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Cytomorphological Studies of the Tribe Desmodieae Found in Northern Nigeria

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***Abstract* – Chromosome counts and morphological studies of some leguminous taxa of tribe Desmodieae from wild populations in Northern Nigeria were carried out to determine their chromosome numbers, phenology and their relationships with the soils on which they were found growing. Results from chromosome counts confirm the previous reports of n=11 for *D. gangeticum, D. scorpiurus, D. tortuosum, D. triflorum, D. velutinum* and *Uraria picta*.The haploid number of n=11 is a new report for *D. barbatum*, while a B- chromosome was recorded for the first time in *D. laxiflorum*. The distribution maps of the investigated taxa and their phenological data are presented for the first time.**

***Keywords* – Chromosome, Morphological, Desmodieae, Phenology.**

I. Introduction

The family Fabaceae is more or less equivalent to Gramineae in economic importance due to its known as potential food plants and a multitude of other uses. With about 700 genera and nearly 20,000 species, they constitute the third largest family of flowering plants after Compositae and Orchidaceae [15].The tribe Desmodieae is an important group in this family. They are shrubs, herbs and rarely trees; leaves pinnately 3-9 foliolate or one foliolate, stipulate; flowers in terminal or axillary racemes. Twenty seven genera was reported in this tribe [16]. In West Africa, it is represented by 3 genera and 22 species. There is paucity of information on the Cytology of the tribe Desmodieae from Northern Nigeria. The only notable contribution is by Goldblatt who reported a base number of x = 11 for this tribe [9]. He recorded a count of n =12 in the single species of *Desmodium* sub gen. *Ougenia.* Taken this into consideration, a systematic cytological investigation of eight species in the tribe from Northern Nigeria was investigated.

II. Materials and Methods

Young flower buds of seven species of tribe Desmodieae were collected from the wild populations and fixed in 1:3 glacial acetic and alcohol for 24 hours. They are then transferred into 70% alcohol for preservation and stored in refrigerator at 4oc until when needed for cytological studies. Staining of the chromosomes was improved by saturating the acetic acid in the fixative with ferric acetate. The anthers were then squashed in 2% aceto- carmine or aceto- orcein stain and finally chromosome number was confirmed from at least 20 well spread cells. Permanent slides were made by passing the prepared slides through 70% alcohol for three minutes and absolute alcohol for two minutes and finally mounted in "euparol".

Pollen fertility was determined from the ability of pollen to stain with 50% glycerol-aceto carmine. The anthers from matured flower buds were squashed in a drop of glycerol-aceto carmine. Pollen grains which were filled with stained protoplasm were considered to be fertile, while small, shrinked and unstained ones were counted as sterile. The grains were observed under 50 different microscopic fields, counted, measured using graduated eye piece graticle and finally percentage pollen fertility was calculated by dividing the number of well filled stained pollen by the total number of cells observed multiplied by hundred.

Distribution maps were constructed from base maps designed by Agboola [1]. The distribution and abundance of all studied plant specimens and those available at Forest Research Institute, Ibadan were inserted in the base map.

Photomicrographs were taken under a NIKON L-50 Orthomat microscope with an automatic Ricoh XR – X 3000 camera attachment and oil-immersion contrast objective of X100 and compensating ocular x 10. Panchromatic high contrast copy films with a speed of 120 to 135 millimeters were used. Voucher specimens from which chromosome counts have been made were deposited in the herbarium of the Biological Sciences, Department, Ahmadu Bello University, Zariawith the following references /accession numbers: *Desmodium barbatum*: MAA025, *D.gangeticum*: MAA094, *D. laxiflorum*: MAA048, *D.scorpiurus*: MAA087, *D. tortuosum*: MAA068, *D.triflorum*: MAA077, *D.velutinum:* MAA005, *Uraria picta*: MAA103.

III. Results

D. barbatum are more or less woody under shrub up to 0.2m or higher with purplish flowers. It flowers from August to October in Northern Nigeria. Eleven haploid counts were determined at metaphase 1. Meiosis was normal with 75% filled pollen. The average pollen grain size was 26.0µm. This is a new chromosome count for this species.

D. gangeticum are erect, half woody, under shrub up to 1.3m high with small white and pink or bluish colour flowers. It flowers from March to April in Northern Nigeria. A haploid count of n=11 was observed at anaphase1 which tallies with earlier reports of 2n=22 by Bir and Sidhu [4], and Yeh *et al.* [18], n=11 by Jahan *et al.* [11]. Meiosis was normal with 78% filled pollen and an average pollen grain size of 24.5µm.

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D.laxiflorum are under shrub, up to 1m, or more high with pink or purple flowers; leaves turn red when the plant is in fruit. Two populations were studied and both proved to have a haploid number of 11. However, in one population 1B-chromosome was noticed only in 20% of the cells. Pollen stainability was 75% with an average pollen grain size of 28.5µm. The earlier recorded numbers for this species are n=11 by Gao and Zou [7].

D. scorpiurus are straggling, climbing or procumbent herb with few small blue flowers; fruits 5-8 seeded. It was introduced from tropical America and found growing abundantly in the North and South Western parts of Nigeria.

Eleven haploid counts were observed at metaphase 1. Meiosis was normal with percentage pollen stainability of 80% and an average pollen grain size of 25.2µm.

*D. tortuosum are e*rect herbs or under-shrub; leaflets thin and flowers very small. It was an introduced species but wide spread in the tropics. A haploid count of n=11 was observed at metaphase 1. This is in agreement with the earlier report of n=11 by Chen *et al.* [5]. Meiosis was normal and regular with percentage pollen stainability of 90% while, the average pollen grain size was 20.8µm.

D. triflorum are prostrate, creeping plant with much branched stem, fruits 5-seeded, pubescent. A haploid count of n=22 was determined at metaphase 1. This corroborate earlier reports of 2n=22 by Gao *and* Zou [7] and Yeh *et al.* [18]. Meiosis was normal with percentage pollen stainability of 88% and the average pollen grain size of 24. 0 µm.

D. velutinum are half woody, erect, rather hairy under-shrub up to 1.5m high, with small pink or purplish flowers and fruit- segments, which adhere like burrs. It flowers from September to November in Northern Nigeria.

Three populations of this species were investigated and all prove to have a haploid count of n=11 with regular meiosis. The average pollen grain size was 23.0µm which confirms the previous reports of 2n=22 by Bairiganjan *et al.* [3], Gao and Zou [7] and n=11 by Gill and Husaini [8]. Meiosis was normal with percentage pollen stainability of 85% and the average pollen grain size of 23.0µm.

Uraria picta are perennial small shrub up to 0.5m high, flowers small, pink or purplish in dense villous spike-like racemes which may be over 30cm long. It grows in acidic and sandy soils of Savannah and derived Savannah regions of the country. It flowers from September to October in the North. The present haploid count of n=11 at anaphase 1 confirms the previous reports of 2n=22 by Gill and Husaini [8] and Kumari and Bir [13]. However, it differs from Sanjappa and Dasgupta's report of 2n=16 [17]. Meiosis was normal and the average pollen grain size was 24.0µm.

IV. Discussion

The eight species from the tribe Desmodieae presently investigated from Northern Nigeria are diploids with chromosome number 2n = 22. This is in line with earlier chromosome numbers report given by authors as indicated in Table 1.The presence of B- chromosome in *Desmodium laxiflorum* is being reported in the studied area for the first time (Table 2). B- Chromosomes were reported in *Indigofera hirsuta* and *I. tinctora* from Northern Nigeria [1]. They were considered to be genetically inert but now, they are known to increase variability and have been a key factor in plant evolution and speciation and the origin of novel adaptation [14]. The chromosome number of n=11 for *D.barbatum* is also a new report for Northern Nigerian species (Table 2). The base number of n=11 seems to be fundamental in this tribe. Goldblatt's count of n=12 in the single species of Desmodium sub. Genus Ougenia seems unlikely [9]. The counts of n=11 is confirmed for *D.gangeticum, D. scorpiurus, D.tortuosum, D.triflorum, D.velutinum and Uraria picta.* From the distribution map it is quite evident that the Tribe Desmodieae are widely distributed within the South west and central with only few populations found around the far North and south eastern part of Nigeria. Meiosis was normal in all species studied with filled pollen grains ranging from 75% to 88% and average pollen grain size ranging from 20.8µm to 28.5µm. Phenological results indicate that all investigated species flowers and fruit within the month of July and November. This will serve as a pointer to plant collectors as to when these plants can be collected for further studies.

References

[1] Agboola, S.A. (1979). An Agricultural Atlas of Nigeria. Oxford University Press London.248pp.

[2] Adelanwa, M. A., Japhet, W. S. and Malgwi, M. M. (2004). Cytomorphological investigations of some species of the genus *Indigofera* L. From Northern Nigeria. *Journal of Tropical Biosciences*. Vol.4:89-91.

[3] Bairiganjan, G. C. and Patnaik, S. N. (1989). Chromosomal evolution in Fabaceae. *Cytologia*. 54: 51-64.

[4] Bir, S. S. and Sidhu, M. (1967). Cytological observation of North Indian members of Leguminosae. *Nucleus*. 10;47-63.

[5] Chen, Z., Chen, T. and Huang, X. (1991). Chromosome counts on Chinese Leguminosae. *Acta Botanica Austo Sinica*.7: 26-39.

[6] Darlington, C. D. and La Cour, S. F. (1962). The handling of Chromosomes, Allen and Unwin, 4th revised edition. 270pp.

[7] Gao, C. and Zou, I. Q. (1995). A report on the Karyotypes and Chromosome numbers of some taxa of *Desmodium*(Sensu lat.) from Guangxi, *Guihaia*. 15(2): 166-171.

[8] Gill, L. S. and Husaini, S. W.H. (1986). Cytological observations in Leguminosae from Southern Nigeria. *Willdenowia* 15: 521-527.

]9] Goldblatt, T. (1981). Chromosome numbers in Legumes 11. *Annals of Missouri Botanical Garden*.68:551-557.

[10] Huang, S. F., Zhao, A. F., Chen, Z. Y., Chen,S. Z. and Huang, X.X. (1985). Preliminary report on Chromosome numbers of plants. Yalin Keji. *Asian Forest Sci. Technol*. (1): 1-15.

[11] Jahan, B., Vahidy, A.A. and Ali, S.I. (1994). Chromosome numbers in some taxa of Fabaceae mostly native to Pakistan.*Annals of Missouri Botanical Garden*.81: 792-799.

[12] Khatoon, S, and Ali, S. I. (1991). Chromosome numbers in sub family Papilionoideae (Leguminosae) from Pakistan.*Willdenowia.* 20: 159-165.

[13] Kumari, S. and Bir, S. S. (1990). Karyomorphological evolution in Papilionaceae. *Journal of Cytology and Genetics*.25: 173-219.

[14] Levin, D. A. (2002). The role of Chromosomal change in plant evolution. Oxford University Press, Newyork U.S.A ISBN 0-19-513860-0.

[15] Lewis, G., Schrire, B., Mackinder, B. and Lock, M. (2005). Legumes of the World.Royal Botanical Garden, Kew.

[16] Ohasi,H., Polhill, R. M.,and Schubert, G. B. (1981). The tribe Desmodieae – In "Advances in Legumes Systematics Part1 " Royal Botanical Garden, Kew, England, Ministry of Agriculture, Fish and Food. Pp.292-300.

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Volume 2, Issue 4, ISSN (Online) 2319-1473

[17] Sanjappa,M. and Dasgupta, A. (1983). Chromosome Number in some Indian Legumes. *Indian Journal of Botany* 6: 61-64.

[18] Yeh, M. S., Yuasa, H. and Maekawa, F. (1986). Chromosome numbers in L*eguminosae*. *Sci. Rep. Res. Evol. Biol.* 3: 57-71.

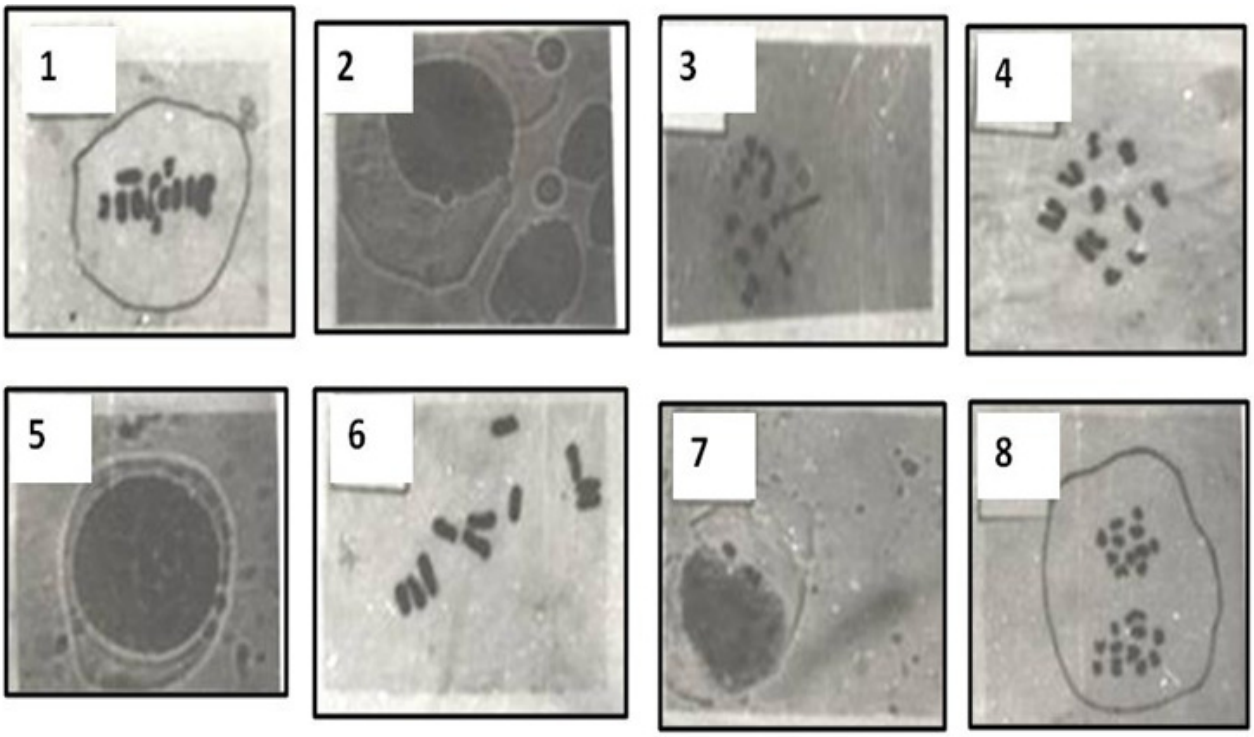

Plate 1: Photomicrographs showing chromosomes and their numbers in the family *Fabaceae* from Northern Nigeria

1. *Desmodium barbatum* (M) (n = 11) 2. *D.gangeticum* (A) (n = 11) 3. *D. laxiflorum* (M) (n= 11 +1B)
4. *D. scorpiurus* (M) (n = 11) 5. *D. tortuosum* (M) (n = 11) 6. *D. triflorum* (M) (n = 11)
7. *D. velutinum* (M) (n = 11) 8. *Uraria picta* (A) (n = 11)

Table 1: Species of Tribe Desmodieae examined with their chromosome numbers

Species	Acc. No.	Source	Flowering period	N
D.barbatum	MAA025	A.B.U. Zaria	Jul-Sept.	New report
D.gangeticum	MAA094	Agric. Farm A.B.U.Zaria	Mar.-April	11
D.laxiflorum	MAA048	A.B.U. Dam Zaria	Aug-Sept	11+1B
D.Scorpiurus	MAA087	A.B.U. Dam	Jul-Sept	11
D.tortuosum	MAA068	Toro Bauchi	Aug-Oct	11
D.triflorum	MAA077	Funtua	Aug-Sept	11
D.velutinum	MAA005	Zango Zaria	Sept-Nov	11
U. picta	MAA103	Jos	Sept-Oct	11

Table 2: Known Chromosome Numbers in Tribe Desmodieae

Taxon	n	2n	x	Authors
D. barbatum	11	22	11	New report
D.gangeticum	11	22	11	Bir & Sidhu (1967)2n=22, Yeh *et al.* (1986) 2n=22, Jahan *et al*. (1994) n=11
D.laxiflorum	11	22	11	Gill *et a.* (1984a) n=11, Sanjappa & Bhatt (1985)2n=22, Gao *et al*.(1995)n=11
D. scorpiurus	11	22	11	Huang *et al*. (1985) n=11
D.tortuosum	11	22	11	Chen (1991) n=11
D.triflorum	11	22	11	Yeh *et al*. (1986) 2n=22, Khatoon & Ali (1991) 2n=22, Gao *et al*.(1995) 2n=22
D.velutinum	11	22	11	Gill & Husaini (1986) n=11, Bairiganjan *et al*.(1989)2n=22,Gao *et al*. (1995)2n=22
U. picta	11	22	11	Sanjappa & Dasgupta(1983)2n=16,Gill& Husaini(1986)n=11,Kumari&Bir (1986)2n=22,

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