

# NUMERICAL TAXONOMIC STUDY OF *IPOMOEA* SPECIES IN SOUTHWESTERN NIGERIA

BY

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B.Sc. (Plant Science and Biotechnology). AAUA

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## **DEDICATION**

This work is dedicated to Almighty God, The Authority of Life and Finisher of faith who saw me through my educational pursuit.

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## ABSTRACT

This study investigated the characters of *Ipomoea* species with a view to improving the taxonomy of the genus in Nigeria, delimit the species into their traditional sections and provide a better understanding of the affinities among species.

Specimens of *Ipomoea* species were collected from different sites in Southwestern Nigeria. Twenty-three *Ipomoea* species were collected from natural population in Southwestern Nigeria and thirteen additional species were herbarium specimens. Eighty one (81) characters were examined on each specimen. The basic data matrixes of  $81 \times 36$  were prepared by coding for presence or absence of the attributes of characters involved. Principal Component Analysis (PCA) was carried out on the taxonomic data using **Palaeontological** Statistics. A combination of two-state and multistate coding were employed. Single Linkage Cluster Analysis (SLCA) was performed for the estimation of resemblance among the groups of Operational Taxonomic Unit (OTU) and the affinities of the different OTUs were determined.

The Single Linkage Cluster Analysis revealed interspecific relationships within the genus *Ipomoea*. At lower similarity coefficients below 58% there was no separation of species. Several clusters or phenons were formed at higher similarity coefficients value based on the affinities of the species. There was correlation between the SLCA and the PCA of the *Ipomoea* species. At lower % variance, the level of similarity was so high that *Ipomoea* could hardly be separated leading to the overlapping and clustering of the species. The PCA disclosed the behavior of the *Ipomoea* species at 7.58, 13.2 and 35.10% variance. There was radial distribution of the *Ipomoea* species at lower % variance of 7.58% and 13.27% which were on components 3

and 2 respectively. When the power of variance was reduced radial distribution took over to strengthen the monophyly hypothesis of *Ipomoea* species.

The study concluded that *Ipomoea* species could be delimited in their traditional sections using the species characters.

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# CHAPTER ONE

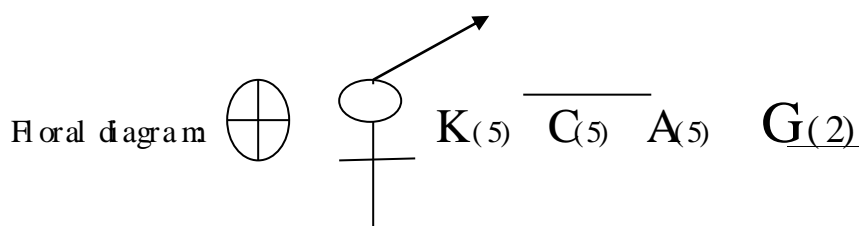
## INTRODUCTION

*Ipomoea* is an exceptionally large and diverse genus in the family Convolvulaceae, comprising over 600 species in strict and traditional concepts of the group (Austin and Huáman, 1996) or up to 1000 species in recent phylogenetic conceptions of the group (Wilkin, 1999; Manos *et al.*, 2001; Miller *et al.*, 2002). Most *Ipomoea* occur in tropical and subtropical climates throughout the world, but representative elements of the genus are in all known biomes (McDonald, 1991; Wilkin, 1999). The genus of about five hundred species found in the tropical and sub-tropical zones of the world. Thirty-eight species have been reported in West Africa and of these, thirty species are present in Nigeria (Hutchinson and Dalziel, 1963). They are mostly herbaceous to woody, scrambler, climber, trailer, twinner, shrub or small tree. The presence of milky latex exudates and bicollateral vascular bundles is highly diagnostic (Shukla and Mishra, 1979).

Leaves are exceedingly variable in shape, they may be cordate, sagitate, lanceolate, hastate, ovate, acuminate, oblong-lanceolate, palmate and suborbicular, leaves margin is entire or serrated, leaves lobed or absent, glabrous or pubescent on both adaxial and abaxial surfaces with either peltate, microhairs or wooly hairs. Leaves are arranged alternate or compound on the stem. Stipule is sometimes present. Leaf base is cordate, attenuate, acute, ovate, truncate, suborbicular or hastate in shape. Leaf apex is mucronate, acuminate, acute, obtuse, retuse or ovate in shape. Leaf is rarely pinnately parted in linear segments and number of leaf lobes varies from 3 to 23. Leaf is bilobed at the apex in some species. Average leaf length range in between 1.2- 30 cm and average leaf breadth range about 1-15 cm. Vein types vary in each plant they may be pinnate simple, palmate simple or

pal mate compound. Petiole present with either glabrous or pubescent with average length between 0.5- 25cm The stems are either pubescent or glabrous with present or absent of hollow stem, most species have scale- like structure on the stem with stem becoming reddish at the leaf node at maturity. Milky latex is encountered in many species.

There is a great deal of variation in the floral structure of *Ipomoea* to the extent that most species can be recognized on its basis. The flowers are known to vary with respect to colour, size and shape. Inflorescences are solitary or sometimes cymose. The flowers are hermaphrodites, actinomorphic, sometimes aggregated at the apices of shoots or enclosed in involucre. They are funnel form or tubular in shape, large or small in size, corolla may be white, yellow pink, red, purple or blue in colour, average flower length is between 1- 15cm and average flower breadth between 0.3- 12cm time of opening of flowers is either morning, afternoon or evening. Corolla is gamopetalous and contorted. Flower bracts are present, united and often forming involucre in some species (Hutchinson and Dalziel, 1963). Sepals vary in size large or reduced, foliaceous or linear in shape, sepal shape may be ovate, lanceolate, oblong, cordate or acuminate. Sepals are hairy or glabrous. Stamens are 5 inserted towards the base of the corolla tube and alternate with the lobes and average length of stamen is between 0.5 to 6.5cm arrangement of anther on stamen is basifixed or versatile, surface of pollen grain is spinose or smooth. Pedicel is present with average length between 1 to 20cm Ovary superior often surrounded by a disc, ovary with 1-4 ovuled. Ovule solitary or paired, erect. Style terminal 1- 4 celled, filiform and average length of style is about 0.5 to 6cm The stigma is bilobular.



*Ipomoea* fruits are of different shapes, they may be ovoid, orbicular, cordate, globose or ovate. Fruit apex shapes are acuminate, acute, obtuse, ovate and ovoid. The shapes of seeds are ovoid, deltoid or rhombate. The seeds are usually 4 but rarely less, seeds are glabrous, pubescent or clothed with long hairs (Orode, 1984; Verdcourt, 1963). According to Metcalfe and Chalk (1957), the clothing hairs especially those consisting of long terminal and one to several stalked cells as well as two armed trichomes are characteristics of the family which enhance easy dispersal.

*Ipomoea* are good flagship species and possible good environmental indicators (Gill, 1992). They contribute immensely to the national economy of America, Freetown, Asia, Ivory Coast, Accra and Ghana, whereas in Nigeria, there is little information about *Ipomoea* (Hutchinson and Dalziel 1963). *Ipomoea* species are generally of vital economic importance ranging from ornamental, medicinal to food yielding value. Some species of ornamentals values include *I. carnea* Jacq, *I. intrapilosa* Rose, *I. alba* Linn, *I. verbascoidea* Choisy (Verdcourt, 1963). *I. longituba* increases lactation in woman, *I. obscura* roots is used externally for rheumatism, colic and dropsy, *I. tenuirostris* Choisy leaves are used to cure rheumatism, *I. wrightii* is used to cure cough and *I. quamoclit* Linn is used as sternutatories. Janapa, a resiniferous drug is got from *I. purga* (Nelson, 1951). Also, according to Gill (1992), the decoction of *Ipomoea asarifolia* (Desr) Roemer and Schult and *Ipomoea involucrella* P. Beauv. is used to wash newborn babies. The leaves and twigs of *I. carnea* Jacq subspecies *fistulosa* L are used to relieve general body pain and latex from the stem and leaves is used to relieve toothache. Young twigs are used as chewing sticks to clean teeth. The tubers root of *Ipomoea batatas* (Linn.) Lam are edible. The leaves of *Ipomoea aquatica* Fork are sources of vegetables for human consumption (Burkill, 1985). Abdulyekeen (2010) reported from his work that crude extract from *I. aquatica*

For k contain anti oxidant and hepatoprotective potential of the ethyl acetate which induced liver damage in mice by carbon tetrachloride. *Ipomoea batatas* (Linn) Lam the sweet potatoes are one of the best known economic products and are widely cultivated in tropical countries. The tubers were regarded as roots but believed by Metcalfe and Chalk (1957) to be