Int.J.Curr.Microbiol.App.Sci (2023) *12*(08): 248-260

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 12 Number 8 (2023)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2023.1208.026

Fruits Variability of Some Nigerian Date-Palm (*Phoenix dactylifera* L.) Accessions as Revealed by Yield Parameters

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Keywords

Date palm, Accessions, Gene pool, Fruit characteristics, Germplasm

Article Info

Received:
20 May 2023
Accepted:
15 July 2023
Available Online:
10 August 2023

A B S T R A C T

The aim of this study was to investigate the fruit physical traits of some date palm accessions conserved in the experimental gene pool of NIFOR Date palm research substation in dutse, Nigeria. A survey and exploration were undertaken to collect the fruits from the population of the Female date palm (*Phoenix dactylifera* L.) trees germplasm across the gene pools. The results showed that the accessions R5P24 and R9P2 had the highest number of fruit length (4.73cm) and (4.87 cm). The accession R7P1 recorded the highest and significantly superior values (11.85 g) in fruit weight, while accession R24P9 recorded the lowest fruit diameter. The accessions R6P20, R14P21, and R5P20 showed no significant differences. Significant differences were recorded among the studied accessions in seed weight, seed length and seed diameter respectively.

Introduction

Date trees typically reach about 21–23 metres (69–75 ft) in height, growing singly or forming a clump with several stems from a single root system. This tree typically has feathery leaves at the top which may be anywhere from 0.9 to 1.5 feet (3 to 5 m) in length. The trunk is usually very long and narrow with rough-textured bark over most of its surface. There are no branches on a date palm tree. The leaves normally cascade downward from the crown of the plant to form a sort of canopy. They might spread anywhere from 19.7 to 32.8 feet (6 to 10 m) in diameter. Date fruits (dates) are oval-cylindrical, 3–7 cm (1.2–2.8 in) long, and about an inch (2.5 cm) in diameter, ranging from bright red to bright yellow

in colour, depending on variety. They are very sweet, containing about 75 percent of sugar when dried. Date fruit is a single, oblong, one-seeded berry, with a terminal stigma, a fleshy pericarp and a membranous endocarp (between the seed and the flesh). Depending on the flesh consistency and moisture content at harvest when fully-ripe, date palm cultivars are divided into three groups, namely soft, semi-dry and dry (Yahia, 2004; Yahia and Kader 2011).

The fruit contributes to the economy and social life within these regions (Bastway *et al.*, 2008) and it is considered as a vital component of their diet (Vayalil *et al.*, 2002) Date fruits are well known as a staple nutritious food and source of wealth for many years (Khan *et al.*, 2008). Because of its high nutritional value, great yields and its long life, the date palm has been mentioned as the "tree of life" (Augstburger *et al.*, 2002). The fruits of the date palms are consumed throughout the world. Dates are being consumed in modern cultures for their pleasant flavor, odor and their biting texture in addition to their use for flavoring foods, beverages and Medication as reported by Vayalil *et al.*, (2002).

The date fruit is monocot, up to 7 cm long. The date has an oblong shape, but some species can reach a sphere-like shape (Al-Alawi *et al.*, 2017). The date fruit consists of exocarp (skin), mesocarp (pulp), endocarp (inner layer) and seeds (pits). Mesocarp is the bulk of the fruit (85-90%), consists of epithelial cells and is divided into external and internal mesocarp (Dayang *et al.*, 2014). The flesh is surrounded by a thin layer of skin that is meant to protect the fruit (Ghnimi *et al.*, 2017).

However, the date seed represents 6-15% of the fruit weight, depending on the species, and is a valuable by-product of the date processing industry. The steed characterizes with the presence of a furrow of variable depth and width along its length. Seeds of different date varieties differ in the depth of the furrow. The date palm fruit seed characterizes with a high content of dietary fiber and can be used to increase the content of dietary fiber in some products (Ghnimi *et al.*, 2017). The seed contains mainly insoluble fractions of dietary fiber, e.g. the date seed Deglet Noor contains 50% cellulose and 20% hemicellulose. Date seeds are mainly used in the production of animal feed (Shafiei *et al.*, 2010).

The seed is usually oblong, ventrally grooved, with a small embryo, and with a hard endosperm made of a cellulose deposit on the inside of the cell walls. The seed weight ranges from less than 0.5 g to about 4 g, and the length from about 12 to 36 mm and breadth from 6 to 13 mm. There are wide variations in fruit and seed characteristics depending on variety, environmental conditions, and the field management practices (Zaid and de Wet, 2002; Al-Yahyai and Kharusi, 2012).

In Nigeria, date palm is one of the most important tree crops of Sahel, Sudan and Guinea Savannah ecologies where it has remained restricted within compounds, homesteads and orchards in the Northern part of the country i.e. above latitude 10^{o}N (Okolo *et al.*, 2005). It is generally believed that the date palm was introduced in to Nigeria in the early 17th century by traders and Muslim pilgrims on pilgrimage to the holy cities of Mecca and Madinah through the Trans Saharan trade route from North Africa and MiddleEast (Omoti and Okolo, 2000).

Although the date palm is not indigenous to Nigeria, but with over 400 years of its existence, the crop has been cultivated for sufficiently long time to have acquired agro – climatic adaptation and so evolved as land races. Most national collections of date palms germplasm rely primarily on these land races. In Nigeria, several collection missions have been undertaken to capture these land races by the Nigerian Institute For Oil Palm Research (NIFOR) for date palm germplasm conservation and crop improvement (Ataga *et al.*, 2012)

The states where Date palm is grown in Northern Nigeria includes Kaduna, Katsina, Kano, Sokoto, Kebbi Jigawa, Yobe, Borno, Gombe, Bauchi and Adamawa States, these are generally referred to as the Nigerian main date palm growing belt of the

country. Other state where it is grown includes Plateau, Taraba, Nassarawa, Kaduna and Niger State, as these states are classified as marginal areas for date palm cultivation in the country. Date production in Nigeria has two fruiting seasons (dry, that is, from February to June; and wet seasons fruits, that is, from July to August), but only the dry season fruit is economically useful, (Abdulqadir *et al.*, 2011). Although little or no research is done on fresh date fruit in wet season, as it is also harvested and consumed during this season (wet season) in Nigeria, being a tropical country.

Germplasm is a term used to describe living genetic resources such as seeds or tissue, maintained for the purpose of breeding, preservation, and other research uses. These resources may take the form of seed collections stored in seed banks, trees growing in nurseries, animal breeding lines maintained in animal breeding programs or gene banks, etc. It provides potential diversity base in genetic resources of cultivated plants (Mahmut, 2012). Germplasm collections can range from collections of wild species to elite, domesticated breeding lines that have undergone extensive human selection.

Genetic diversity is the sum total of genetic characteristic with in any specie or genus (Rao and Hodgkins, 2002). Genetic diversity is required by breeders for the development of new, superior crop varieties with desirable qualities that can ensure a stable, plentiful supply of food; feed, and fibre. Therefore, genetic studies cannot be conducted if species do not show any variation. It is clear that gene erosion is a very dangerous and alarming feature of present day exploitation of genetic sources. This prospect alarms both geneticists and breeders, since lack of diversity severely impairs the future improvement of crops and/or limits the possibilities for addressing new production constraints (Vetelainen *et al.*, 2008). The progress of any genetic preservation is dependent on understanding the amount and distribution of the genetic variation present in the genetic pool. Date fruits have great importance in human nutrition owing to their rich content of essential nutrients which include carbohydrates sugar ranging from 65% to 80% on dry weight basis mostly of inverted form i.e glucose and fructose. In addition, date fruit has been reported to have other important components like proteins, fat, vitamins, dietary fiber, fatty acids, polyphenols, antioxidant and amino acids. Date palm fruits have been reported to have natural constituents like phytochemicals, sterols, carotenes and flavonoids have been screened for various medicinal activities to reduce the side effects of artificial drugs that bring harm to human body systems. The pulp is rich in iron calcium cobalt copper, fluorine, manganese, sodium, copper and zinc etc.

Materials and Methods

Description of Study Area

The area for this study are Nigerian Institute for Oil palm Research (NIFOR), Date Palm Research Substation Dutse, Jigawa state where the fruit samples were collected and Federal University of Technology, Minna, Niger state in which the field experiment and some laboratory work was carried out. The substation of NIFOR is situated on latitude $10^{o}14^{1}$N and longitude $4^{O}12^{1}$E.The substation ecology is within the Sudan savannah with annual rainfall of about 600mm per annum and average temperature of 32^{O}C. The soil type is sandy to loam. The Experimental Garden is situated at the Department of Biological Sciences, Federal University of Technology, Minna, Niger State, Nigeria. Geographically, Minna is located in the North central geopolitical zone of Nigeria. It is located within longitude 6^{o}34 East and latitude 9^{o}36 north. It covers a long area of 88 square kilometers with an estimated human population of 348,788 (Niger State Ministry of Agriculture 2008). The area has a tropical climate condition with mean annual temperature, relative humidity and rainfall of 20-30^{o}C, 61% and 1334cm respectively. The climate presents two distinct seasons: a raining season between May and October and a dry season between November and April each year. The vegetation is a typical Guinea savannah type consisting majority of

grassland with scattered trees.

Exploration and Collection of fruits

A survey and exploration were undertaken to collect the fruits from the population of the Female date palm (*Phoenix dactylifera* L.) trees germplasm across the gene pools in the experimental field of Nigerian Institute for Oil palm Research (NIFOR) date palm research substation, Jigawa state, Nigeria. The Institute has the national mandate for the crops cultivation. The exploration and collection mission were undertaken to Gene pool 1 which contains germplasm originally collected from Sokoto, kebbi and Zamfara States); Gene pool 2 (collections from Kaduna and Katsina State); Gene pool 3 (containing collections from Kano and Jigawa State), Gene pool 4 (which contains germplasm from Bauchi and Gombe State) and Gene pool 5 (containing germplasm from Borno and Yobe State) Nigeria. The collection of fruits were done during the harvesting period between February and March, which involved a systematic random sampling from selected matured Female trees in all the gene pools. The collected date fruit were checked for physical damage and injury from insects and fungal infection. They were then brought to the laboratory of the Department of Plant Biology, Federal University of Technology, Minna, for studies.

Morphological Parameters of Fruits and Seeds

The morphological features of fruits and seeds were determined according to the method adopted by (Hanen *et al.,* 2009) with the following:

1. Colour of the fruit
2. Texture of fruit
3. Length of the seed/length of the fruit (cm) were determined using a meter rule
4. Weight of the seed/weight of the fruit (gram) were determined using a weighing balance
5. Diameter of the seed/ width of the fruit (gram) were determined using micrometer screw guage
6 Thickness of the pulpit (mm) were determined using micrometer screw guage
7. Weight of the seed/weight of the fruit (gram) were determined using a weighing balance
8. Length of the seed/length of the fruit (cm) were determined using a meter rule
9. Diameter of the seed/ width of the fruit (gram) were determined using micrometer screw guage.

Phenotypic Characters of the Fruit

Phenotypic observation of the accessions revealed colour variations among all the collected accessions regardless of the gene pool from which they were obtained. Four different shapes which are ovate, obovate, spherical and cylindrical were observed (Table 4.1). The cylindrical type of shape was the most abundant with nine (9) of the accessions being recorded, while the spherical shapes was the least observed among the accessions, (Table 4.1).

The colours observed among the accessions were brown, black, light brown and dark brown respectively (Plate I). A total of six accessions were recorded to have brown colour representing 28% of the total accessions, while 23% of the accessions represented the dark brown colour, the highest number of colour studied among the accessions was light brown which represented 38% and the least colour observed is the black which was recorded in the accession Zaria.

However, the texture of the fruit among the studied accessions were observed to be rough and smooth, six of the accessions were recorded to have smooth epicarp, representing 29% of the total accessions studied, while 15 Accessions were recorded to have rough epicarp representing 71% of the total accessions studied, (Plat II and Plate III).

Phenotypic characters of the seed

There were variations in the color of seed in all the accessions studied ranging from light brown, reddish brown and a combination of both colors in the seed. The result showed 47.6% of the accessions were light brown while 28.5% were reddish brown and 33.3% were reddish brown. Most accessions with

reddish brown color were observed to have a smooth seed coat while accessions with light brown color and accessions having the combination of both colors (light brown and reddish brown) were recorded to have a rough seed coat (Plate IV)

Results and Discussion

Fruit length

The results presented in Table 4 for fruit length as revealed by analysis of variance (ANOVA) showed a significant variation at ($P \leq 0.05$) and the accessions R5P24 and R9P2 had the highest number of fruits (4.73cm) and (4.87 cm), while the lowest was obtained in accession R13P1 (2.70cm) respectively.

Fruit weight

With regard to fruit weight, the accession R7P1 recorded the highest and significantly superior values (11.85 g) while the lowest was recorded in accessions R5P8 with a mean of 2.12 g, this value was significantly the same with R4P29 (table 4.5). However the accessions R5P20, R13P1 and R2P4 are statistically the same at P0.05.

Fruit diameter

The ANOVA showed a highly significant difference ($P<0.05$) among the accessions. The accession R7P1 had a significant higher diameter of fruit (2.10 mm). This value was significantly different from all other accession. The lowest was obtained in R24P9 (1.03mm), while no significant differences were observed in R13P9 and R9P12 but are significantly different from the values of all other accessions.

Fruit thickness

The result of fruit thickness showed significant differences at $P<0.05$. The highest value was recorded in accessions R7P1 and R15P6, with the mean values of 4.00 mm and 4.00 mm respectively.

However, no significant differences were observed in accessions R6P20, R14P21, and R5P20, with their mean values of 3.33 mm, but they are significantly different from the values of all other accessions.

Seed weight

The variation observed among the accessions in terms of seed weight at $P<0.05$. The highest mean value was recorded in the accessions R16P31 and R24P9 with the mean value of (1.53 g) and (1.51 g) while the least seed weight was observed in the accession R4P29 with the value (0.85 g), this value is significantly different from the values of all other accessions statistically.

Seed Length

The highest seed length was observed in accession R9P2 with (3.00 g) while the lowest was observed in accession R6P20 with (1.90 g), however high significant differences was recorded among the other accessions as revealed by ANOVA at $P<0.05$ respectively.

Seed diameter

The result of seed diameter showed significant differences at $P <0.05$, the highest value was obtained in R7P1 with a mean value of 8.67 mm, followed by accession R16P31 with 8.00 mm. The least was observed in R4P29 with 5.67 mm, this value was significantly different from the values of all other accessions.

The extensive variations of the fruits among the studied accessions revealed an important diversity in fruit characters which can be very useful in the assessment of phenotypic variability in the development of breeding programmes.

Table.1 Sources and Description of Date palm fruits Germplasm from the Genepools in Dutse Nigeria

S/N	Accessions	Gene pools	Place of Collection	State	Fruit Shape	Fruit Colour
1	R1P10	Genepl II	Nifor/Dutse	Jigawa	Obovate	Light brown
2	R1P18	Genepl II	Nifor/Dutse	Jigawa	Cylindrical	Light brown
3	R2P4	Genepl IV	Nifor/Dutse	Jigawa	Obovate	Brown
4	R3P22	Genepl II	Nifor/Dutse	Jigawa	Cylindrical	Dark brown
5	R4P12	Genepl III	Nifor/Dutse	Jigawa	Obovate	Light brown
6	R4P29	Genepl III	Nifor/Dutse	Jigawa	Obovate	Light brown
7	R5P8	Genepl III	Nifor/Dutse	Jigawa	Ovate	Light brown
8	R5P20	Genepl I	Nifor/Dutse	Jigawa	Obovate	Light brown
9	R5P24	Genepl II	Nifor/Dutse	Jigawa	Cylindrical	Dark brown
10	R6P20	Genepl II	Nifor/Dutse	Jigawa	Ovate	Dark brown
11	R7P1	NCRP	Nifor/Dutse	Jigawa	Obovate	Light brown
12	R9P2	Genepl I	Nifor/Dutse	Jigawa	Cylindrical	Brown
13	R9P12	Genepl II	Nifor/Dutse	Jigawa	Cylindrical	Dark brown
14	R13P9	Genepl1	Nifor/Dutse	Jigawa	Ovate	Brown
15	R13P1	Genepl IV	Nifor/Dutse	Jigawa	Spherical	Light brown
16	R13P5	Genepl IV	Nifor/Dutse	Jigawa	Cylindrical	Brown
17	R14P21	Genepl II	Nifor/Dutse	Jigawa	Cylindrical	Brown
18	R15P6	Genepl III	Nifor/Dutse	Jigawa	Spherical	Light brown
19	R16P31	Genepl I	Nifor/Dutse	Jigawa	Ovate	Dark brown
20	R24P9	Genepl III	Nifor/Dutse	Jigawa	Cylindrical	Light/dark brown
21	ZARIYA	Zaria Field	Nifor/Dutse	Jigawa	Cylindrical	Black

Table.2 Some fruit characteristics of the twenty-one date palm accession

Accessions	Fruit length (cm)	Fruit weight (g)	Fruit diameter (mm)	Fruit thickness (mm)	Seed weight (g)	Seed length (cm)	Seed diameter (mm)
R13P9	3.40±0.06^{defg}	2.71± 0.08^{hi}	1.10±0.10^{ij}	1.67±0.33^{e}	0.84±0.08^{f}	2.20±0.12^{d}	7.33±0.33^{bc}
R16P31	3.77±0.23^{cd}	4.18±0.26^{g}	1.40±0.06^{cdef}	1.67±0.33^{e}	1.53±0.24^{a}	2.63±0.09^{b}	8.00±0.58^{ab}
R6P20	3.07±0.09^{gh}	3.22±0.27^{h}	1.27±0.03^{fghi}	3.33±0.33^{b}	1.12±0.14^{cde}	1.90±0.06^{g}	6.67±0.33^{cd}
R5P8	3.10±0.15^{gh}	2.12±0.13^{i}	1.23±0.09^{ghi}	2.00±0.00^{de}	1.17±0.17^{cde}	2.27±0.09^{e}	6.33±0.33^{cd}
R3P22	4.13±0.19^{bc}	6.67±0.46^{cd}	1.47±0.03^{cdef}	2.33±0.33^{cde}	1.30±0.07^{c}	2.43±0.12^{d}	7.00±0.00^{c}
R5P24	4.73±0.15^{a}	9.10±0.22^{b}	1.50±0.06^{cde}	3.67±0.33^{ab}	1.31±0.12^{c}	2.60±0.26^{bc}	6.67±0.33^{cd}
R1P18	3.23±0.12^{efg}	2.73±0.03^{hi}	1.37±0.09^{defg}	2.00±0.58^{de}	1.48±0.16^{b}	2.63±0.09^{b}	7.00±0.00^{c}
R1P10	3.80±0.12^{cd}	5.63±0.29^{ef}	1.27±0.09^{fghi}	3.00±0.00^{bc}	1.35±0.11^{bc}	2.50±0.06^{c}	6.67±0.33^{cd}
R7P1	4.50±0.25^{ab}	11.85±0.29^{a}	2.10±0.12^{a}	4.00±0.58^{a}	1.42±0.12^{b}	2.57±0.22^{bc}	8.67±0.33^{a}
R14P21	3.87±0.09^{cd}	4.11±0.13^{g}	1.30±0.0^{6efgh}	3.33±0.33^{b}	1.35±0.06^{bc}	2.87±0.07^{ab}	6.33±0.33^{cd}
R15P6	3.10±0.35^{gh}	4.93±0.58^{fg}	1.73±0.09^{b}	4.00±0.00^{a}	1.20±0.10^{cde}	2.27±0.12^{e}	7.33±0.67^{bc}
R4P29	3.20±0.0fg	2.04±0.30^{i}	1.17±0.03^{hij}	2.00±0.00^{de}	0.85±0.05^{ef}	2.10±0.06^{f}	5.67±0.33^{d}
GPIV	3.27±0.09^{efg}	4.12±0.18^{g}	1.30±0.00^{efgh}	3.00±0.00^{bc}	1.05±0.10^{cdef}	2.60±0.6^{ab}	6.33±0.33^{cd}
R24P9	3.80±0.15^{cd}	4.06±0.37^{g}	1.03±0.09^{j}	2.67±0.33^{bcd}	1.51±0.02^{a}	2.50±0.06^{c}	6.33±0.33^{cd}
ZARIYA	3.70±0.15^{cde}	6.08±0.24^{de}	1.37±0.03^{defg}	2.67±0.33^{bcd}	1.02±0.15^{def}	2.57±0.12^{bc}	0.67±5.67^{cd}
R9P2	4.87±0.09^{a}	7.10±0.20^{c}	1.23±0.03^{ghi}	3.67±0.33^{ab}	1.10±0.05^{cde}	3.00±0.06^{a}	5.67±0.33^{d}
R5P20	3.90±0.06^{cd}	5.19±0.27^{f}	1.57±0.07^{bcd}	3.33±0.33^{b}	0.99±0.03^{abc}	2.43±0.18^{d}	6.67±0.33^{cd}
R13P1	2.70±0.12^{h}	5.11±0.26^{f}	1.57±0.03^{bcd}	3.67±0.33^{da}	1.27±0.06^{cd}	2.03±0.03^{f}	7.33±0.33^{bc}
R13P5	3.60±0.06^{def}	4.89±0.32^{fg}	1.50±0.06^{cde}	2.67±0.33^{bcd}	1.15±0.14^{cde}	2.60±0.06^{bc}	6.33±0.33^{cd}
R2P4	3.47±0.15^{defg}	5.08±0.14^{f}	1.60±0.06^{bc}	3.00±0.58^{bc}	1.29±0.27^{cd}	2.40±0.06^{d}	7.33±0.33^{bc}
R9P12	4.50±0.06^{abd}	6.44±0.06^{cde}	1.13±0.07^{ij}	2.00±0.58^{de}	1.12±0.10^{cde}	2.80±0.06^{ab}	6.00±0.58^{cd}

Values are mean±standard errors; values with different letter(s) in the same column are significantly different at P≤0.05.

Plate.1 Shape and colour variations among the date fruits accession studied

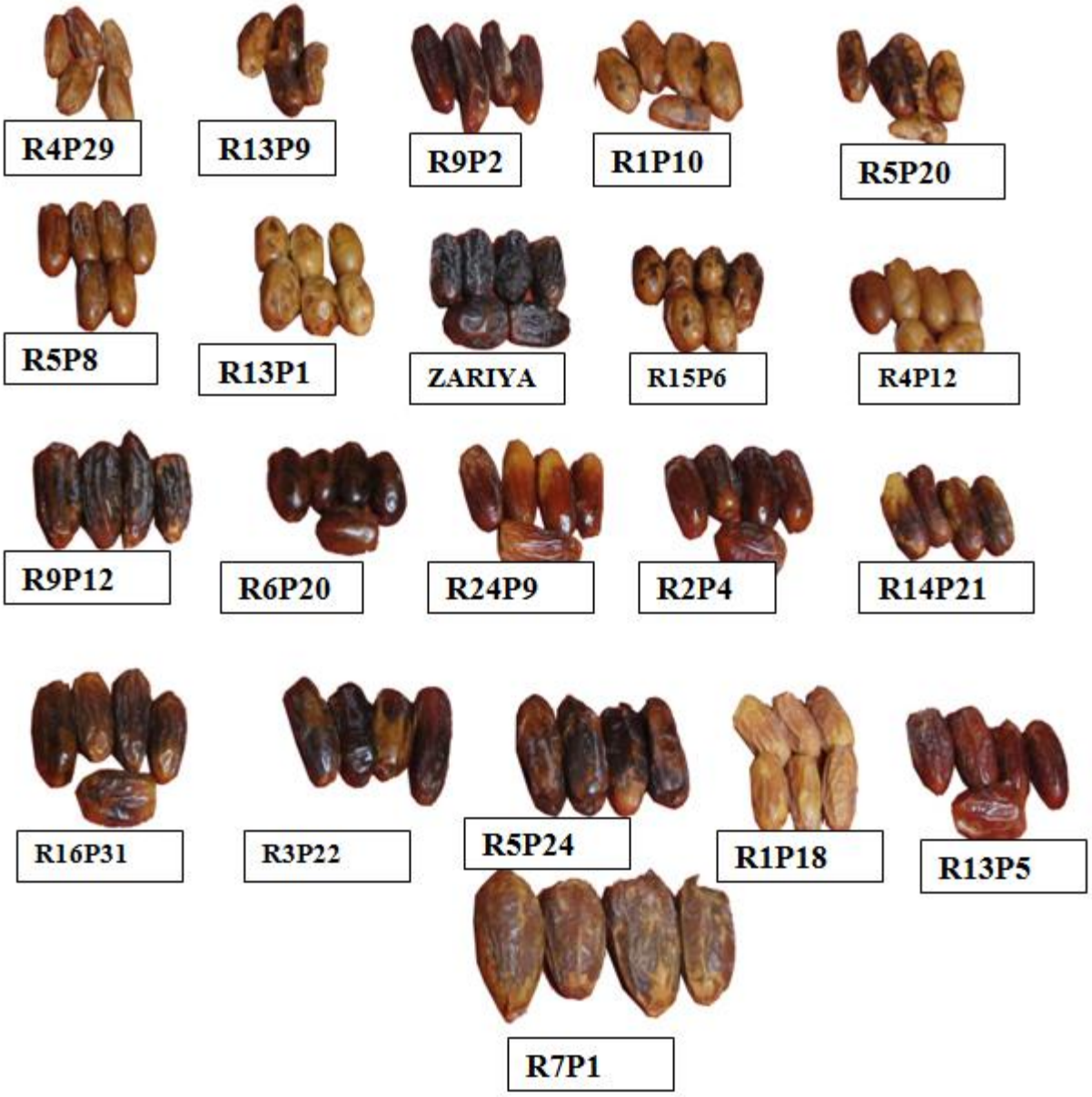


Plate.2 Accessions with smooth epicarp

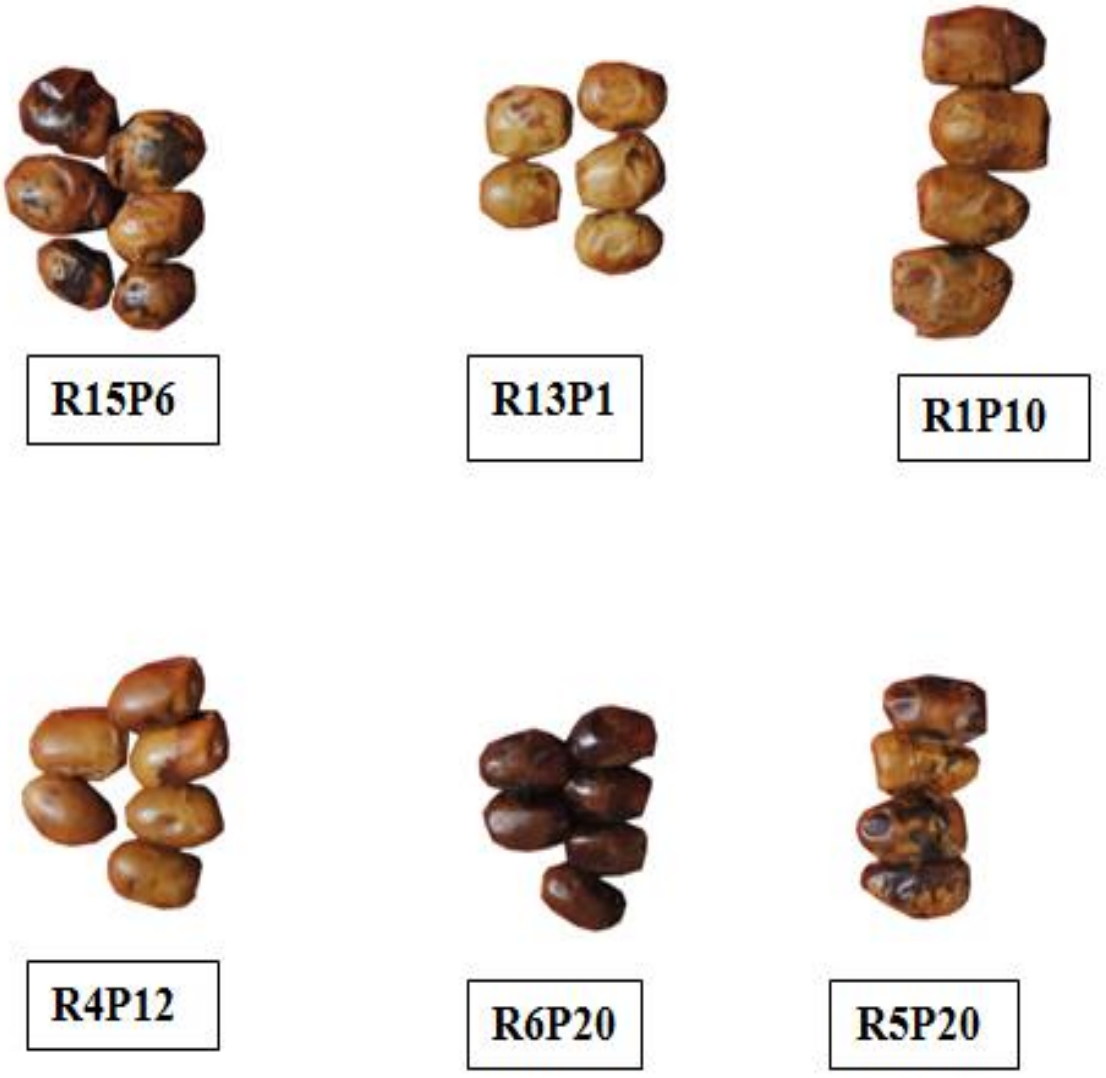


Plate.3 Accessions with rough epicarp

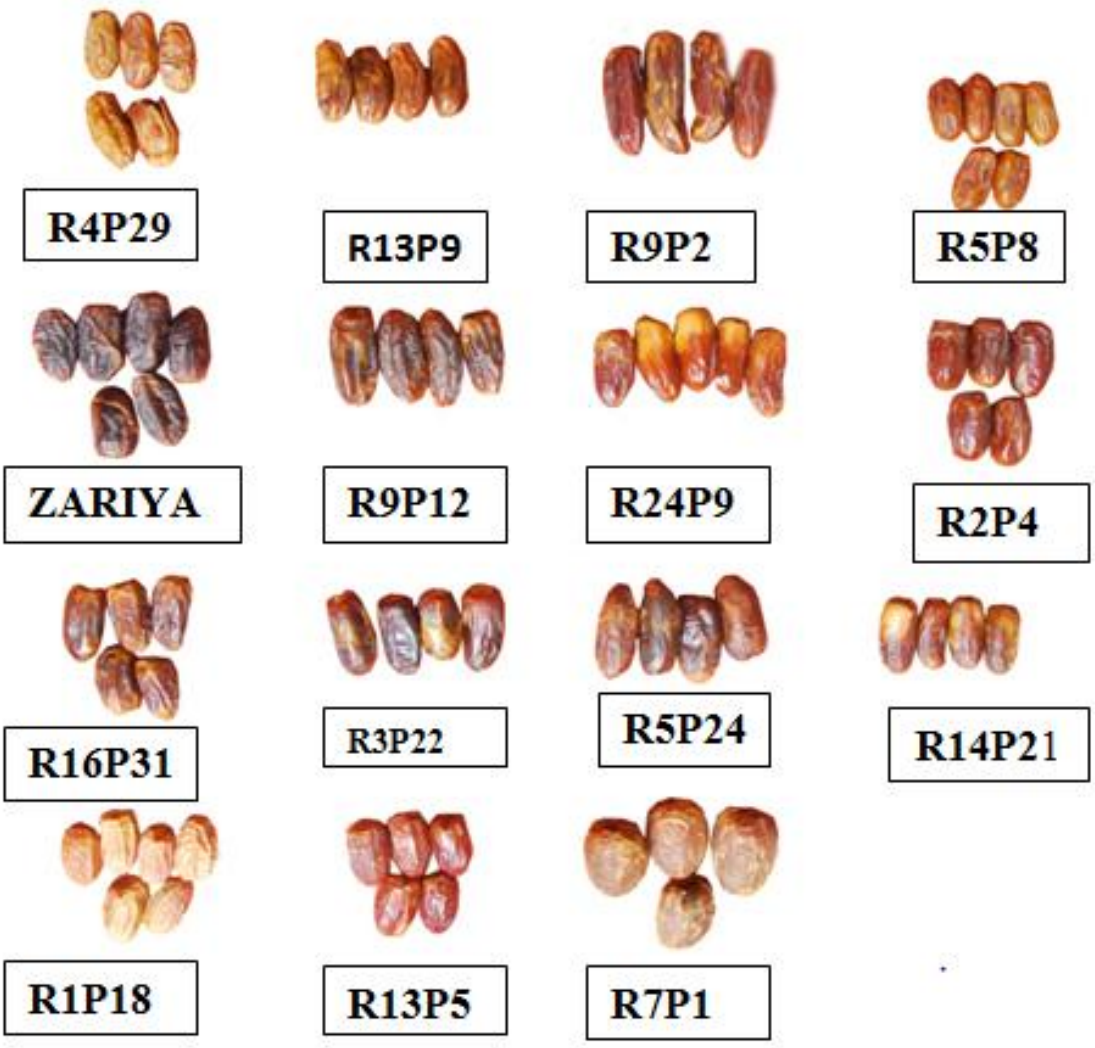
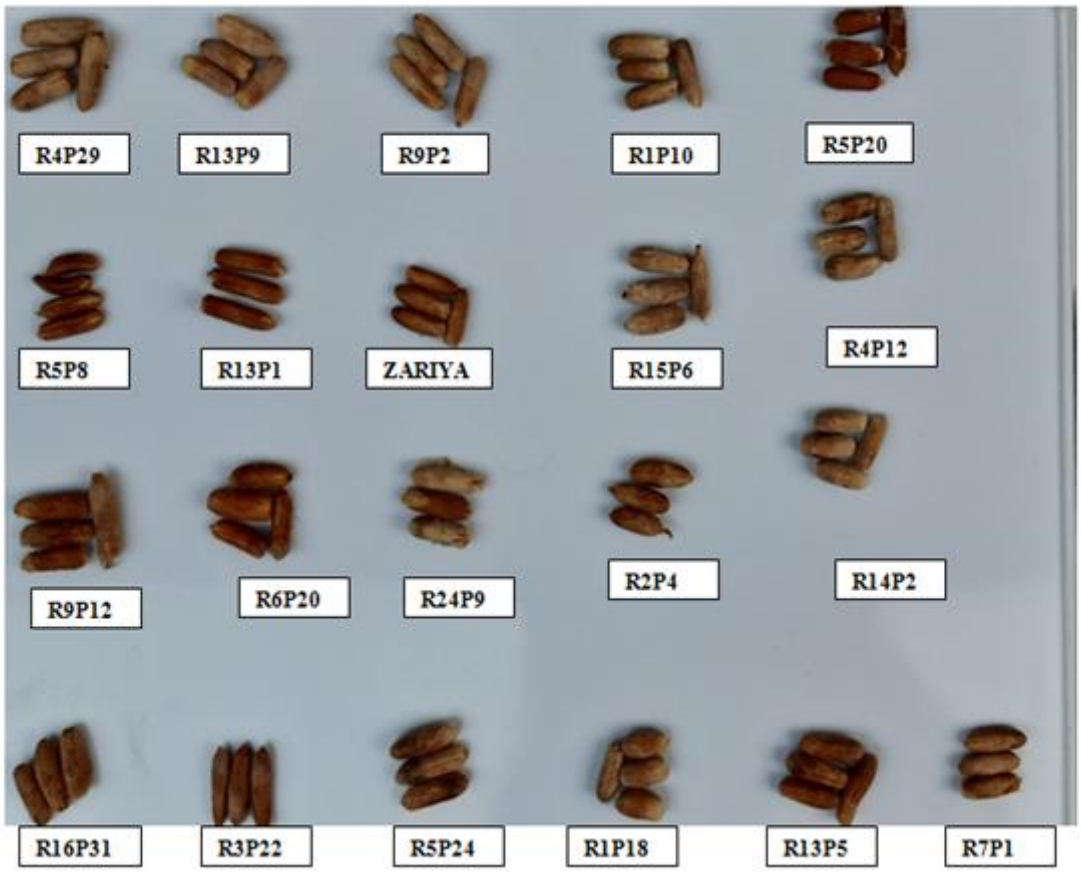


Plate.4 Colour variations of Seeds of the date accessions



The variations observed in the fruit characteristics among the accessions might be due to differences from the genetic base and genetic variability of different pollens on fruit characters (a process known as metaxenia effect). This agrees with the report of Merwad *et al.,* (2015). They reported that the different type of pollen sources used in pollination had different effects on fruit physical quality of date palm.

The fruit weight (2.04 g-9.10 g) recorded in this study is in agreement with 5 g-12 g as recorded by Muhammad *et al.,* (2016) in their study on some yield parameters of major Date Palm cultivars in Pakistan, This has also been supported with (11.60 g–7.05g) of fruit weight as reported by Abdoulhadi *et al.,* (2011) in the their study on the assessment of fruits in date cultivars of Saudi Arabia, but disagrees with the 23.80 g as reported by Mansour (2005) on Morphological and Genetic Characterization of Some Common date palm cultivars in Ismailia region in Egypt.

Jaradat and Zaid (2004), reported that characters such as large fruit length of date palm cultivars is a unique variant found with a high polymorphic index. However, the significant differences in fruit length (2.70 cm-4.87 cm) among the studied accessions is in conformity with the 2.4–3.9cm as reported by Ghulam *et al.,* (2010) in their study on fruit characterization of pakistani dates.

In addition, Farag *et al.,* (2012) who also reported in their study on date fruits of Zaghloul cultivar from Saudi Arabia and opined that date palm fruits are influenced by the type of pollinator used for pollination of the mother tree. Significant differences in the fruit length can be as a result of

varietal differences among the studied accessions, similar findings were also reported by Ghulam *et al.*, (2010) on some Pakistani date palms, Al-Hooti *et al.*, (1997) also reported that the fruit size significantly varied from one cultivar to another. On the other hand, the group of the studied accessions such as R5P24, R7P1, R9P2, R9P12 and R3P22 deserves much care and can be utilized in mass propagation.

The fruit diameter of 1.03-2.10 cm recorded among the studied accessions is synonymous to the 1.5–2.4cm of fruit diameter as reported by Ghulam *et al.*, (2010) on some pakiatani date palm cultivars. The pronounced variations in the fruit diameter among the studied accessions might be due to varietal differences as well as effect of different pollen sources used to pollinate the mother plant, However, Iqbal *et al.*, (2012) has reported that the pollination at different times significantly affected fruit length and diameter of Dhakki variety. El Mardi *et al.*, (2002) also reported in their study that variations in diameter of date fruit can be as a result of varietal differences.

Fruit seed is considered as one of the most important physical characters. Sometimes two varieties are similar in everything except the seed properties. The result on fruit characteristics' is in agreement with the report of Mohammed Elsafy (2000) who also opined that a wide range of diversity explains the large estimated number of accessions in Nigeria and may indicate the benefit of screening date palm germplasm for agronomically important traits.

In addition, Hanane and Halima (2020) in their study on some local Algerian date palm cultivars and reported that farmers use most commonly the fruits as a way to distinguish between cultivars than palms. Therefore, consideration of the fruit traits studied should be taken into account for Nigerian date palm characterization.

Conflicts of Interest

All authors did not declare any conflicts of Interest.

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How to cite this article:

Yahaya, S. A., O. A. Falusi, O. A. Daudu, A. Abubakar, N. I. Mariam, B. M. Abdulkarim, R. H. Aliyu, C. I. Okoye and Yakubu, M. 2023. Fruits Variability of Some Nigerian Date-Palm (*Phoenix dactylifera* L.) Accessions as Revealed by Yield Parameters. *Int.J.Curr.Microbiol.App.Sci.* 12(08): 248-260.
doi: https://doi.org/10.20546/ijcmas.2023.1208.026