MONOGRAPH
ON
DIOSCOREA TOMENTOSA KOENIGEX. SPRENG, *DIOSCOREA WALLICHII* HOOK.F. & *DIOSCOREA ALATA* LINN

FOREST BOTANY DIVISION
STATE FOREST RESEARCH INSTITUTE
JABALPUR (M.P.)

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DIOSCOREA TOMENTOSA KOENIGEX. SPRENG, *DIOSCOREA WALLICHII* HOOK.F. & *DIOSCOREA ALATA* LINN

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FOREWORD

Yam is the common name for some species in the genus *Dioscorea* (family Dioscoreaceae). These are perennial herbaceous vines cultivated for the consumption of their starchy tubers in Africa, Asia, Latin America and Oceania.

Dioscorea tomentosa Koenig ex. Spreng occurs in forests, mountain slopes with an altitude between 900 and 1300 m. Its distribution out side India is also reported in, Bangladesh, Malaysia, Myanmar, Thailand. It is a rare climbing species. In Madhya Pradesh, it occurs occasionally in Hoshangabad district. *Dioscorea wallichii* is common in mixed and sal forest. It occurs in Bastar, Raigarh and Raipur district of Chhattisgarh and Seoni district of Madhya Pradesh. *D.alata* is a native of south east Asia and is considered to be closely allied to wild species, *D.persimilis* Prain and Burkill, and *D. hamiltonii*. It is the most important species among the cultivated yams and is grown throughout the tropics and in countries bordering the tropics. It is practically cultivated in all the states in India. All the three species are cheap source of carbohydrate and valuable for nutritious food.

This monograph provides useful information on the distribution and habitat, morphology, flowering and fruiting, natural regeneration, artificial regeneration, utilization, chemical constituents, threat status, conservation measures etc., of these three species of genus *Dioscorea* for promoting their conservation and overall development of forestry, medicinal and environmental sectors.

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(C.P. Rai, IFS)
Director

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DIOSCOREA TOMENTOSA KOENIGEX. SPRENG

I. KNOWING THE SPECIES

Tamil : Nalvaelikizhangu, Shaval Kilangu

Malayalam : Inthi Kachchil, Nuli, Chavu, Pindi

II. DISTRIBUTION AND HABITAT

Yam is the common name for some species in the genus *Dioscorea* (family Dioscoreaceae). These are perennial herbaceous vines cultivated for the consumption of their starchy tubers in Africa, Asia, Latin America and Oceania. There are many cultivars of yam. In central parts of India, the yam (or Garadu) is prepared by being finely sliced, seasoned with spices and deep fried. In southern parts of India, the vegetable is a popular accompaniment to fish curry. In Assam, it is known as Kosu and is normally boiled, mashed and lightly seasoned with salt.

Dioscorea tomentosa Koenig ex. spreng occurs in forests, mountain slopes with an altitude between 900 and 1400 m. Occasional on slopes by forest borders, less in the plains. Found across the Indian subcontinent.

Its distribution out side India is also reported in, Bangladesh, Malaysia, Myanmar, Thailand. It is a rare climbing species. In Madhya Pradesh, it occurs occasionally in Hoshangabad district.

III. MORPHOLOGY

It is a climber with tubers, herbaceous perennial lianas, growing to 2–12 m or more tall. Stems twining to the left, grooved, with small recurved prickles, cottony white tomentose. Branchlets twining to the left, tomentose, rarely prickled. Leaves densely tomentose. Leaves alternate, usually 3- foliate, rarely 5-foliate, middle leaflet obovate, densely tomentose beneath, lateral leaflets elliptic-ovate, up to 12 X7 cm, abruptly acuminate at apex, petioles tomentose with prickles. Flowers white, in simple or branched, axillary, pendulous panicles, bracteate, rachis densely pubescent. Tepals coriaceous, tomentos. Stamens 3, fertile. Staminodes 3. Capsules oblong,3 winged, white- brown tomentose. Seeds winged at base.

IV. FLOWERING AND FRUITING

Flowers in axillary spikes, purplish. Flowering occurs during July - October. Fruit, a capsule, cuneately oblong, winged, fruits downy, eventually becoming glabrous. Seeds 3, obovoid, apically winged. Fruiting occurs during August-November.

V. NATURAL REGENERATION

Natural regeneration is very poor.

VI. ARTIFICIAL REGENERATION

It can be propagated through seeds and micro propagation. It can be cultivated as a garden crop with adequate moisture and good drainage. It prefers light sandy loam soil. FYM is usually applied. Tubers and bulbils are used for propagation. The pit size of 45 cm x 45cmX 45 cm at a distance of 1 m is generally prescribed for planting. The planting period is July – August. Initially vines need climbing support. The crop mature in 6-8 months after planting. The weeding and soil working are necessary during the development of crop.

VII. UTILIZATION

It is edible after detoxification. Eating the cooked tuber is believed to help clean the digestive system and also promote hair growth. The tubers is steamed or roasted before eating.

VIII.CHEMICAL CONSTITUENTS

Tubers of many *Dioscorea* are considered as good source of Vitamin 'C' and Diosgenin. Diosgenin (575.000 to 616.667 mg/g) and Vitamin 'C' (6.467 to 6.600 mg/g) contents are found both in fresh tuber and dry tuber of *Dioscorea tomentosa*.

VIII.THREAT STATUS AND CONSERVATION MEASURES

It is a medicinal and priorities herb species for conservation in the botanical garden (as per BSI guidelines). The protocol on micro propagation through tissue culture need to be developed for its conservation and mass multiplication.

IX. SOURCE INSTITUTIONS FOR DETAILED INFORMATION

1. State Forest Research Institute, Polipathar, Jabalpur 482008 (M.P.)
2. Botanical Survey of India, Central Circle 10 Chatham Lines, Allahabad (UP)
3. Indian Council of Forestry Research and Education, Dehradun (Uttaranchal)
4. Council of Scientific and industrial Research, New Delhi.
5. Flora of Nilgiri Biosphere (Northern Nilgiri Biosphere Reserve)
6. PG Department of Botany, Utkal University, Vanivihar, Bhubaneswar-751004, Orissa, India
7. P.N. College (Autonomous) Khurda, Orissa, India

DIOSCOREA WALLICHII HOOK.F.

I.KNOWING THE SPECIES

Synonym: *Dioscorea wallichii* var. *christiei* Prain & Burkill, *Dioscorea wallichii* var. *vera* Prain & Burkill

*II.*DISTRIBUTION AND HABITAT

Dioscorea wallichii is common in mixed and sal forest. It occurs in Bastar, Raigarh and Raipur district of Chhattisgarh and Seoni district of Madhya Pradesh.

III. MORPHOLOGY

Genus

Dioscorea is a genus of over 600 species of flowering plants in the family Dioscoreaceae, native throughout the tropical and warm temperate regions of the world. The vast majority of the species are tropical, with only a few species extending into temperate climates. It is named after the ancient Greek physician and botanist Dioscorides.

They are tuberous herbaceous perennial lianas, growing to 2–12 m or more tall. The leaves are spirally arranged, mostly broad heart-shaped. The flowers are individually inconspicuous, greenish-yellow, with six petals; they are mostly dioecious, with separate male and female plants, though a few species are monoecious, with male and female flowers on the same plant. The fruit is a capsule in most species, a soft berry in a few species.

Species

Tubers palmately branched, cylindric. Stem twining to right, stout, glabrous. Leaves opposite or alternate, simple; petiole 4—12 cm; leaf blade orbicular or ovate, 6—18 × 6—22 cm, glabrous, basal veins 7—11, base cordate to deeply so with narrow sinus and basal lobes rounded, margin entire, apex acute or shortly acuminate. Male spike 2—5 cm, in delicate, axillary panicles 4—10 cm;

rachis straight. Male flowers: bracts triangular-ovate; perianth purplish red dotted, outer lobes elliptic-ovate, inner ones broadly obovate; stamens 6; staminodes large, subglobose. Female spikes simple or branched. Female flowers: perianth lobes fleshy, outer ones ovate, inner ones broadly ovate. Capsule (immature) not reflexed, drying blackish, oblate, 2—2.7 cm, glabrous, base truncate, apex emarginate to truncate; wings 1.7—2 cm wide. Seeds inserted near middle of capsule, winged all round.

IV. Flowering and Fruiting

August – December

V. NATURAL REGENERATION

Natural regeneration is scattered.

VI. ARTIFICIAL REGENERATION

It can be cultivated as a garden crop with adequate moisture and good drainage. It prefers light sandy loam soil. FYM is usually applied. Tubers and bulbils are used for propagation. The pit size of 45 cm x 45cmX 45 cm at a distance of 1 m is generally prescribed for planting. The planting period is July – August. Initially vines need climbing support. The crop mature in 6-8 months after planting. The weeding and soil working are necessary during the development of crop.

VII. UTILIZATION

It can be used at food after detoxification. It is the cheap source of carbohydrate.

VIII. CHEMICAL CONSTITUENTS

Protein 2.83, Carbohydrate 29.41, Fat 0.02, Moisture 66.52, Ash 0.79, Fiber 0.43, Energy (kcal) 129.14 (g/100 g fresh weight).

IX. THREAT STATUS AND CONSERVATION MEASURES

IUCN Status – Least concern. *Ex-situ* conservation and promotion of *in-situ* conservation through habitat development is the urgent need of hour.

X. SOURCE INSTITUTIONS FOR DETAILED INFORMATION

1. State Forest Research Institute, Polipathar, Jabalpur 482008 (M.P.)
2. Botanical Survey of India, Central Circle 10 Chatham Lines, Allahabad 211002 (UP)
3. Forest Research Institute, PO – New Forest, Dehradun (Uttaranchal)
4. Council of Scientific and Industrial Research, New Delhi.

DIOSCOREA ALATA LINN

I.KNOWING THE SPECIES

Synonym: *Dioscorea atropurpurea* Roxb, *D. globosa* Roxb, *D. purpurea* Roxb,*D.rubella* Roxb.

II. DISTRIBUTION AND HABITAT

D.alata is a native of south east Asia and is considered to be closely allied to wild species, *D.persimilis* Prain and Burkill, and *D. hamiltonii*. It is the most important species among the cultivated yams and is grown throughout the tropics and in countries bordering the tropics. 72 races showing variations in size, shape and color of tubers and in consistency and quality of flesh have been recognize. It is practically cultivated in all the states in India.

III. MORPHOLOGY

Genus

Dioscorea is a genus of over 600 species of flowering plants in the family Dioscoreaceae, native throughout the tropical and warm temperate regions of the world. The vast majority of the species are tropical, with only a few species extending into temperate climates. It is named after the ancient Greek physician and botanist Dioscorides.

They are tuberous herbaceous perennial lianas, growing to 2–12 m or more tall. The leaves are spirally arranged, mostly broad heart-shaped. The flowers are individually inconspicuous, greenish-yellow, with six petals; they are mostly dioecious, with separate male and female plants, though a few species are monoecious, with male and female flowers on the same plant. The fruit is a capsule in most species, a soft berry in a few species.

Species

A large climber, up to 50 ft high, with quadrangular winged stems twining to the right. Leaves opposite or rarely alternate usually 5-nerved . Bulbils globose, ovoid or obpyriform, sometimes much elongated or flattened,

produced in large numbers in some races and sparingly in others. Tubers brown to black in color, non –poisomous and edible, they may be single or several, polymorphous, cylindrical or clavate, deeply descending into the soil, globose, stout and short , pyriform, lobed in various ways, fingered , loosing its positive geo-tropism with subsequent change of direction in the soil.

IV. FLOWERING AND FRUITING

August – December

V. NATURAL REGENERATION

Natural regeneration is scattered.

VI. ARTIFICIAL REGENERATION

It thrives in areas having 60 inch per annum rainfall. In areas of less rainfall it can be grown under irrigation. It is generally propagated by tuber tops bearing 2or3 buds each. In some races, aerial tubers are used for propagation. Its yield ranges from 3 to 15 tonnes per acre.

VII. UTILIZATION

It is an edible yam and is used in vegetables as potato. The hill tribes use the tuber as a substitute for rice. Yams with a purple tint are sometimes used for coloring and flavouring ice- creams. The tuber is considered anthelmintic and useful in leprosy, piles and gonorrrhoea.

VIII. CHEMICAL CONSTITUENTS

Analysis of tuber (on dry matter basis): Albuminoids,7.96 - 15.68; fat,059-1.26; ash,4.23-7.28; fibre 2.19-6.12; carbohydrates; 71.67-85.02 ; and P_2O_5, 0.44-0.98%. On an average it contains 21% starch.

IX. THREAT STATUS AND CONSERVATION MEASURES

IUCN Status – Least concern. *Ex-situ* conservation and promotion of *in-situ* conservation through habitat development is the urgent need.

X. SOURCE INSTITUTIONS FOR DETAILED INFORMATION

1. State Forest Research Institute, Polipathar, Jabalpur 482008 (M.P.).
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