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Observations on Vegetative and Floral Morphology of some *Momordica L* Species (Cucurbitaceae) in Tropical Western Africa

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ABSTRACT: Observations on the vegetative and floral morphology of seven species of *Momordica* L namely *M. charantia*; *M. cissoides*; *M. cabraei*; *M. multiflora*, *M. foetida*; *M. angustisepala* and *M. balsamina* are presented. The result of the vegetative characters shows that *M. angustisepala* is a perennial woody climber with 8m height *M. cabraei* being a perennial herbaceous trailer, twiner or climber with a height of 5m while others are herbaceous annual trailers or climbers with heights ranging between 1.5m 4.5m. The stem shows that *M Charantia* is pubescent and has 5 ridges and 5 furrows; *M cissoides* has 3 ridges and 3 furrows; *M multiflora* has 8 ridges and 8 furrows; *M. cabraei* has 10 ridges and 10 furrows; *M. foetida* 6 ridges and 6 furrows *M. balsamina* 4 ridges and 4 furrows whereas *M. angustisepala* is cylindrical. The tendrils of *M. charantia* and *M. cissoids* are unbranched while the rest species have bifid tendrils. M. *cabraei* is densely tomentose; *M. angustisepala* is glabrous while the stems of others are pubescent. The leaf of *M. charantia*; *M. cissoides* and *M. balsamina* are compound, pedately 5 7 foliate while the leaf of the rest are simple. All the leaf types are pubescent on both adaxial and abaxial surface. The inflorescence of *M. cissoides*, *M. multiflora*; *M. Cabraei* and *M. angustisepala* are dioecious with *M. cissoides* being solitary borne by long peduncle with leafy bract subtending up to middle of peduncle. *M. multiflora* indeterminate racemose; *M. foetida* simple, umbel pedicelliate and *M. angustisepala* simple, umbel axillary while the inflorescence of the rest are monoecious and axillary. In all species there are variations in flower, fruit and seed traits. *M balsamina* is observed to be a xerophyte while others are mesophytes. The significance of these characters in the taxonomy and systematics of these taxa was discussed in view of perceived similarities in structural and reproductive biology of these taxa.

KEY WORDS: Observations, Vegetative, Floral, Morphology, *Mormodica*, Species, Western Africa.

INTRODUCTION

Momordica is of the tribe jollifae in the family Cucurbitaceae. It is a fairly large genus. There has been some controversy about the exact number of species in the genus. Dutta (1979) stated that it is made up of 45 species whereas Roy *et al* (1991) argue that it consists of about 65 species spread all over the tropics and sub tropics with the highest concentration in tropical Africa. The genus may be represented in West Africa by about seven species. *Momordica* species are plants with enormous potentials both as sources of foods and drugs. They have various ethno botanical uses and have

found a special place in the lives and cultures of many tribes in Western Africa (Okoli 1984; Dalziel 1937; Burkull 1985). They are dicotyledonous plants bearing pepos with many seeds. Their fruits are fleshy with some being dehiscent and some indehiscent (Ndukwu 1988; Aguoru 1998). *Momordica* species are mostly herbaceous annuals and tendril climbing or thwinners while a few are woody and perennial yet tendrils climbing or thwiners (Purseglove 1968). *Momordica* species like other cucurbitaceae are used as oil plants, sources of tanning materials, sponge and household utensils (Okoli 1984). Despite the enormous uses of *Momordica* species in tropical Western Africa as reported by Dalziel (1937) and Burkill 1985 information on their taxonomy is almost lacking. Efforts at the collection of fresh specimen of one of the species of this genus in the course of this study within western Africa Nigeria in particular where it was reported to be present yielded no result. Only herbarium specimens were used. This may indicate gradual extinction of the species without proper taxonomic documentation. A brief morphology but non taxonomic description of *Momordica* species was given by Hutchinson *et al* (1937).

The use of vegetative and floral morphology in the systematic grouping, characterisation and classification of different taxa is no more a scarce event. Edeoga *et al* (1998) used vegetative and floral characters to classify eight species of *Dioscorea spp*; Mbagwu *et al* (2006) used floral and vegetative characters to delineate eight species of *Vigna* spp. Agbagwa *et al* (2006) used morphological features in the systematic groupings of *Abrus* species in West Africa. Inspite of the numerous economic and agronomic importance of the *Momordica* species, there is dearth of clear taxonomic criteria most especially in vegetative and floral morphology to delineate these taxa. The aim of this study therefore is to present the vegetative and floral characters of seven species of *Momordica* that could be used for the systematic characterisation of these species.

MATERIALS AND METHODS

These studies were made on both living and herbarium materials (*Momordica **L*** species) identified with standard herbarium specimens collected from Forestry Herbarium Ibadan (FHI), University of Ife Herbarium (IFE) now Obafemi Awolowo University Ile Ife, University of Port Harcourt herbarium (UPH)

and the University of Agriculture, Makurdi herbarium (UAM). The living materials were collected from different parts of Nigeria during several trips. Morphological studies were carried out by observations

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being made on vegetative and floral characteristics of mature plants growing in the fields or on identified and preserved materials deposited in the various herbaria consulted. Measurements were taken of both vegetative and floral parts and analysed statistically. Floral formulae diagram of typical male and female ***Momordica*** species were taken; half flower drawing of male and female flower of *Momordica* was taken. Photographs of habit and relevant vegetative features of the *Momordica* species were taken. Voucher specimens were deposited at the university of Port Harcourt and University of Agriculture Makurdi herbaria. The list of specimens examined is shown in table I.

Table I: List of *Momordica* ***L*** species examined

S/No	Taxa	Collector Accessory/ Herbarium Number	Locality
1	*M. charantia* L	Aguoru, 002 UPH	Behind Ofrima, University Park, University of Port Harcourt.
		Aguoru, 005 UPH	Iwo Road, Lagos-Ibadan Express Way Ibadan, Oyo State.
		Aguoru. 006 UPH	Pacco Estate, Rumulaogu Akpor Rivers State
		Faremi, 444. FHI	Near Animal House, University of Ife biological garden, University of Ife, Ile-Ife, Osun State.
		Sanford, 5780 IFE	University of Ife biological garden, University of Ife, Ile-Ife, Osun State.
		Tubosun 001 IFE	Equatorial Guinea
		Gbile 302 IFE	University of Ife-Agric farm Ibadan Campus, Oyo State.
			University of Ibadan premises, Oyo State.
2	*M. cissoides plance ex* Benth	Aguoru 009 UPH	Near Animal House, University of Ife biological garden, University of Ife, Ile-Ife, Osun State.
		Okafor 060375 FHI	Nsukka, Enugu State
		Gbile 308 FHI	University of Ife biological garden
		Hall 1190 FHI	Idanre Mountain Ondo State.
3	*M. Multifora* Hook-f	Faremi	Ife – Osun State
		Aguoru 010 UPH	Near Hippopotamus pond, University of Ife biological garden, University of Ife, Ile-Ife, Osun State

RESULTS

The result of the vegetative features of the seven *Momordica* species studied showed that *M.charantia*; *M. cissoides*, *M. multifora*, *M. balsamina* are annuals while *M. cabraei*; *M. foetida* and *M. angustisepala* are perennials though all are climbers or trailers with the aid of tendrils. The stems of *M. cabraei* and *M. angustisepala* are woody others are herbaceous. The tendril of *M. charantia* is simple while that of *M. cissoides*, *M. multiflora*; *M. cabraei*, *M. foetida*, *M. angustisepala* and *M. balsamina* are bifid. The stem of *M. charantia* is aerial, greenish, pubescent angular with 5 ridges and 5 furrows; *M. cissoides* stem is pubescent to glabrous angular with 3 ridges and 3 furrows. Stem of *M. multiflora* herbaceous though sometimes woody with hooks, angular with 8 ridges and 8 furrows. Stems of *M. cabraei* glabrous, angular having 10 ridges and 10 furrows. Stem of M. foetida glabrous to tomentose, woody with roots at nodes, angular with 6 ridges and 6 furrows. Stem of *M. angustisepala*, aerial, tomentose when young cylindrical and glabrous when matured, tendrils arise at node, stem of *M. balsamina* aerial, sub glabrous to pubescent, angular with 4 ridges and 4 furrows.

The leaf of *M. charantia* is compound pedately 5 7 foliate, toothed, acute and pubescent on both adaxial and abaxial surfaces. *M. cissoides* leaf is compound palmately 5 lobed pubescent on both surfaces petioluate. Median leaflet bigger than others, cuspidate, attenuate and serrate. *M. multiflora* leaf is simple, petiolate, alternate, elliptic, aristate, cordate and abaxially and adaxially pubescent. *M. cabraei* leaf is simple, alternate, densely tomentose on upper surface, serrate, mucronate and cordate. *M. foetida* leaf has cordate base pubescent on both surfaces. Produces very offensive odour when squeezed. *M. Angustisepala* leaf is simple, variable, petiolate, serrate and cordate, pubescent on both surfaces. *M. balsamina* leaf is compound pedately 5 7 foliate, aristate, serrate, cordate. Dotted with gland on the under surface. The leaf lengths and widths differs substantially. Table 2 shows summary of the diagnostic morphological features of the *Momordica* species studied. Figures 3-9 shows habit of the various *Momordica* species studied.

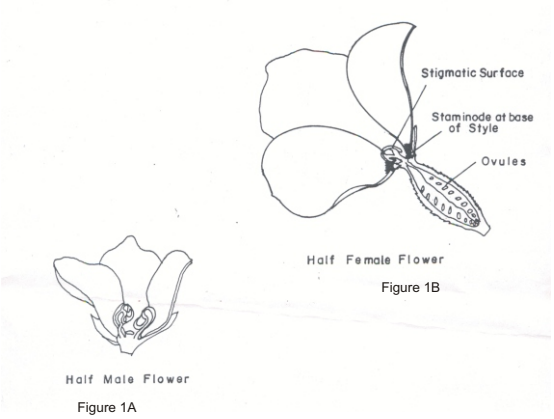

Figure 1B

Figure 1A

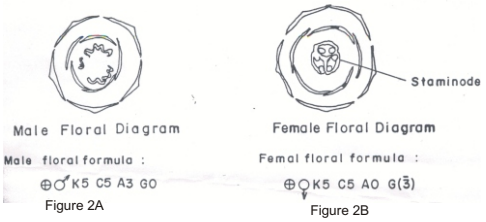

Figure 2A

Figure 2B

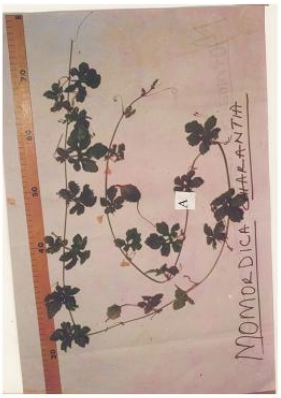

Figure 3A - M.charantia

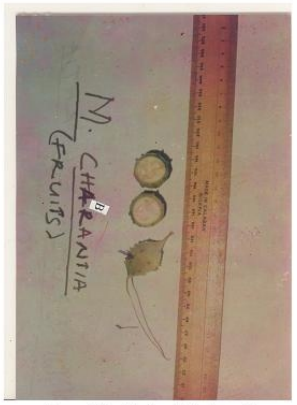

Figure 3B - Fruits of M.charantia

Figure 4 - M.cissoides (arrow showing fruit)

Figure 5 - M.multiflora

The floral morphology is shown (Fig 1 and 2). Table 2 indicates summary of the diagnostic floral and morphological characters of *Momordica* species studied. All the species are zygomorphic. *M. charantia* and *M. balsamina* are monoecious, *M. foetida M. cissoides M. cabraei*, *M. angustisepala* and *M. multiflora* are dioecious. The inflorescence of *M. charantia* is borne on long peduncle with bract below middle of the peduncle, simple axillary and solitary. *M. cissoides* inflorescence is solitary borne on long peduncle with leafy bract above middle of peduncle. Inflorescence of *M.* multiflora is indeterminate racemose and exist in clusters. Peduncle long with short pedicel. *M. cabraei* inflorescence has long peduncle, which is thick, strong and hairy pedicle not as thick as peduncle. *M. cabraei* inflorescence is a simple umbel and pediceliate. *M. angustisepala* has simple umbel but axillary inflorescence. *M. balsamina* inflorescence is axillary simple, pedicel pubescent with long peduncle. The fruits of *M. cabraei* are indehiscent while the fruits of the rest species are dehiscent. The seeds of *M. foetida*; *M. charantia* are sculptured whereas those of the rest are either smooth or grooved. *M. balsamina* is a xerophyte found growing on sandy savannah while the rest species are mesophyte. The woody perennials are used in sponge making for bathing and washing of dishes. All are used as twines and their leaves, stems and roots for various medicinal purposes.

DISCUSSION

The characteristic vegetative and floral features of the seven species of ***Momordica*** are summarised in Table 2. The outcome of this investigation has separated the species into climbers, thwiners and trailers for the first time. It has also for the first time separated the species into herbaceous annuals and woody perennials. The report on symmetry as Zygomorphic is also for the first time. The variations in the vegetative and floral morphology as seen in flowers, fruits, seeds, leaves and other vegetative and floral characters of the investigated *Momordica* species are in agreement with some of the earlier findings of Hutchinson and Dalziel (1954) and Aguoru (1998) and some are actually reported for the first time. Whereas others are added data for easy identification and characterisation of these taxa. These data from the vegetative and floral morphology of the *Momordica* species investigated, however present some important characters that could be exploited in improving the characterisation of the *Momordica* species.

S/No	Taxa	Duration/Habit	Stem/Tendrils	Leaf	Inflorescence	Flower/Fruit/Seed	Other remarks
1	*M. charantia* L	Annual, profuse, herbaceous climber or trailer	Herbaceous, green, pubescent, has 5 ridges and 5 furrows. Tendril simple unbranched.	Compound pedately 5-7 foliate pubescent on both surfaces, lobulate or toothed, acute	Monoecious, borne on long peduncle bract below middle of peduncle. Simple axillary and solitary	Yellow, petal tometose. Thecae arcuate. Fruit – oval and beaked, 8 rows of tubercules, 30 – 120mm long and 18- 45mm across. Fleshy, dehiscent. Seeds in red pulp. White, sculptured	Cultivated, mesophyte, wild, lowland rainforest, roadside, abandoned farmland. Foot of hill. Found in southern zones.
2	*M. cissoides* Planch ex Benth	Annual, Herbaceous, trailer or climber by means of Tendrils	Herbaceous greenish pubescent has 3 ridges and 3 furrows. 1-3 mm long Tendril simple and unbranched.	Compound, petioluate, pubescent on both surfaces, palmately 5 lobed. Median leaflet bigger than others, cuspidate, attenuate, serrate	Dioecious, solitary borne on long peduncle leafy bract above middle of peduncle	White with large black purple spot at base of each petal, female flowers sub-sessile. Fruits fleshy, 36mm long and 23mm across.	Wild, weed of cultivated farm land, rainforest undergrowth, waste land. Abandoned buildings. Mesophyte
3	*M. Multifora* Hook F	Annual herbaceous trailer or climber of about 3.9m	Herbaceous, greenish has 8 ridges and 8 furrows, glabrous and occasionally have hooks. Tendrils bifid	Simple, petiolate, alternate, elliptic, serrate, aristate, cordate, pubescent on both surfaces	Dioecious indeterminate. (racemose). In clusters. Peduncle long and pedicel short	Multiple, white Thecae curved slightly. Fruits dehiscent, smooth cylindrical, beaked & brownish. Seed oblong in shape, margin. Grooved	Wild, abandoned building, lowland of rainforest. Sometimes cultivated. Mesophyte.
4	*M. Cabraei* (Cogn) Jeffrey	Perennial, herbaceous trailer, thwiner or climber of about 5m	Densely tomentose, greenish, has 10 ridges and 10 furrows. Tendrils axillary and bifid.	Simple, alternate, petiolate. Densely tomentose and upper surface serrate mucronate,	Dioecious, peduncle long, thick and strong. Hairy and less thick pedicle.	White, funnel shaped. Petal pubescent on both surfaces 75mm long and 35mm across. Head of fruit broad. Indehiscent smooth and succulent. Seed dirty when	River banks. Along oil pipelines. Secondary bush and forest zone and middle belt zones. Some times cultivated. Mesophyte.
5	*M. foetida* Schum & Thonn	Pereninial Herbaceous trailer or climber of about 4.5m	Densely tomentose greenish. Has 6 ridges & 6 furrows, root at nodes about 4.5m long. Tendril extra auxiliary & bifid	Simple, cordate shaped, cordate base. Pubescent on both surfaces. Produce offensive odour when squeezed.	Dioecious, simple umbel pediceliate	Sepals black petal white, ovary inferior and densely & softly papilose spinose 18 – 37mm long & 13-22mm across. Thecae in triplicate. Fruit, fleshy dehiscent into 3 halves, covered with soft spines 900mm long and 40mm across. Oval seed brown, oblong, testa sculptured.	Mesophyte. High forest climber. Mountain foots. Foot paths. Margin swamps. Secondary thickest of all rainforest zones. Sometimes cultivated.

6	*M. angustisepala* pala Harms	Perennial woody climber 8m height	Wood cylindrical pale, glabrous and slightly rough. Tendril simple unbranched at times bifid	Petiolate simple variable in shape serrate, cordate, pubescent on surfaces	Dioecious, simple umbel axillary	Cream coloured, petals bigger than sepals. No fruits observed	Cultivated, grows in virgin forest. Lower slope of hills. Moderately moist and partially shaded humic soil.
7	*M. balsamina* Lin	Annual, trailer or climber 1.5 – 4m	Herbaceous, pubescent, has 4 ridges & 4 furrows, tendril simple, unbranched sometimes bifid.	Compound pedately 5 - 7 foliate. Pubescent on both surface serrate, cordate, aristate. Dotted with glands beneath. 12 – 120mm broad and 10-90 mm long	Monoecious axillary, simple peticle pubescent peduncle long	Yellow, sometimes white. Bell shaped ovary inferior, puberulose; fruits on long stalk. Oblong teret. Beaked and dehiscent. 39mm long. Seed not observed	Xerophyte. Cultivated grows in the arid zones of North. Also wild and grows on sand.

A diagnostic key based on morphological characters of the *Momordica* species studied in this present work is presented below.

1. **Leaves compound**

2 leaves pedately 5 –7 lobed, plant monoecious, flowers yellow.

3 leaves dotted with glands underneath, stem have 4 ridges and 4 furrows, tendril simple bifid atimes, fruits oblong, teret 39mm long and dehiscent irregularly.

……*M. balsamina*

3' leaves not dotted with glands underneath, stem have 5 ridges and 5 furrows, tendrils not bifid, fruit oval, dehiscent into 3 halves, oval seed enclosed in scarlet pulp.

……*M. charantia*

2' leaves palmately 5 lobed, leaflet held in position by petiolules, stem have 3 ridges and 3 furrows, plant Dioecious, flower white with large black purple spot at the base of each

petal. Fruits 36mm long and 23mm across, ellipsoid, echinate, indehiscent seed warty, red in colour.

……*M. cissoides*

1' **Leaves Simple**

4 stem has hooks or roots at the node, 3.9-4.5, long. Inflorescence racemes (indeterminate)

5 leaves fetid, fruits covered with soft spines, oval shaped, not beaked 90mm long and 40mm across, seed testa sculpture.

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