

DIVERSITY AND DISTRIBUTION OF THE GENUS *DIOSCOREA* IN WESTERN GHATS

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INTRODUCTION

- The genus *Dioscorea* is one of the largest groups among monocotyledons belonging to the family Dioscoreaceae.
- The members are commonly known as yams and are widely cultivated for its edible tubers throughout tropics and occupies 3rd most important food crops in the world, next to cereals and pulses.
- The word yams comes from Portuguese or Spanish name as "Inhame" which means "to eat".
- The genus is distributed mainly in three centers of diversity namely South Africa, South East Asia and Latin America.
- The genus *Dioscorea* represents 850 spp. (Mabberley, 1997) and in India reported the occurrence of 32 spp. (Prain and Burkill, 1936, 1939) of which 17 are distributed in W. Ghats.
- The genus shows close affinity towards dicotyledons by the presence of petiolate compound leaves, non sheathing leaf base, reticulate venation etc.

REASONS FOR UNDERTAKING THE STUDY

- Many of the *Dioscorea* species serve as a "life saving" plant group to marginal farmers and forest dwelling communities during the period of food scarcity (Arora and Anjula pandey, 1996)
- Most of the tubers are edible and few are also used as medicinal. More than five million people are directly or indirectly depending on this crop for their food, feed, medicine etc.
- In spite of its manifold economic importance, the group is not taxonomically well studied for the last 60 years in India except a few attempts by the regional flora researchers.

REASONS FOR UNDERTAKING THE STUDY.....contd

- The taxonomy of quite a few species in this genus is considered to be very problematic (Prain and Burkill, 1936, 1939; Velayudan, 1998) due to their continuous variability of morphological characters especially in aerial parts such as leaves and bulbils. This makes it difficult for taxonomists to segregate distinctly the various taxa of the genus.
- The dioecious nature, variable phyllotaxy, different phenology of the same species, deep seated bulky underground tubers etc makes the group much more difficult for researchers and hence neglected.
- Against this background the present study has been undertaken to delimit and unravel the species complex that exists in the Western Ghats based on fresh explorations from the wild as well as in cultivation.

CURRENT STATUS OF SPECIES OF *DIOSCOREA* - A GLANCE

1. World	-	850 Species
2. South East Asia	-	150 ”
3. India	-	32 ”
4. Western Ghats	-	17 ”
5. Present Study	-	20 Species
		+ 10 Varieties
		+ 8 unidentified species

GENERAL CHARACTERS OF THE GENUS *DIOSCOREA*

Most notable characters are :

1. Universal dioecism of the genus
2. Twining climbers without tendrils
3. Twining of the stem is species specific and producing leaves and inflorescence
5. Inflorescence are axillary spikes
6. Under ground part of all the species are tuberous

METHODOLOGY

- A reconnaissance survey based on literature was done to determine the area of distribution in Western Ghats
- Plant Specimens were collected from different areas of Western Ghats, examined in the field itself and preserved in FAA for further studies
- Field characters were noted then and there
- Ethno Botanical importance of each species were noted
- Live photographs of the specimens were taken including tubers for identification
- Specimens were processed for Herbarium as per the standard procedures
- Illustrations were made based on fresh specimens

METHODOLOGY.....contd

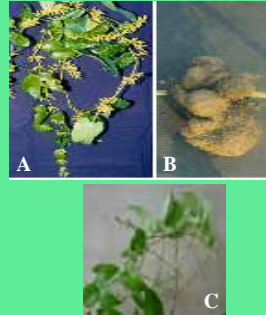
- Consulted the following herbaria for confirming the identity and authentication of specimens
 1. Central National Herbarium (CNH), Calcutta.
 2. Herbarium of Indian Museum, Calcutta.
 3. Herbarium of BSI, Pune.
 4. Blatter Herbarium, Bombay.
 5. Herbarium of BSI southern Circle (MH), Coimbatore, Tamil Nadu.
 6. Herbarium of Madras Christian college, Tamil Nadu.
 7. Herbarium of Presidency College Madras, Tamil Nadu.
 8. Herbarium of TBGRI Palode (TBGT), Trivandrum, Kerala.
 9. Herbarium of KFRI, Trichur, Kerala.
 10. Herbarium of NBPGR, Trichur, Kerala.
 11. Herbarium of University of Calicut (CALI), Kerala.
- Established *ex-situ* gene bank at TBGRI for monitoring and evaluation.

RESULTS

- During the course of present study, a total of 38 taxa have been collected and out of which 20 species and 10 varieties have been identified.
- The remaining 8 taxa are imperfectly known owing to the lack of either male or female flowers. Therefore efforts are being continued to collect the materials to confirm the identity of these taxa, which may finally end up to new reports to India or to Western Ghats

SPECIES	STATUS OF DISTRIBUTION	SPECIES	STATUS OF DISTRIBUTION
1. <i>Dioscorea alata</i>	Cultivated	11. <i>Dioscorea Jacquemontii</i>	nw, cw, sw (E & R)
2. <i>Dioscorea anguina</i>	nw, cw, sw (E & R)	12. <i>Dioscorea kalkaprasadii</i>	sw (E & R)
3. <i>Dioscorea belophylla</i>	nw, cw, sw (E & R)	13. <i>Dioscorea oppositifolia</i>	nw, cw, sw
4. <i>Dioscorea bulbifera</i>	nw, cw, sw	14. <i>Dioscorea pentaphylla</i>	nw, cw, sw
5. <i>Dioscorea composita</i>	Int. & Cult.	15. <i>Dioscorea rotundata</i>	Int. & Cult.
6. <i>Dioscorea esculenta</i>	Cultivated	16. <i>Dioscorea spicata</i>	sw (E & R)
7. <i>Dioscorea glabra</i>	nw, cw, sw	17. <i>Dioscorea tomentosa</i>	nw, cw, sw
8. <i>Dioscorea floribunda</i>	Int. & Cult.	18. <i>Dioscorea vexans</i>	Int. & Cult.
9. <i>Dioscorea hamiltonii</i>	nw, cw, sw (E & R)	19. <i>Dioscorea wallichii</i>	nw, cw, sw
10. <i>Dioscorea hispida</i>	nw, cw, sw	20. <i>Dioscorea wightii</i>	sw (Endangered)

DIFFERENT SPECIES OF DIOSCOREA: A VIEW



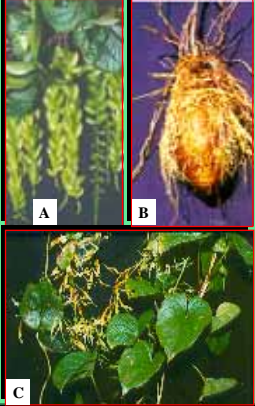
- ❖ Stem twining to the right.
- ❖ Rachis of male inflorescence zigzag.
- ❖ Stem winged, terete.
- ❖ Petiolar base with auricular extension.
- ❖ Tubers polymorphic.

Dioscorea alata L.: A. Habit- A portion of the male plant with inflorescence, B. Bulbils, C. A portion of the female plant with inflorescence.

Tubers of different varieties of *Dioscorea alata* L.



Dioscorea belophylla Voigt.: A. Habit with female inflorescence
B. Tubers



A **B** **C**

- Stem twining to the left and narrowly alate.
- Leaves simple.
- Tubers solitary, not stalked.
- Bulbils present.
- Leaves glabrous beneath.

Dioscorea bulbifera L.: A. Infructescence, B. Tuber, C. A portion of the male plant with inflorescence



A **B** **C**

Dioscorea composita Hemsl.: A, B & C. Closer view of stands



A **B**

- Stem twining to the left and terete.
- Leaves simple, pubescent beneath.
- Tubers several, distinctly stalked.
- Bulbils absent.

Dioscorea esculenta (Lour.) Burkill : A. Habit, B Tubers



A **B**

- Tubers longer than var. *esculenta*.
- Leaves are also larger than var. *esculenta* with sharp spines.
- Tubers several, distinctly stalked with a small mat of prickles.

Dioscorea esculenta (Lour.) Burkill var. *fasciculata* : A. Habit, B Tubers



A **B**

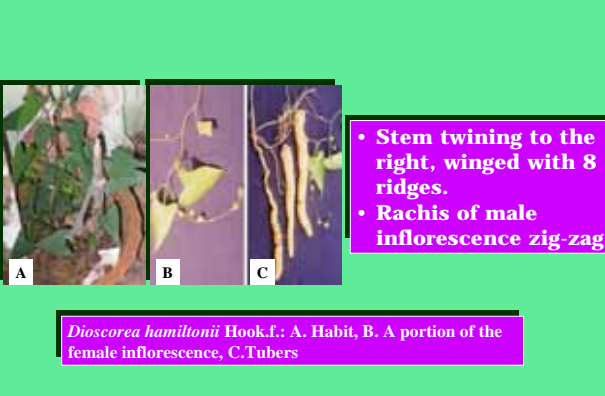
- Tubers larger distinctly stalked covered with a fine large mat of spines.
- Leaves smaller.

Dioscorea esculenta (Lour.) Burkill var. *spinosa* : A. Habit, B Tubers



A **B** **C**

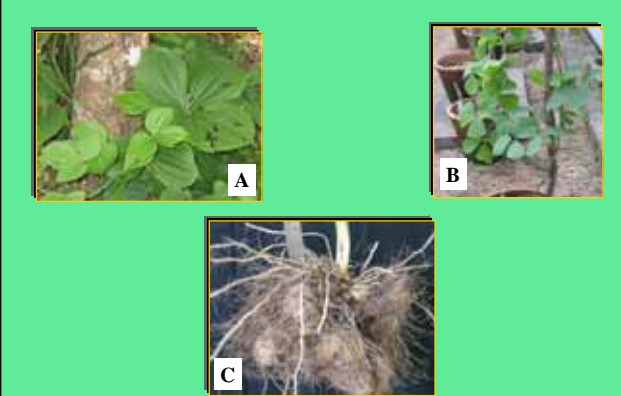
Dioscorea floribunda Martens & Galeotti : A. Habit with female inflorescence, B & C Closer view of female inflorescence



A **B** **C**

- Stem twining to the right, winged with 8 ridges.
- Rachis of male inflorescence zig-zag

Dioscorea hamiltonii Hook.f.: A. Habit, B. A portion of the female inflorescence, C. Tubers



A **B** **C**

Dioscorea hispida Dennst. : - A & B. Habit, C. Tubers

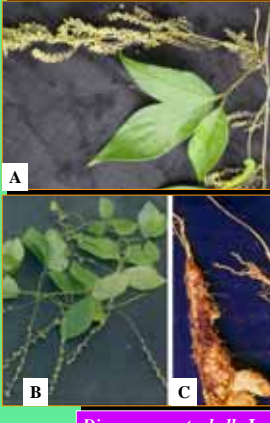


A

B

- Stem twining to the right.
- Leaves opposite and sub-opposite.
- Secondary veins obscure on both sides.

Dioscorea oppositifolia L. : A. Habit with male inflorescence, B. Tuber



A

B

C

- * Stem twining to the left.
- * Leaves compound, glabrous or rusty tomentose below.
- * Bulbils present.

Dioscorea pentaphylla L. : A. Male plant with inflorescence, B. Female plant with inflorescence, C. Tuber



A

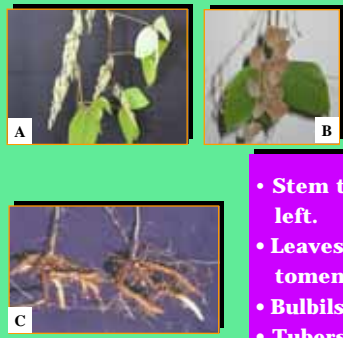
B

C

D

- Leaves glabrous, opposite.
- Stem with prickles, twining to right.

Dioscorea rotundata Poir. : A. Habit, B - D. Tubers



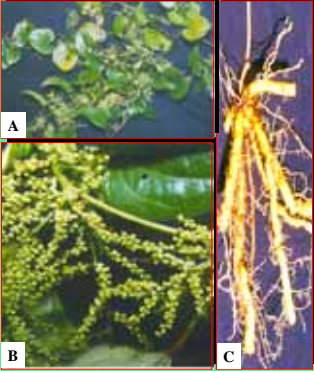
A

B

C

- Stem twining to the left.
- Leaves compound and tomentose.
- Bulbils absent.
- Tubers numerous.

Dioscorea tomentosa Koenig ex Spreng. : A. Habit with male inflorescence, B. Female infructescence, C. Tubers



A

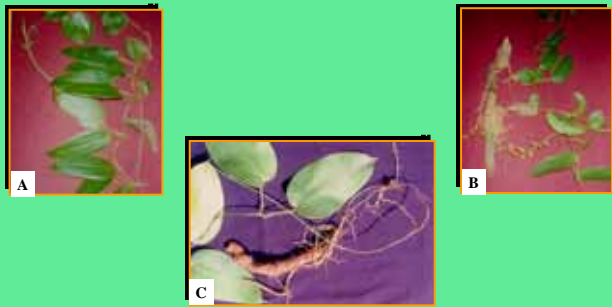
B

C

- Stem twining to the right and without wings.
- Rachis of male inflorescence not zigzag.
- Leaves alternate.
- Tubers fibrous.

Dioscorea wallichii Hook.f. : A. Habit with male inflorescence, B. Closer view of male inflorescence, C. Tubers

INTERESTING COLLECTIONS OF DIOSCOREA



A

B

C

Dioscorea spp. No 1: A. Habit, B. Habit with bulbils and female inflorescence, C. Tuber with leaves



Dioscorea spp. No 2: Tubers with leaves



A

B

Dioscorea spp. No.3: A. Habit, B. Tubers



Dioscorea spp. No.4: A. & B. Habit, C.Tubers



Dioscorea spp. No.5: Tubers



Dioscorea spp. No.6: Tubers



Dioscorea spp. No. 7: A. & B. Tubers



Dioscorea spp. No. 8: A. Habit with infructescence, B. Tubers

Germplasm of Dioscorea species in TBGRI



Germplasm of Dioscorea species in TBGRI



CONCLUSION

- Different regional floras of Western Ghats revealed that a total of 20 species are present in the wild as well as in cultivation.
- The present study is based on fresh exploration carried out in this area and identified 20 species and 4 taxonomic varieties of *Dioscorea pentaphylla* and 2 varieties each of *D. bulbifera*, *D. esculenta* and *D. oppositifolia*.
- The survey also led to the collection of 8 imperfectly known taxa which may finally end up to new reports to India or to Western Ghats.
- The study assumes a great significance in understanding the taxonomy as well as ethnobotany of yams and also provide a ready reckoner for different species of *Dioscorea* which are present in W. Ghats and also in India.
- Since *Dioscorea* is a vital food crop to the poorest of the poor as well as a medicinal plant, the conservation of wild relatives and land races gains much significance in strengthening our food security in future.

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