VARIABILITY IN MORPHOLOGICAL CHARACTERS OF CASHEW TREES (*Anacardiumoccidentale* L.) GROWING AT EGUME, DEKINA LOCAL GOVERNMENT, KOGI STATE

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Abstract: Morphological variation has been a tool in classification of cultivars and thus used in study of genetic relationship. In this study, the morphological features of cashew trees (*Anacardiumoccidentale L.*) was studied with the aid of Cashew descriptors by International Board for Plant Genetic Resources (IBPGR). Fifty (50) cashew trees were randomly selected for the study and tagged at Egume, Dekina Local Government Area, Kogi State. Seven characters namely;tree habit, branching pattern, colour of the young leaves, colour of mature leaves, leaf-shape, leaf apex shape and leaf cross section were observed. Results revealed that for tree habits, spreading was observed in 24% of the selected trees while each of upright and compact and, upright and open were observed on 38% of the trees. Resultsof branching pattern shows that 30% of the selected trees had intensive pattern, the rest had extensive pattern. The colours of young leaves were purple (56%), purple red (20%), red (12%), green purple (8%), and green (4%). None of the young leaves examined exhibited green yellow or purple yellow colouration. Variabilities were also observed in colour of mature leaves, shape of leaves, and shapes of leaf apicesThe results of this study reveals that variability exist in cashew trees growing at Egume for all the morphological traits examined and this could be due to genetic differences and selection by human kind.

Keywords: Cashew, dorminant, genetic, morhological, shape, variability

Introduction

Cashew (*Anacardiumoccidentale* L.) is one of the major economic crops of Nigeria and native to Brazil (Samal *et al*., 2003). The multipurpose tree crop is grown extensively in four continents: South America, Australia, Asia, and Africa. World production of cashew nut in 2012 was estimated at 4.2 million metric tonnes from over 30 different countries (FAOSTAT, 2013). Nigeria is ranked among the top ten Cashew producing countries of the world; coming second after Vietnam. The others in order of production are India, Cote d'lvoire, Benin, Philippines, Guinea Bissau, Tanzania, Indonesia, and Burkina Faso (FAOSTAT, 2013). Cashew varieties cultivated in Nigeria are of variable nut sizes. These were introduced into the country at different periods between 16th century to 1982 by Portuguese explorers from India, Tanzania, Mozambique, and Brazil (Aliyu, 2012).

The cashew tree is a sprawling broad-leafed evergreen, well adapted to poor soils and dry sandy locations, drought resistant, but grows best on well drained sandy soils with pH of 4.5 to 6.5 (Aliyu and Awopetu, 2007). Genetic improvement is limited by the lack of knowledge of genetic diversity of the existing germplasm. Breeding of cashew is mostly based on selection of useful phenotypic and agronomic traits such as nut size, nut weight, colour of apple, size of the fruits, tree canopy, length of panicle, and overall yield production (Mneney *et al*., 2001; Chabi-Sika *et al*., 2013).

Traditionally, genetic diversity evaluated in crop species is based on differences in morphological and qualitative traits (Schut and Stam, 1997). In many cases, morphological characters have been used as a powerful tool in the classification of cultivars and as such continue to be the first step in the studies of genetic relationship in most breeding programmes (Van Beuningen and Busch, 1997). Cashew descriptor developed by International Board for Plant Genetic Resources (IBPGR) for the evaluation of cashew has been used for morphological characterization (Aliyu, 2012). The aim of this study is to quantify the morphological variation among the cashew trees (A*nacardiumoccidentale* L.) growing in Egume, Dekina Local Government Area, Kogi State, Nigeria.

Materials and Methods

Study area

The research work was carried out at Egume (Dekina local government area of Kogi State) which is located on latitude 7^{0}28′25″N and longitude 7^{0}14′ 148″E of the equator (Fig. 1). Egume is located within the warm humid zone of Nigeria with average temperature of 27^{0}C during the time of study. The wet season is from about April to the end of September or early October while the dry season is from about October to about the end of March or early April. The mean annual rainfall is 1260 mm and the effects of the harmattan can be severe, especially from about November. The vegetation is essentially guinea savanna with mixed deciduous forest patches.The area is characterized by sandy layer ranging between 78.6 and 84.6%, and clay ranging from 13.68 to 17.68%.

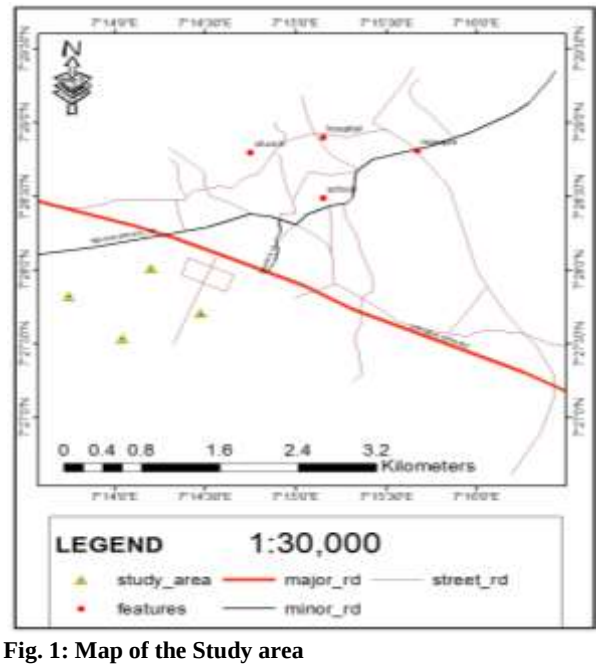

Fig. 1: Map of the Study area

Sampling procedure

Fifty (50) cashew trees were selected at random and tagged from one to fifty (1 – 50) in Egume, Dekina Local Government Area, Kogi state. The selected trees were observed for some morphological characters highlighted in Cashew descriptors by International Board for Plant Genetic Resource (1986);

Tree habit: upright and compact, upright and open, or spreading.

Branching pattern: extensive or intensive.

Colour of young leaves: green, yellow, orange, light pink, red, or brown. .

Colour of mature leaves: yellow, green, dark green, or pink.

Leaf shape: obovate, ovate, oblong, or circular.

Leaf apex-shape: pointed, rounded, or indented

Leaf cross-section: level, reflexed, incurved, or twisted.

Data analysis

The data obtained were subjected to descriptive statistics**.**

Results and Discussion

The percentages of tree habits presented in Fig. 1 shows that while 24% of the trees had a spreading tree habit (Plate 1), each of upright and compact, and upright and open constituted 38% (Plate 2). Castro *et al.* (2011) reported that 60% of *Anacardiumoccidentale* accessions had upright/open tree habit, 40% had upright and compact tree habit, and 0% had spreading habitin their study carried out at Embrapa Tropical Agroindustry, located in Pacajus, CE, Brazil. It was observed that the three cashew tree habits outlined by IBPGR (1986) were all present in the study area.

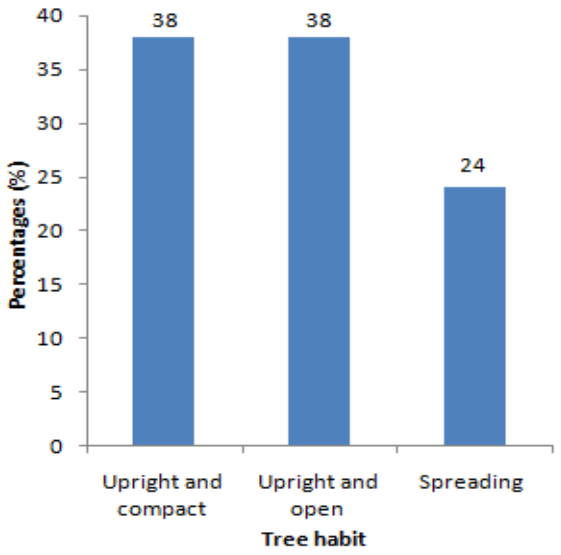

Fig. 1: Tree habits of the cashew trees

Plate 1: Tree habit (spreading)

Plate 2: Tree Habit (upright and open tree)

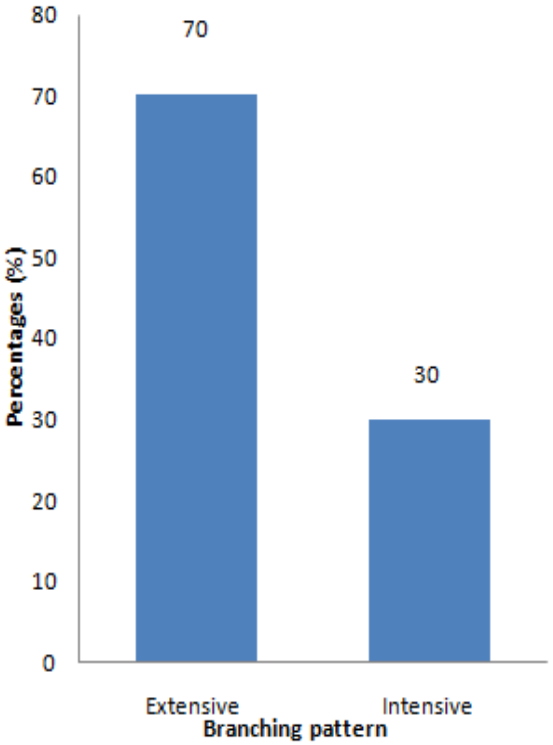

Fig. 2: Branching pattern of cashew trees

The percentages of branching pattern presented to Fig. 2 shows that 70% of the cashew trees had extensive branching patterns (Plate 3) while 30% had the intensive branching patterns. This is an important morphological feature of the plant as it has been shown to influence productivity (Saroj *et al.*, 2014). Although in most cases yield potentials is genetic and environment has some influence, nonetheless, trees with extensive branching patterns appears to be low yielding while those with intensive to a large extent appears to be high yielding (Olubode *et al.*, 2018).

Plate 3: Branching pattern (extensive)

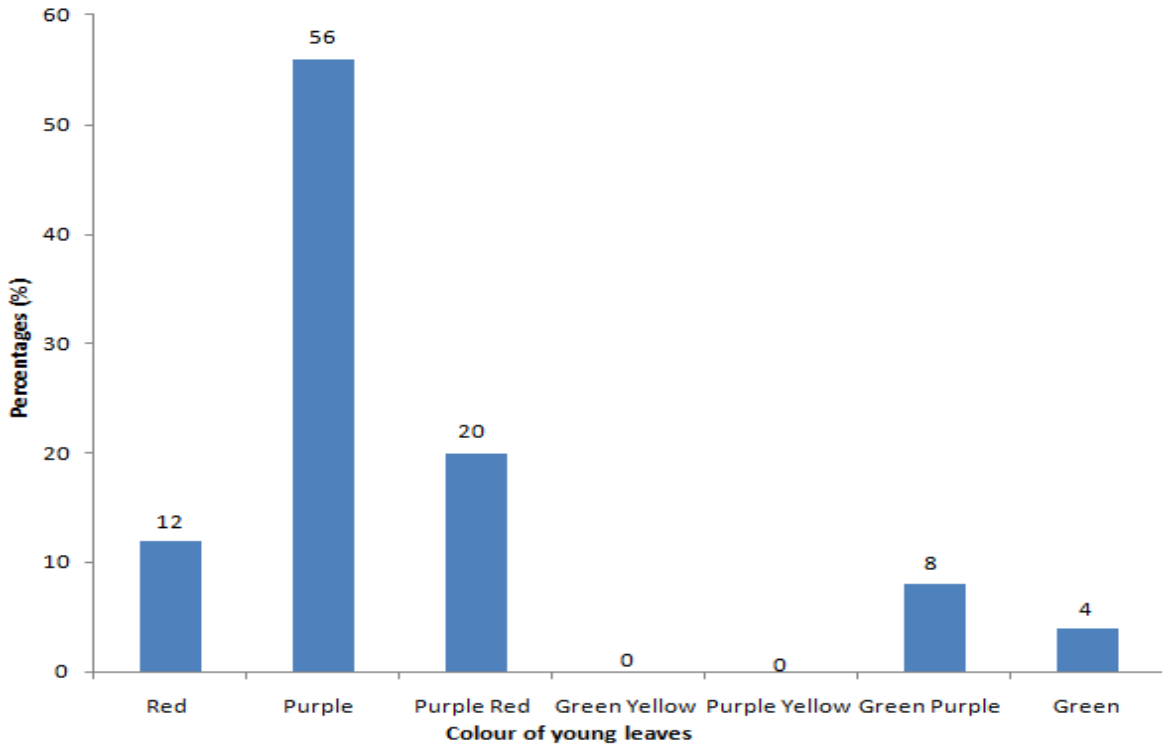

Fig. 3: Colour young leaves cashew trees

Figure 3 shows that none of the young leaves was green yellow or purple yellow in colour. Purple (56%) was the dominant colour (Plate 4) followed by purple red (20%). Other colourations were red (12%), green purple (8%), and green (4%).

Plate 4: Colour of young leaves (purple)

The variation in young leaf colour indicates that the trees are different cultivars and this agrees with Masawe, (2006) who said different cashew cultivars can physically be distinguished by flush colour, especially flushing prior to flowering. The crown of cashew trees with a different flush colour look quite different and the leaf colour can be one of the distinctive characteristics among cashew cultivars.

Colour of young leaves have been used for study of variability in Cashew. Castro *et al.* (2011) reported 80% reddish green and 20% light green young leaves. The young leaves of cashew are edible and medicinal (Chemonics International Inc., 2002).

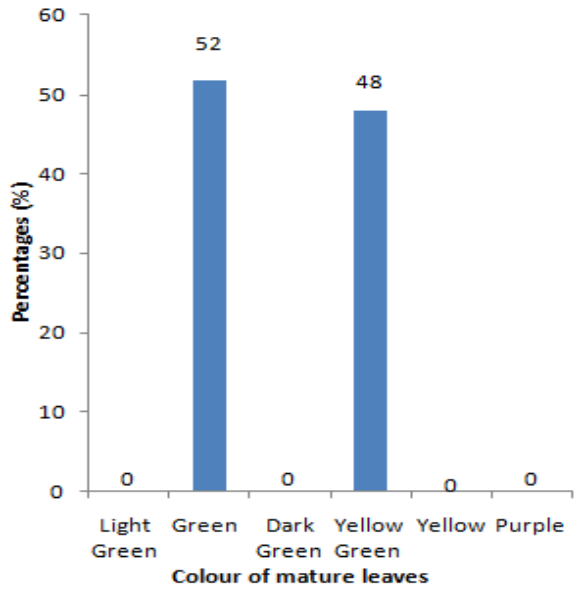

Fig. 4: Colour of mature leaves of cashew trees

Plate 5: Colour of mature leaf (dark green)

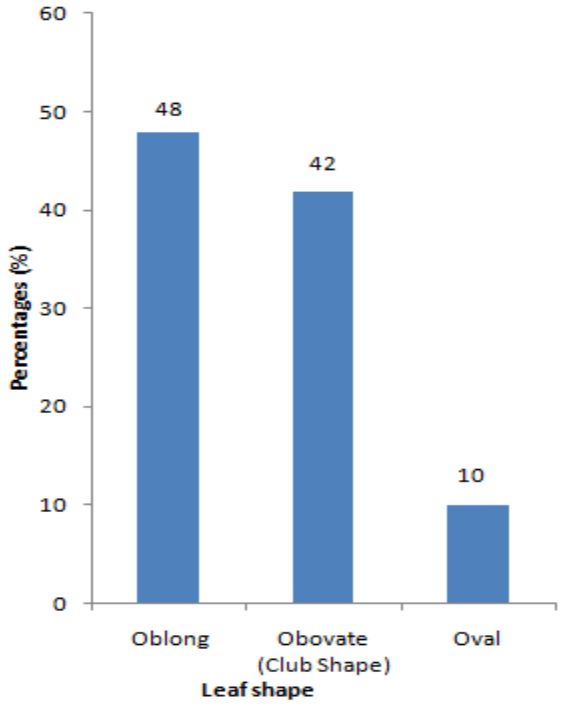

Fig. 5: Shapes of leaves of cashew trees

The colour of mature leaves presented in Fig. 4 shows that light green, dark green, yellow and purple were absent among the selected trees, green colour was observed in 52% of the selected trees (Plate 5) and yellow green in 48% of the selected trees. This result agrees with the report of Castro *et al.* (2011) who showed that 80% of *Anacardiumoccidentale* had green mature leaves while 20% had dark green mature leaves when they conducted their survey at Embrapa Tropical Agroindustry, located in Pacajus, CE, Brazil. Masawe (2006) reported that matured cashew leaves are generally green but colour intensity depends on the genotype.

The shapes of leaves observed from the randomly selected trees presented in Fig. 5 shows that oblong leaf shape had the highest percentages (48%), followed by obovate (club shape) 42%, and then oval 10%. This result indicates variation in cashew trees growing in the study area. Castro *et al.* (2011) used leaf shape as a means of morphological variability studies in *Anacardium* and reported 60% obovate leaf shape.

Figure 6 shows that rounded apex shape was observed in 60% of the selected trees. This was followed by indented (slight notch) (Plate 6), in 36% while pointed shape (Plate 7) was the least (4%) of the selected trees. The pointed apex shape seems to be rare among cashew tree as Nayak *et al.* (2014) reported the pointed apex shape to have occurred in just 7 accessions of all the 115 accessions studied at Puttur, India. Cashew leaf apex shape is a means of morphological classification.

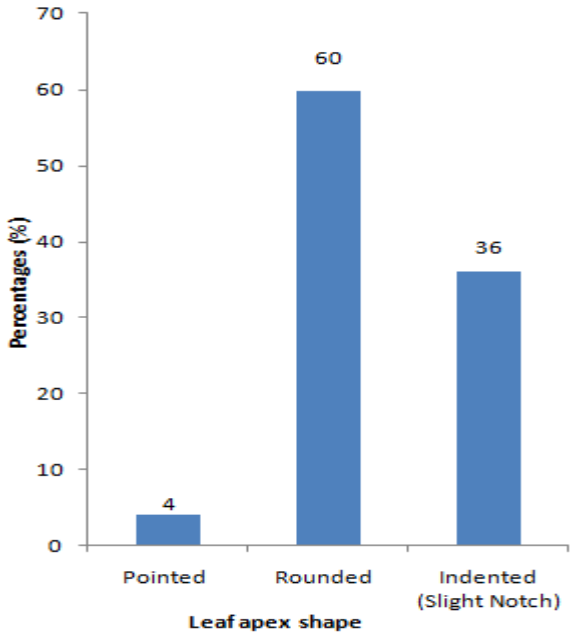

Fig. 6: Leaf apex shapes of cashew trees

Plate 6: Leaf apex shape (indented)

Plate 7: Leaf apex shape (pointed)

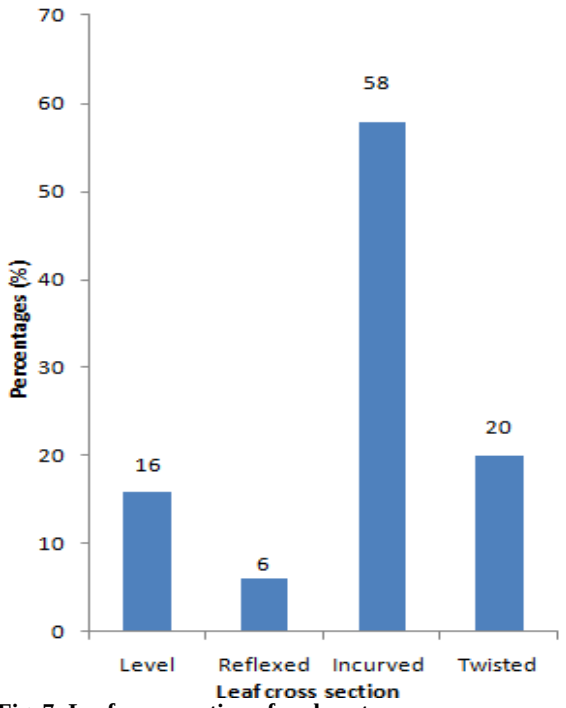

Fig. 7: Leaf cross section of cashew trees

Result presented in Fig. 7 shows that 58% of the selected trees had incurved leaf cross section which is the highest observed, 20% had twisted leaf cross section. All the descriptors for leaf cross section highlighted by IBPGR (1986) were observed among the selected trees, this is an indication of the variation that exists among the selected trees growing at the study area.

Conclusion

This study has provided information for assessing the level of morphological variation in cashew trees growing at Egume and the information might help in tree improvement programmes. The trees showed morphological variations in the tree habit, colour of the young leaf, colour of the mature leaf, the branching pattern, the leaf shape, the leaf apex shape and leaf cross section. However, to confirm whether the variations in habits studied are genetic in nature, there is need to do molecular studies using molecular markers.

Conflict of Interest

The authors declare that there is no conflict of interest related to this study.

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