

Fruit and seed characteristics among selected *Parkia biglobosa* (JACQ) G. Don. Population

*Olorunmaiye, K.S¹, Fatoba, P.O¹, Adeyemi, Oreoluwa.C.¹ and Olorunmaiye, P. M²

¹ Department of Plant Biology University of Ilorin, Nigeria

² Department of Plant Physiology and Crop Production University of Agriculture, Abeokuta, Nigeria

*Corresponding author: ksolorunmaiye@yahoo.com

ABSTRACT

Fruit Characteristics (pod length, number of pod per bunch, pulp and seed weight, pulp weight and pod breadth), Seed Characteristics (number of seed per bunch, expected seed number per pod and seed weight per bunch), and Qualitative Characteristics of seeds (seed colour, shape, size and texture) of *Parkia biglobosa* (Jacq) G. Don population were investigated in this study. Twenty six (26) *P. biglobosa* population were sampled at the permanent site of the University of Ilorin, Nigeria, in May 2010 and fruits were collected from these populations for study. Pulp and seeds were removed manually from the dry brown indehiscent pods by using hand to break the pods along their sutures and de-pulping was done by manual washing with hands in water. There were significant differences (at P=0.05) among the fruit and seed characteristics of 26 populations of *P. biglobosa* investigated. Five (5) plants showed high pod number per bunch with 20 pods and above while long pod lengths were observed in seventeen (17) plants. Two (2) plants have narrow pointed tip pods (apex) and four (4) plants with broad pod breadth. One (1) plant has its apex size similar to its base (1.53cm). Seventeen (17) plants were observed to have more than 100seeds per bunch while, only one plant was noticed to exhibit wrinkled seed coat, the fifteen (15) plants had flat oval seeds. Two (2) plants had pure black seed coat and twenty four (24) had brownish seed coat colours. Larger percent of the plants have medium seed size, five (5) plants have small seed size and others are of big size.

Keywords: *Parkia biglobosa*, pod, pulp, seed, pod length, seed weight, seed colour and seed texture.

INTRODUCTION

Parkia biglobosa (Jack.) G. Don. also known as dawadawa (Hausa), African locust beans (English), Igba/Iyere (Yoruba), Nere (Bambara) have been known to be a native of Africa and is an important multipurpose tree of West African Savannah land and one of the most common species of the parkland agro-forestry system (Sacande and Clethero, 2007). More attention have been given to economically important species of tree plants especially *P. biglobosa* in recent years to a sustainable use and integrated management due to an increasing recognition of its contribution to fulfil basic needs of people, household economics, food security and conservation of natural resources (Joshi and Joshi, 2009). *P. biglobosa* as a common species of the parkland agro-forestry, plays important roles such as food and wood production, supply of timber, firewood, pulp and fibre through fodder, gum, drugs, and dyes as well as restoration of fertility (Okafor,1980; Popoola and Maishanu,1995). In most of these agrarian communities, Nigeria inclusive, forest foods

are essential dietary supplements especially during lean agricultural production periods or times of emergency. The Nigerian Study/Action Team (NEST, 1991) submitted that leaves, fruits, nuts and oils obtained from wild plants have provided food for humans, livestock and wildlife in many parts of the country. Latiff *et al.* (2002) reported that forest resources directly contributed up to 80% of the livelihoods of the people in that country living in extreme poverty.

Alfezia africana, *Parkia biglobosa*, *Prosopis africana* and many other species are most of the fruit and food trees suitable for outlying farms in the derived savannah fall into the categories of semi-wild and protected species in cultivated farmland. *Borassus aethiopum* and *Adansonia digitata* provide food, income and employment to the people (Tee and Popoola, 2007; Tella *et al.*, 2008; Tee and Verinumbe, 2007). All these species are important sources of food (Okafor, 1980) ranging from staple items like moulded fruit pulp and condiments of seed of *P. biglobosa*. Brown material obtained from *P.*

biglobosa and *F. polite*, Leafy vegetables of *Vitex doniana*, edible fruits of *Butyrospermum paradoxum* and *Borassus aethiopicum* and many others. Wild fruits and leaves from trees and shrubs provide good nutritious supplements to diet such as protein, vitamins and roughages and also medicinal value at certain times of their growing period. They provide protein, energy, starch, vitamins and essential minerals to human diet. Above all, they also provide income and employment opportunities to rural and urban households (Tee *et. al.* 2009). Several crops were reported to perform better around and under the shade of *P. biglobosa* (Okafor 1980). *Parkia biglobosa* tree is important in North-central Nigeria along with other species like *Prosopis africana*, *Acacia Species*, *Borassus aethiopicum*, *Adansonia digitata* and *Tamirandus indica* (Verinumbe, 1991).

The roots, barks, leaves, stems, flowers, fruits and seeds of *P. biglobosa* are all used medicinally to treat a range of ailments including diarrhoea, ulcers, pneumonia, burns, coughs, jaundice etc (Sacande and Clethero, 2007). The pulp contains higher cellulose and sucrose but less ascorbic acid than the cotyledons. The pulp also contains simple sugars except maltose (Alabi *et.al.*2005). The seeds of *P. biglobosa* on fermentation are used in cooking stew and soup. The sweet yellow pulp contains 60% sugar when ripe and the seeds contain 30% protein as well as vitamins and minerals (Sacande and Clethero, 2007). The fruit pods are used to produce an insecticide powder for treating crops.

MATERIALS AND METHODS

Fruit and seed characteristics were studied among twenty six (26) *Parkia biglobosa* (Jacq.) G. Don. tree population in the permanent site of the University of Ilorin campus, Nigeria. Three bunches were collected from each plant (tree) sample and were used for the fruit and seed characteristics studies where pod number per bunch, pod length, pod breadth, pulp weight per bunch, seed weight per bunch, weight of 100 seeds per plant sample, seed colour, seed texture, seed size and shape were taken. The pulp and seeds were removed manually from dry brown indehiscent pods of matured fruit by using hand to break the pods along the sutures (Shelling); de-pulping was done by manual washing in water to remove the seeds from the pulp covering them. Seeds were then sun dried, weighed, counted and packed after which the seed colour, texture, shape and size were determined. Data collected were subjected to statistical analysis using analysis of

variance (ANOVA) and means were separated using New Duncan multiple range test (DMRT).

RESULT AND DISCUSSION

The results of fruit and seed characteristics of *Parkia biglobosa* populations are presented in tables 1 – 3. These results show an amazing significant differences at ($P < 0.05$) among the population of *Parkia biglobosa* plants studied.

Table 1 revealed plant number twenty one (21) to have the highest number of pod per bunch (15.00) while the lowest was recorded in plant fifteen (15) with 6 pods per bunch. Plants 1, 2, 22 and 25 have approximately the same number of pods per bunch ranging from 13.00 – 13.67, while plants 10, 12, 23 and 24 had 10.00 – 10.67. The longest pod length was recorded in plant 19 and the shortest in plant 3 with 27.13cm and 15.24cm respectively. The pod breadth at apex, middle and base varies among various *Parkia biglobosa* plant population with the widest apex observed in plant 6 (1.53cm) and narrowest in plants 11 and 18 (0.91cm). Widest pod breadth at the middle was found in plant 23 (2.53cm) and its narrowest counterpart in plant 2 (1.33cm). Plants 1, 6, 8, 12, 13 all fall in the range of 2.09cm – 2.77cm in their pod breadth at the middle. The pod breadth size at the base was observed in plant 8 to be the widest (1.69cm) and the narrowest in plant 3 (0.29cm). Every other plant falls within the range of 1.14 – 1.53 cm. Some of the *Parkia biglobosa* population (plants 1, 6, 8, 12, 13 and 23) fit in to the description of the millennium seed bank project Kew which reported *Parkia biglobosa* pod to be 2-3cm wide (Sacande and Clethero, 2007). The pulp and seed weight also varied in the population with 102.33g as the highest value observed in plant 22 and plant 18 had the lowest (26.67g). Highest value of the pulp weight was observed in plant 22. Plants 22 and 18 showed highest and lowest values respectively in pulp + seed weight and pulp weight alone (Table1).

Plant 23 has the largest number of expected seed per pod (i.e no of seed positions observed in each pod before de-pulping of fruit by mere feeling with hands at the depressions formed on the pods) with 21.33 while the smallest number was observed in plant 16 with 8.78 (Table 2). The number of expected seed/pod ranges from 8.98 – 21.33 in all the population with plants 8, 18 and 24 ranging from 14.22 - 14.44 having approximately the same number of expected seed/pod. The number of seed/bunch was observed to be highest in plant 22 (225.00) and smallest in plant 15 (64.89). The number of seed/bunch ranges from 64.33 – 225.00 throughout the population. Other plants with low seed weight value are 4, 14, 15 and 16.

Table 1: Fruit characteristics among selected *Parkia biglobosa* population

Plant no	Mean pod no/bunch	Mean pod length(cm)	Mean pod breadth(cm)			Pulp+seed wt(g)	Pulp wt(g)
			Apex	Middle	Base		
1	13.33 ^{a-c}	22.94 ^{a-c}	1.27 ^{a-d}	2.19 ^{a-c}	1.44 ^{a-d}	87.33 ^{a-d}	53.33 ^{a-c}
2	13.67 ^{ab}	22.33 ^{a-d}	1.03 ^{b-d}	1.33 ^g	1.14 ^{c-e}	84.67 ^{a-d}	52.00 ^{a-c}
3	6.67 ^{cd}	15.24 ^d	0.96 ^{cd}	1.34 ^{fg}	0.92 ^e	69.67 ^{a-e}	34.33 ^{a-d}
4	7.00 ^{b-d}	18.06 ^{b-d}	1.07 ^{b-d}	1.73 ^{c-g}	1.38 ^{a-d}	34.67 ^{ef}	21.67 ^{cd}
5	8.00 ^{b-d}	17.95 ^{cd}	1.00 ^{b-d}	1.73 ^{c-g}	1.20 ^{c-e}	49.33 ^{c-f}	24.67 ^{b-d}
6	11.33 ^{a-d}	22.92 ^{a-c}	1.53 ^a	2.27 ^{ab}	1.53 ^{a-c}	89.67 ^{abc}	57.67 ^{ab}
7	8.00 ^{b-d}	21.18 ^{a-d}	1.39 ^{a-c}	1.98 ^{b-e}	1.48 ^{a-c}	55.00 ^{c-f}	36.00 ^{a-d}
8	7.33 ^{b-d}	20.34 ^{a-d}	1.31 ^{a-d}	2.12 ^{a-c}	1.69 ^a	41.00 ^{ef}	22.67 ^{cd}
9	7.00 ^{b-d}	18.99 ^{b-d}	1.35 ^{a-d}	1.84 ^{b-f}	1.42 ^{a-d}	52.67 ^{c-f}	30.00 ^{a-d}
10	10.00 ^{a-d}	22.13 ^{a-d}	1.05 ^{b-d}	1.55 ^{eg}	1.36 ^{a-d}	88.33 ^{abc}	52.67 ^{a-c}
11	9.33 ^{a-d}	18.96 ^{b-d}	0.91 ^d	1.70 ^{c-g}	1.21 ^{b-e}	63.67 ^{a-f}	38.33 ^{a-d}
12	10.33 ^{a-d}	17.95 ^{cd}	1.42 ^{ab}	2.00 ^{b-e}	1.23 ^{b-e}	54.67 ^{c-f}	32.00 ^{a-d}
13	7.00 ^{b-d}	21.88 ^{a-d}	1.36 ^{a-d}	2.09 ^{a-d}	1.38 ^{a-d}	46.33 ^{d-f}	28.33 ^{a-d}
14	9.00 ^{a-d}	23.37 ^{a-c}	1.18 ^{a-d}	1.89 ^{b-e}	1.23 ^{b-e}	49.67 ^{c-f}	34.00 ^{a-d}
15	6.00 ^d	25.38 ^{ab}	1.09 ^{b-d}	1.80 ^{b-g}	1.26 ^{b-e}	38.00 ^{ef}	22.00 ^{cd}
16	8.67 ^{a-d}	17.09 ^{cd}	1.14 ^{a-d}	1.60 ^{d-g}	1.21 ^{b-e}	53.00 ^{c-f}	39.33 ^{a-d}
17	11.67 ^{a-d}	20.87 ^{a-d}	1.07 ^{b-d}	1.79 ^{b-g}	1.49 ^{a-c}	84.00 ^{a-d}	53.33 ^{a-c}
18	6.67 ^{cd}	21.11 ^{a-d}	0.91 ^d	1.56 ^{eg}	1.33 ^{c-e}	26.67 ^f	15.67 ^d
19	7.67 ^{b-d}	27.13 ^a	1.12 ^{a-d}	1.98 ^{b-g}	1.21 ^{b-e}	67.00 ^{a-f}	45.00 ^{a-d}
20	9.33 ^{a-d}	21.27 ^{a-d}	1.05 ^{b-d}	1.81 ^{b-g}	1.05 ^{de}	60.33 ^{b-f}	37.33 ^{a-d}
21	15.00 ^a	20.01 ^{a-d}	1.07 ^{b-d}	1.78 ^{b-g}	1.31 ^{a-d}	70.00 ^{a-e}	40.00 ^{a-d}
22	13.00 ^{a-c}	22.43 ^{a-d}	0.95 ^{cd}	1.72 ^{c-g}	1.21 ^{b-e}	102.33 ^a	59.67 ^a
23	10.33 ^{a-d}	26.75 ^a	1.16 ^{a-d}	2.53 ^a	1.60 ^{ab}	97.00 ^{ab}	53.33 ^{a-c}
24	10.67 ^{a-d}	21.35 ^{a-d}	1.08 ^{b-d}	1.88 ^{b-e}	1.20 ^{c-e}	52.67 ^{c-f}	26.33 ^{a-d}
25	13.00 ^{a-c}	17.72 ^{cd}	1.14 ^{a-d}	1.74 ^{c-g}	1.14 ^{c-e}	62.67 ^{a-f}	39.33 ^{a-d}
26	9.33 ^{a-d}	20.09 ^{a-d}	1.03 ^{b-d}	1.70 ^{c-g}	1.16 ^{c-e}	69.67 ^{a-e}	47.67 ^{a-d}

Values with the same letter(s) along the same columns are not significantly different at (p=0.05)

Plant number	Expected seed no/pod	No of seed/bunch	Seed wt/bunch(g)
1	16.56 ^{a-c}	154.33 ^{b-d}	34.00 ^{a-d}
2	17.44 ^{ab}	159.33 ^{a-d}	32.67 ^{a-d}
3	13.33 ^{bc}	168.33 ^{a-c}	35.33 ^{a-c}
4	12.78 ^{bc}	64.33 ^f	13.00 ^g
5	16.00 ^{a-c}	120.67 ^{b-f}	24.67 ^{b-g}
6	16.89 ^{ab}	132.33 ^{b-f}	32.00 ^{a-e}
7	15.00 ^{a-c}	101.33 ^{c-f}	19.00 ^{c-g}
8	14.22 ^{a-c}	81.33 ^{ef}	18.33 ^{d-g}
9	15.22 ^{a-c}	80.33 ^{ef}	22.67 ^{b-g}
10	18.55 ^{ab}	128.33 ^{b-f}	35.67 ^{ab}
11	15.89 ^{a-c}	134.00 ^{b-f}	25.33 ^{b-g}
12	13.11 ^{bc}	102.33 ^{c-f}	22.67 ^{b-g}
13	17.45 ^{ab}	77.00 ^{ef}	18.00 ^{d-g}
14	8.89 ^c	71.67 ^f	15.67 ^{e-g}
15	17.89 ^{ab}	64.89 ^f	16.00 ^{fg}
16	8.78 ^c	81.00 ^{ef}	13.67 ^{fg}
17	19.89 ^{ab}	190.33 ^a	30.67 ^{a-e}
18	14.44 ^{a-c}	66.00 ^f	11.00 ^g
19	15.22 ^{a-c}	95.00 ^{d-f}	22.00 ^{b-g}
20	16.11 ^{a-c}	114.67 ^{c-f}	23.00 ^{b-g}
21	15.45 ^{a-c}	145.00 ^{b-e}	30.00 ^{a-f}
22	19.67 ^{ab}	225.00 ^a	42.67 ^a
23	21.33 ^a	160.00 ^{a-d}	43.67 ^a
24	14.33 ^{a-c}	112.00 ^{c-f}	26.33 ^{b-g}
25	18.00 ^{ab}	119.67 ^{c-f}	23.33 ^{b-g}
26	17.00 ^{ab}	118.00 ^{c-f}	20.00 ^{b-g}

Values with the same letter(s) along the same column are not significantly different at ($p=0.05$).

Table3: Qualitative characteristics of seeds among selected *Parkia biglobosa* population

Plant number	Seed colour	Shape	Size	Textture
1	Db	Fo	Bg	Smo
2	Brown	Rov	Sm	Smo
3	Var. Brown	Fo	Bg	Smo
4	Choco brown	Fo	Bg	Smo
5	Db	Rov	Sm	Smo
6	Db	Fo	Bg	Smo
7	Choco brown	Rov	Md	Smo
8	Db	Fo	Bg	Smo
9	Db	Fo	Md	Smo
10	Db	Fo	Md	Smo
11	Black	Rov	Md	Smo
12	Choco brown	Fo	Bg	Smo
13	Var. Brown	Fo	Bg	Smo
14	Db	Fo	Md	Smo
15	Db	Fo	Md	Smo
16	Choco brown	Rov	Sm	Smo
17	Black	Fo	Sm	Smo
18	Db	Rov	Md	Smo
19	Var. Brown	Fo	Bg	Smo
20	Choco brown	Oval	Md	Wrk
21	Db	Rov	Md	Smo
22	Db	Rov	Md	Smo
23	Choco brown	Fo	Bg	Smo
24	Db	Fo	Md	Smo
25	Var. Brown	Rov	Md	Smo
26	Db	Rov	Sm	Smo

Var brown=Variegated brown

Db=Dark brown

Choco brown=Chocolate brown

Fo=Flat oval, Wrk=Wrinkle, Rov= Round oval

Bg=Big, Md=Medium, Sm= Small,

Smo=Smooth

For the Qualitative characteristics of seeds among the *Parkia biglobosa* population, plant 20 was observed to have a wrinkled seed coat while others have smooth seed coat. 15 plants of the selected *Parkia biglobosa* population have flat oval seed shape and others having shapes between round oval and oval. Their sizes fall among big (plants 1, 3, 4, 6, 8, 12, 13, 19 and 23), medium (plants 7, 9, 10, 11, 14, 15, 18, 20, 21, 22, 24 and 25) and small (plants 2, 5, 16, 17 and 26). The seeds of plants 1, 5, 6, 8, 9, 10, 14, 15, 18, 21, 24 and 26 are dark brown in colour, two plants have pure black and the others have brown related seed coat colours (Table3). The characteristics of the fruit and seed of *Parkia biglobosa* population studied (seed brown-blackish weight. Seed colour was majorly within brown and black colour, ovoid-related, smooth and varied sizes within the pods) are also similar to the report of Staples and Elevitch (2009) on the description of *Samanea saman* (rain tree). Seed characteristics of some *Parkia biglobosa* population also agree with the characteristics of Garden pea as reported by Akhter *et al*, (2009) in terms of seed colour, seed shape and texture of the seed coat and the description of Sacande and Clethero (2007) on the millennium seed bank project kew.

CONCLUSION

The population of *Parkia biglobosa* studied revealed an amazing character display that cuts across the number of pods per bunch, number of seeds per pod, number of seeds per bunch, seed colour, seed weight, and fruit pulp derivatives with smooth seed coat texture.

REFERENCES

- Akhter, N., Rahman, M.M., Hasanuzzaman, M. and Nahar, K., (2009). Physiological Response of Garden Pea (*Pisum sativum* L.) Growth under Different Light Environment. *Botany Research International* 2 (4): 304-309.
- Alabi, D.A., Akinsulire, O. R. And Sanyaolu, M.A (2005). Qualitative determination of chemical and nutritional composition of *Parkia biglobosa* (Jacq.) Benth. *African Journal of Biotechnology* Vol. 4 (8), pp. 812-815. Forest Product in Pakistan. Ethno-Botany Project. WWF-P, Peshawar, Pakistan.
- Joshi, A.R and Joshi, K. (2009). Plant Diversity and Ethno-botanical notes on tree species of Syabru Village, Langtang National park, Nepal. *Ethno botanical leaflets* 13: 651-64.
- Latif, A., Z.K. Shinwari and S. Begum, (2002). Potentials and Market status of Mushrooms as Non-timber Non-timber Forest Production in Pakistan. Ethno-Botany Project. WWF-P, Peshawar, Pakistan.
- NEST, (1991). Nigeria's threatened environment: a National profile.
- Okafor, J. C., (1980). Edible Indigenous Woody Plants in the Rural Economy of the Nigerian Forest Zone. *Forest Ecology and Management* Vol 3: 45-55.
- Popoola, L. and H. Maishanu, (1995). Socio-economic values of some potential farm forestry species in Sokoto State. Proceeding of the 24th Annual Conference of the Forestry Association of Nigeria. Kaduna. Oduwaiye, E.A., (Edn.), pp: 109-119.
- Sacande, M. and Clethero, C, (2007). *Parkia biglobosa* (Jacq.) G. Don. Millennium Seed Bank Project Kew. Seed Leaflet No 124.
- Tee, N.T. and I. Verinumbe, (2007). Utility dynamic and prioritization of *Borassus aethiopum* (Mart) in Northeastern Nigeria. *J. Agri. Res. Policies*, 3: 87-93.
- Tee, N.T. and L. Popoola, (2007). The role of *Borassus aethiopum* (Mart) on livelihood sustainability, the North-eastern Nigeria Experience. *Discovery and Innovation*, 19: 230-237.
- Tella, I.O., M.O. Tella and A.Y. Buba, (2008). Utilization and Commercialization of two MPTS (*Borassus aethiopum* and *Adansonia digitata* in Some semiarid Communities, In: J.C. Onyekwelu, V.A.J. Adekunle and D.O. Oke (Edn.) Proceedings of the First National Conference of the Forest and Forestry Products Society. 16th -18th April, At the Federal University of Technol. Akure, pp: 140-146.
- Verinumbe, I., (1991). Agroforestry development in northeastern Nigeria. *Forestry Ecology and Management. Elsevier Publishers B.U. Amsterdam*, 45: 309-317.