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STATUS OF DATE PALM (*Phoenix dactylifera* L.) GENETIC ESOURCES IN NIGERIA

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ABSTRACT

The current status of date palm (*Phoenix dactylifera* L.) genetic resources in Nigeria collected from varied eco – geographical systems was catalogued. A total of 387 females and 274 males date palms currently exist from a very large number of accessions collected between 1981 and 1990. These accessions are being maintained in an *ex situ* field gene banks. A few introductions from Namibia (3) and Israel (45) are part of Nigerian collections.

Key words: Date palm, Genetic Resources, Gene banks, *Phoenix dactylifera* L.

INTRODUCTION

The date palm (*Phoenix dactylifera* L.) has been cultivated and subjected to selection by man since ancient times and the distinction between wild and cultivated is blurred (Krueger, 1995, 2001a). Within the genus *Phoenix*, it is generally accepted that there are 12 – 13 species (Chevalier, 1952 Barrow, 1998) (Table 1).

Wild *Phoenix* species are found in the tropics and sub tropics of Africa and Asia while *Phoenix dactylifera* originated in the Middle East Western India and Iraq (Barrow, 1998).

Table 1: 13
Species in the genus Phoenix

Species	Common name	Distribution	Notes	Synonyms
Phoenix acaulis	-	N. India,Burma	Stemless:fruit edible;sometimes confused with *P. loureiri*	-
Phoenix anadamanensis	-	Bay of Bengal	Single trunk; semi – dwarf; species status somewhat questionable	-
Phoenix caespitose		Somalia,Arabian peninsula	Habitat:wadis;stemless;fruit edible;species status somewhat questionable	*Phoenix Arabica*
Phoenix canariensis	Canary island date palm	Canary Islands	Wide range of habitats within distribution; single trunk;fruit edible; widely cultivated as ornamental	*P.cycadiflora, P. jubae, P.tenuis*
Phoenix dactylifera	Date palm	Middle east to West India, North Africa	Habitat:wadis, oases; widely cultivated in suitable climates for fruit;many other plant	*P. atlantica*

			parts utilized	
Phoenix loureiri	-	India,China,Indochina, Malaysia	Dwarf; fruit edible;other plant parts utilized;taxonomy somewhat confused: 2 arieties (*loureiri,humilis*)	*P.formosana,P.hanceana,P. humilis,P. ousleyana*
Phoenix paludosa	-	Bay of Bengal,Indochina,Mal aysia	Habitat: mangrove swamps and estuaries;semi – dwarf	
Phoenix pusilla	-	South India, Sri Lanka	Fruit edible ;other plant parts utilized	*P.farinifera,P.zeylanica*
Phoenix reclinata	Senegal date palm	Tropical and subtropical Africa,Madagascar,co moro islands	Habitat and morphology variable;fruit edible;other plant parts utilized;wiely cultivated as ornamental	*P.abyssinica,P.baoulensis,P.co morensis,P.madagascariensis,P .senegalensis,P.spinosa,P.zanzi bariensis,*etc.
Phoenix reobelenii	Pygmy date palm	Laos,Vietnam,South China	Rheophytic;dwarf;Widely cultivated as ornamental	-
Phoenix rupicola	Cliff date palm	North India	Single trunk;semi-dwarf;fruit eaten by animals but not humans	-
Phoenix sylvestris	Indian date palm	Indian and Pakistan	Wide range of habitats;utilize for sugar, fruit	-
Phoenix theophrasti	Cretan date palm	Crete, Turkey	Habitat: coastal areas; species status questionable	-

Adapted: after Barrow S. C. 1998. A monograph of Phoenix L. (Palmae: Coryphoideae). Kew Bull, 53:513 – 575.

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 10^0 N (Okolo *et al.,*2005). It is generally believed that the date palm was introduced in to Nigeria in the early 17^{th} 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 Middle East (Omoti and Okolo, 2000).

The date palm in Nigeria is essentially cultivated for its edible fruits which are very nutritious and energy producing. Thus the date palm is a high value economic tree. A female date palm produces 10 – 75 kg of fruit per annum of maturity. Economic returns are about ₦ 200, 000/ha/year. Thus the date palm has provided income and improved livelihood to grow and has enhanced rural transformation. With the expected increase in demand for food resulting from a population exceeding 140 million inhabitants, the date palm offers a good source of high nutritive value.

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 on primarily on these land races. In Nigeria, several collections 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. The objective of this study was to provide information on the current status of plants (catalogued) present in the repository (gene bank) of Nigerian Institute For Oil palm Research (NIFOR). Such information make germplasm more readily available for distribution to users.

Fig 1: Gene pool 1 (Planted 1981)

Fig 2: Gene pool 2 (Planted 1982)

Fig 3: Gene Pool 3 (Planted 1984)

Fig 4: Gene Pool 4 (with some new introduction of unknown origin)

Fig 5: Gene pool 5 (Planted 1990)

Fig 6: Exotic Varieties from Namibia and Israel

Germplasm Collections

It is generally accepted among breeders that for genetic progress to be achieved in any crop improvement programme, depends on the availability for genetic variation as represented by the genetic diversity existing among the advanced and primitive cultivars as well as their wild and weed relatives must be explored (Ataga, 1989). The available germplasm is usually a valuable source of parents for hybridization and subsequent development of improved materials.

The status of date palm genetic resources and their conservation (*in situ* and *ex situ*) globally is not well known. Bettencourt *et al.*(1992) listed only about ten collections worldwide, the largest of which are found in Algeria, India, Iraq, Nigeria and the United states. Bettencourt *et al.* (1992) further noted that with the exception of Nigerian collections most accessions appear to be elite cultivars and breeding lines and thus have very low genetic diversity.

Nigerian collections and its status

A few date palm germplasm collections have been carried out to assemble the variability in the crop in Nigerian (Osuhor and Samarawiwa, 1981; Osuhor, 1982). These collections (land races) have been used to establish five field gene banks (*ex situ*) at the date palm substation, Dutse, Jigawa state, Nigeria between 1981 and 1990. The substation is situated on latitude 10^0 14^1N and longitude 4^0 12^1E. The substation ecology is within the sudan savannah with annual rainfall of about 600mm per annum and average temperature of 32^0C. The soil type is sandy to loam. By 2001 (NIFOR, 2002), a few accessions (clones) from Namibia and Israel were introduced and were also used to establish a gene bank. The Nigerian materials were collected from the date growing areas of the date palm belt such as Sokoto state (Gwadawa, Anka, Local Government Areas), Kaduna State (Funtua and Katsina Local Government Areas), Kano State (Wudil, Gaya and Dutse (now in Jigawa State) Local Government Areas), Bauchi State (Gombe, Ningi Darazo and Bauchi Local Government Areas) and Borno State (Misau, Shira, Fika and Potiskum Local Government Areas). These materials which have been used to establish gene banks have been characterized and evaluated and described in various reports (Osuhor,1983, Agwu *et al.,*1989;NIFOR,1993,1995 and 2008) indicating that considerable diversity in fruit characteristics exists in the Nigeria landraces. On the basis of fruit length, these materials could be broadly classified into large, medium and small fruits which appear to compare favorably with leading commercial varieties, elsewhere. The current status (catalogue) of these field gene banks and a few introductions is presented in table 2

Table 2: General status of date palm field gene banks in Nigeria

Gene pool	Year planted	Ha	Original no of planting	Survival count Female	Male
1	1981	2	1500	38	57
2	1982	7.2	1170	100	9
3	1984	8.0	100	75	71
4	1987	7.2	304	18	21
5	1990	8.2	1365	108	116
Namibia	2001	-	11	3	-
Israel	2001	-	49	45	-
		TOTAL	**6409**	**387**	**274**

The field conditions of these gene banks are presented in plates 1-6. The number of female and male date palms is 387 and 274 respectively suggesting poor survival inspite of the very large numbers of accessions initially planted. The very low survival rate at the current field gene banks might be as a result of scarcity of water for irrigation at the initial period of field planting. The Genebanks are kept weed-free all year round and fertilizer both organic and inorganic routinely applied to sustain the palms. These materials need to be further evaluated using a set of model descriptors for date palm as proposed by Rizk and Shaebasy (2007) including molecular level genetic analysis.

CONCLUSION

The highest priorities are to increase the representation of those accessions/landraces not currently in the collection, increase the amount and genetic diversity of diseases free materials available and conduct further evaluations of the germplasm. Increasing the overall size of collections should be the result of filling the gaps in the collection and increasing the genetic diversity thereof rather than simply obtaining whatever germplasm is available. This can be achieved by further collection of fruit within the entire date growing areas of Nigeria. *Ex situ* conservation of genetic resources are very important as genetic diversity is severely threatened by population pressure, fire or clearance for agriculture. These collections also make germplasm more available to users.

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REFERENCES

1. Agwu S. I.,I. I. Onwubuya,I. B. Omamor, E. O. Osuhor, Y. Abubakar, C. I. Aisagbonhi and E. N. Uyovbisere (1989). Date palm Research in Nigeria. *Proceedings of the international conference on palm and palms products (Ed.Rees A.R, D. O. Ataga and D. A. Okiy) Benin City Nigeria. 633-638.*
2. Ataga C. D. (1989). Variation pattern, inter – character relationships and stability studies on some oil palm (*Elaies guineensis)* populations. *Ph. D thesis University Of Ibadan. 208pp.*
3. Barrow S. C. 1998. A monograph of *Phoenix* L. (Palmae: Coryphoideae). *Kew bulletin. 53: 513 – 575.*
4. Bettencourt E., T. Hazekamp and M. C. Perry (1992). Directory of germplasm collections. *6.1. Tropical and subtropical fruits and tree nuts. IBPGR. Rome.*
5. Krueger R. (1995). Mystique of date palms links old and new worlds. *Diversity, 11: 128 – 129.*
6. Krueger R. (2001a). Date palm germplasm: overview and utilization in USA.*proceedings, 1st international conference on Date palms.Al-ain, UAE, March 1998.*
7. NIFOR 1964. *NIFOR First Annual Report, 1964.*
8. NIFOR 1993. *NIFOR Thirtieth Annual Report, 1993.*
9. NIFOR 1995. *NIFOR Thirty – Second Annual Report 1995.*
10. NIFOR 2002. *NIFOR Thirty – Ninth Annual Report, 2002.*
11. NIFOR 2008. *NIFOR I In house research review progress report 2001 - 2008*
12. Okolo E. C., Okwuagwu C. O. and Ataga C. D. (2005). Prospect of date plantation establishment in Nigeria. *Journal of Agric forestry and fisheries 6:1:24 – 28.*
13. Omamor I. B., 2004. Date palm Research Programme 2004 (Unpublished).
14. Omoti U. and Okolo E. C. (2000). Date palm Research in Nigeria: Progress and priorities. *Proceedings of Date palm international symposium, Windhoek, Namibia.*
15. Osuhor E. (1983). Estimates of genetic parameters of fruit traits among some date palm (*Phoenix dactylifera* L.) types grown in Nigeria and their implications in selection. *Thesis, Ahmadu Bello University, Zaria, Nigeria.*
16. Osuhor E. and Samarawiwa I. (1981). Studies on genetic variability of fruit characteristics in population of Date palm (*Phoenix dactylifera* L.) in Nigeria. *Paper presented at the 8th Genetics Society of Nigeria conference held in Benin City, Nigeria (1980).*
17. Reda M. Rizk and S. F. Sharabasy (2007). Descriptors for Date palm (*Phoenix dactylifera*
18. L.) characterization and evaluation in gene banks. *Plant genetic resources Newsletter 150: 42 – 44.*