means (N.S); LSD (0.05) for Months means (0.4668); LSD (0.05) for Cocoyam variety x Months mean (N.S).

Table 2. Effect of different cultivars of cocoyam and months on plant height at harvest.

Cultivar	Plant height at harvest (cm)			Mean
	June	July	August	
Ede Nkiti (Colocosiaspp)	6.56	5.58	4.40	5.513
Akili Nsukka (Colocosiaspp)	6.42	5.14	4.50	5.353
Ede Oyibo (Xanthosoma spp)	6.020	5.44	4.38	5.280
Mean	6.333	5.387	4.427	

N. S = Not significant. LSD (0.05) for Cocoyam variety means (N.S); LSD (0.05) for Months means (0.4567); LSD (0.05) for Cocoyam variety x Months mean (N.S).

Table 3. Effect of different cultivars of cocoyam and months on leaf area of cocoyam.

Cultivar	Leaf area (cm^2)			Mean
	June	July	August	
Ede Nkiti (Colocosiaspp)	58.9	53.2	51.9	54.7
Akili Nsukka (Colocosiaspp)	40.1	40.2	33.2	37.8
Ede Oyibo (Xanthosoma spp)	35.8	40.8	28.8	35.1
Mean	44.9	44.8	38.6	

N.S = Not significant. LSD (0.05) for Cocoyam variety means (6.72); LSD (0.05) for Months means (N.S); LSD (0.05) for Cocoyam variety x Months mean (N.S).

significantly different when compared to the other two cultivars. The analysis of variance also revealed that the interaction between cocoyam varieties and months of planting dates was not significant.

The result for stem girth of three different cultivars of cocoyam is presented in Table 4. The highest stem girth was recorded in the month of June as 4.06 cm followed by July then August, 3.92 and 3.74 cm respectively. The lowest leaf area was recorded in the month of August as 3.08 cm. The result of cocoyam stem girth recorded for Ede Nkiti cultivar was significantly different when compared to the other two cultivars. The analysis of variance indicated that the interaction between cocoyam varieties and months of planting dates was not significant.

Table 5 revealed that the number of cocoyam corms produced in the month of June was significantly different from that of July and August. The highest number of corms was recorded in the month of June as 26.2 followed by August then July, 18.0 and 17.8 respectively. The lowest number of corms was recorded in the month of August as 12.4. The number of corms produced by Ede Nkiti cultivar was significantly different when compared to the other two cultivars. The analysis of variance showed that the interaction between cocoyam varieties and months of planting dates was not significant.

DISCUSSION

From the results obtained, plant height was highest in the month of June and significantly different from other months, Ede Nkiti cultivar plant height was highest both at insertion and at harvest according to Tables 3 and 4 respectively, there was not a very wide difference in plant height compared to July and August planting date in the other two cultivars, Akili Nsukka and Ede Oyibo. Deblonde and Ledent, (2001) reported that the taller potato plants observed within May and June planting dates when rainfall was high confirmed that plant height was sensitive to moderate rain conditions and found that plants exposed to

Table 4. Effect of different cultivar of cocoyam and months on stem girth of cocoyam.

Cultivar	Stem girth (cm)			Mean
	June	July	August	
Ede Nkiti (Colocosiaspp)	4.06	3.92	3.74	3.907
Akili Nsukka (Colocosiaspp)	3.40	3.26	3.20	3.287
Ede Oyibo (Xanthosoma spp)	3.20	3.12	3.08	3.133
Mean	3.553	3.433	3.340	

N.S = Not significant. LSD (0.05) for cocoyam variety means 0.3015; LSD (0.05) for months means N.S; LSD (0.05) for cocoyam variety x months mean N.S.

Table 5. Effect of different cultivars of cocoyam and months on the number of corms.

Cultivar	Number of corms			Mean
	June	July	August	
Ede Nkiti (Colocosiaspp)	26.2	17.8	18.0	20.67
Akili Nsukka (Colocosiaspp)	20.6	17.2	13.6	17.07
Ede Oyibo (Xanthosoma spp)	19.8	13.8	12.4	15.33
Mean	22.2	16.2	14.67	

N.S = Not significant. LSD (0.05) for Cocoyam variety means (3.45); LSD (0.05) for Months means (3.45); LSD (0.05) for Cocoyam variety x Months mean (N.S).

low water stress were tallest, which also played out in this experiment.

Higher significant leaf area was accrued by Ede Nkiti cultivar than the other cultivar as recorded in Tables 4 and 5, which implies more area of photosynthetic activity hence increased corm and cormel formation. These results are in agreement with previous findings by Bussell and Bonin (1998) from their studies on taro (*Colocasia esculenta*) in New Zealand. Mcfarland and Barko (1990) study on cocoyam in India, suggested that increased leaf area due to earlier planting may be associated with higher amount and longer duration of rainfall, warmer air temperature and higher relative humidity experienced during the juvenile growth period of the crops, which invariably influenced corm yields.

Previous studies by Lebot et al. (2006), Omenyo et al. (2013) and Osuji and Nwala (2015) showed that yield differences due to planting date can be ascribed to variation in weather conditions (precipitation, sunshine and relative humidity). This study confirms that rainfall was more abundant in the months of June than in July and August during the cropping season. Also, plants sown earlier had more time for growth under suitable moisture and temperature that cocoyam cultivars required for increased corm yield. Similar studies on two potato cultivars (Kawakami et al., 2006) showed that delaying planting date reduced tuber yield mainly because of a shortened growing period. Furthermore, Balali et al. (2008) who had compared three planting dates (November, December and February) on mini-tuber production of Marfonapotato (*Solanum tuberosum cv.Marforna*) in South Africa, reported that November was optimal and delay reduced mini-tuber yield significantly.

Conclusion

The results of this study indicate that the month of June recorded the highest values for the number of leaves, plant height, leaf area, stem girth and number of cocoyam corms. Therefore, the month of June is recommended for farmers in rainforest zone of Anambra State as the cocoyam planting date.

CONFLICT OF INTEREST

Authors have declared that no conflicting interest exit.

REFERENCES

Agueguia, A., Fatokun, A. C., & Hahn, S. K. (1992) protein analysis of ten cocoyam, *Xanthosoma sagittifolium* (L) Schott and *colocasia esculenta* (L) Schott genotypes. Root crops for food security in Africa. Proceedings of the 5th Triennial symposium, kampala, Uganda, p. 348.

Balali, G. R., Hadi, M. R., Yavari, P., Bidram H., Naderi A. G., Eslami A. (2008). Effect of pot size, planting date and genotype on mini tuber production of *Marfona*potato cultivar. *African Journal of Biotechnology,* 7(9), 1265-1270.

Bussell, W. T., & Bonin, M. J. (1998) Effects of high and low watering levels on growth and development of taro. *New Zealand Journal of Crop and Horticultural Science,* 26(4), 313-317.

Deblonde, P. M. K., & Ledent, J. F. (2001). Effects of moderate drought conditions on green leaf number, stem height, leaf length and tuber yield of potato cultivars. *European Journal of Agronomy*, 14(1), 31-41.

Dimelu, M. U., Okoye, A. C., Okoye, B. C., & Agwu, A. E. (2008):

Determinants of gender efficiency of small-holder cocoyam farmers in Nsukka Agricultural Zone of Enugu State. Proceedings of the 42nd Annual Conference of the Agricultural society of Nigeria, Ebony State University, Abakaliki. Pp. 993-998.

Food and Agricultural Organization (FAO) (2012). FAO Statistical yearbook world food and agriculture, Rome, Italy. Food and agriculture organization of the united Nation.

Kawakami, J., Iwama, K., & Jitsuyama, Y. (2006) Soil water stress and the growth and yield of potato plants grown from micro tubers and conventional seed tubers. *Field Crops Research*, 95(1), 89-96.

Lebot, V., Ivancic, A., Quero-García, J. (2006). Comparative performance of local and introduced cultivars of taro (*Colocasia esculenta* (L.) Schott) in Vanuatu. In: *Proceedings of the 14th Symposium of the International Society for Tropical Root Crops*. Thiruvananthapuram, Kerala, India, 20–26 November, (ISTRC).

Manner, H. I., & Taylor. M. (2010). Farm and forestry production and marketing profile for taro (*Colocasia esculenta*). In: Eleviteh, C. R. (ed). *Specially crops for pacific Island Agroforestry*. Permanent Agriculture Resources (PAR) Holualoa. Hawaii.

McFarland, D. G., & Barko, J. W. (1990). Temperature and daylength effects on growth and tuber formation in Hydrilla. *Journal of Aquatic Plant Management*, 28(1), 15-19.

Obi, I. U. (2002). Statistical Methods of detecting differences between treatment means and Research Methodology. Issues in Laboratory and field experiments. AP Express Publishers 117.

Okoli, E. E., & Okoronkwo, C. M. (2020). Heritability and combining ability estimates among seven varieties of maize in South-eastern Nigeria. *International Journal of Science, Environment and Technology*, 9(2), 98-107.

Omenyo, E. L., Quain, M. D., Moses, E., Asumadu, H., Acheampong, P. P., & Ankomah, A. A. (2013). Farmer participatory development of cocoyam (*Xanthosoma Sagittifolium*, Linn, Schott) Cultivars. *International Journal of Science Innovations and Discoveries*, 3(1), 74-85.

Osuji, J. O., & Nwala, P. C. (2015). Epidermal and cytological studies on cultivars of *Xanthosoma* (L.) Schott and *Colocasia* (L.) Schott. *International Journal of Plant and Soil Science*, 4, 149-155.

Steel, R. G. D., & Torrie J. H. (1980). *Principles and procedures of statistics. A Biometrical Approach*. 2nd edition. McGraw-Hill International Book Co. NY. p. 633.