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A new species of the genus *Macroptilium L. (Leguminosae Juss.) Faboideae* for the flora of Senegal

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Abstract

Macroptilium lathyroides (L.) Urban was recorded for the first time in Senegal in the Dakar region. A detailed description of the species has been well established accompanied by illustrations.

Keywords: *Macroptilium lathyroides*; Species; Flora; Genus; New

1. Introduction

Senegal is located in the far west of the African continent and belongs to three climatic domains (Sahelian in the north, Sudanian in the center and sub-Guinean in the south), which gives it a potential richness in biological diversity, both animal and vegetation [19]. Moreover, this rich flora has been studied by several botanical prospectors such as [5], [11], [4], [14] and [18]. However, with globalization and the development of international trade, especially with agricultural products, the flora of countries or localities have experienced a number of intrusions of exotic taxa. In the flora of Senegal, the genus Macroptilium was until now represented by two species (*Macroptilium lunatus L* . and *Macroptilium adenanthus* G.F.W. Mey.). Recently, the species *Macroptilium lathyroides* was encountered in the Dakar region. This work aims to contribute to the knowledge of a new specific taxon of the genus *Macroptilium* for the flora of Senegal.

2. Material and methods

2.1. Study site

The sample was collected at the level of the Diversion Road North of Dakar, near the Saint-Lazard Catholic cemetery. The site is located in the far west of the country, in the Department of Dakar and more precisely in its northwestern part. It corresponds to the second massif of volcanic origin whose average altitude is the highest in the region (more than 60 m). The Dakar Region is located on the Cap Vert peninsula and covers an area of 550 km^2. It is between 17° 10 and 17° 32 West longitude and 14° 53 and 14° 35 North latitude. The climate is Canarian or sub-Canarian. The temperature varies between 17° and 25° C from December to April and from 27° to 30° C from May to November. The wind regime is marked by the predominant influence of the trade wind. Rainfall is characterized by a relatively short duration of wintering, varying between three and four months from June to October. It is important to emphasize that Dakar region is between the 300 and 600 mm isohyets and the seasonal norms (1930 – 1960 and 1951 – 1980) are respectively 552.2 and 472.5 mm (update the rainfall data (1980 – 2000).

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Figure 1 Map of the study area

3. Methodology

The characterization of this new species was made from the description of the biological form, the port, the vegetative organs, and the reproductive organs (flower, inflorescence pod and seeds). Some stable traits have been retained because of their easy observation in nature or on herbarium specimens and their high taxonomic value [10], [13].

Thus, for this work, the morphological characterization focused on the following organs:

- The stem: geometric shape, color, hairiness;
- Leaves: types, phyllotaxis, number of leaflets, leaf shape, length and width of the blade, leaf tip and base, leaf venation, rachis length, petiole length, petiolule length, leaf hairiness;
- The stipules and stipels: shape and length;
- The flower: color of the corolla, length of the calyx, length of the peduncle, length of the pedicels;
- The fruit: type, shape, length and width, number of seeds per pod, hairiness of the pericarp, orientation.

3.1. Identification

Identification was made by comparing the specimen with samples of flora species from Senegal or elsewhere.

To do this, the following equipment was used:

- The different editions of the Flore du Senegal [1], [2], [15]
- The herbarium collections of the genus Phaseolus deposited in the herbaria (DAKAR of the Department of Plant Biology and IFAN);

4. Results and discussion

The adapted methodology allowed us to describe a new specimen of the genus *Macroptilium*
Scientific Name: *Macroptilium lathyroides (L.) Urb.,*

Synonyms*: Macroptilium lathyroides (L.)* Urb. var. thyroids,
Macroptilium lathyroides (L.) Urb. var. semierectum *(L.)* Urb.,
Phaseolus crotalarioides Mart. ex Benth.,
Phaseolus lathyroides L.,
Phaseolus semierectus L.,
Phaseolus semierectus L. var. angustifolius Benth.

4.1. Description of *Macroptilium lathyroides* (L.) Urb.

Macroptilium lathyroides (L.) Urb is an erect annual or perennial herb with erect branches. It can reach from 0.4 to 1.4 m in height with a decumbent habit with a cylindrical section. It has trifoliolate leaves, alternate with oval to lanceolate leaflets, sometimes elliptical. The leaves are 3.5 to 8 cm long and 1.3 to 3.5 cm wide, with a pointed top and a wedge-shaped base. The leaflet has a glabrous upper side and a hairy underside. The margin of the leaflet is entire, provided with small navicular hairs. The lateral leaflets are asymmetrical. The petiole is 2.5-7 cm long and the petiolule 2-3 mm. The stipules are lanceolate and the lateral leaflets 6-7 mm long and broad towards the base. Inflorescence is a terminal semi-erect spike-like raceme, about 15 cm long, carried by axillary peduncles 15-30 cm long. The flowers are often grouped in pairs, 1.5 to 2.5 cm long, with a papilionaceous corolla of brown, purple to red colour; calyx short green campanulate. The stamens 8 to 10, the ovary superior. Fruits linear, subcylindrical, dehiscent, 7 to 11 cm long and 2 to 2.5 mm wide, slightly arched and constricted towards the middle. They are minus of navicular hairs with a pointed top and a rounded base where the calyx remains. The pod usually contains 17 to 25 seeds. White or brown taproot. The stem is full, pubescent with a rounded section.

(A): Leaves, leaflets, phyllotaxis; (B): Upper face; (C): Underside; (F): Stem stipules and pubescence; (D): Petiolule; (E): Inflorescence; (G): Reproductive organ; (H): Gynoecium; (J): Stamen; (I): Fruit (pod) (K) and Seed (L)

Figure 2 Morphological characteristics of *Macroptilium lathyroides*

The comparative study of the samples of this specimen with those of the two other species of the genus *Macroptilium* listed in the flora of Senegal, and of the herbarium samples (DAKAR, IFAN, KEW) reveals a certain taxonomic proximity, linked to the character traits of stem, leaf, flower and fruit. However, discriminating morphological traits were observed between *Macroptilium lathyroides* and the two other taxa of the same genus. These character traits relate to the length of the flower stalk, the color of the corolla, the shape of the fruits and especially the number of seeds contained in the pods (table 1). This comparative analysis seems to confirm that it is a new species. These results corroborate with those of [1], [2] respectively in the flora of Senegal and in the new illustrated flora, as well as in numerous works of floristic and forest inventories carried out in the Department of Plant Biology.

Table 1 Traits of morphological and biological characters of the three species of *Macroptilium* encountered in Senegal

Characters				***Macroptilium adenanthus* G.F.W. Mey.**	***Macroptilium lunatus L* inn**	***Macroptilium latyroides* (L.) Urb**
Tige	Wear and biological type			perennial Herbaceous	annual or biennial herbaceous	herbaceous perennial with voluble stems
	Appearance of the branches			voluble, pubescent	voluble, pubescent	Voluble, pubescent
Sheets	Type			trifoliate	trifoliate	trifoliate
	Petiole	Length		3 to 6 cm long	5 to 10 cm long	2,5 to 7 cm long
		Pilosity		scattered hairs	pubescent	pubescent
		Petiolule	Lateral Petiolules	3-5 mm , Denser sparse hairs	5-6 mm, pubescent	2 to 3 mm. pubescent
			Terminal Petiolule	7 to 15 mm, Dense sparse hairs	the terminal 15 to 25 mm, pubescent	the terminal 7 to 10 mm, pubescent.
	Leaflet		Length	3 to 12 cm	4 to 8 cm	3,5 to 8 cm
			Width	2 to 4 cm	3 to 6 cm	1,3 to 3,5 cm
			Form	oval	broad and short oval, the laterals asymmetrical, the median diamond-shaped (terminal)	oval to lanceolate, sometimes elliptical.
			Marge	whole without navicular hairs	whole, without navicular hairs	whole, with small navicular hairs
			Pilosity	leaves glabrous, or with rare pubescence and rather on the veins.	glabrescent surfaces, except the pubescent veins, the top can have very short hairs (magnifying glass)	glabrous upper face and the hairy lower face.
	Base			rounded base, asymmetrical in the lateral leaflets	truncated or broadly rounded base, with a wide corner for the terminal leaflet	wedge-shaped
	Summit			mucroned corner top	acute wedge-shaped top, mucronate.	pointed
	Nervation			Trinervated base, 2 or 3 other lateral ribs	Trinervated base, 3 or 4 other lateral ribs	Base trinervated 3 or 4 other lateral ribs.
Stipules	Form and length			oval, 2-5 mm long	triangular acuminate, 2-4 mm long	6 to 7 mm long and wide towards the base
Flowers	Inflorescence type			squat axillary raceme	Flowers in short panicle, axillary	semi-erect spiciform raceme terminal
	Peduncle			0.5 to 25 cm	1.5 to 30 cm long	15 à 30 cm
	Corolla color			pink, or white with purplish reverse,	white	brown, purple to red color

Fruit	Type	Pods	Pods	Pods
	Form	flat, linear, slightly arched towards the top	in a semi-circle	slightly arched and constricted towards the middle, 7 to 11 cm
	Number of seeds	7 to 13 seeds.	3 to 4 seeds	17 to 25 seeds

In addition, *Macroptilium lathyroides* was reported in northern Senegal in the sugar cane plantations of the Senegalese Sugar Company by [12]. However, according to [7], the introduction of *Macroptilium lathyroides* is linked to the drought of 1970 where cattle were decimated for lack of fodder. It is in this context that trials have been carried out in Lower Senegal for the multiplication of drought-resistant herbaceous fodder plants [7]. Thanks to their ability to resist the pedoclimatic conditions (rainfall of 350 mm and on poor or salty soils) of the Sahelian environment and their richness in mineral elements, species have been chosen and introduced in Senegal, in particular *Macroptilium lathyroides*. Combined with the practice of tedding, they can theoretically solve the problem of feeding livestock.

4.2. Species identification key

1. Plant, whose inflorescence is a panicle. The leaves are alternate trifoliate. The leaflets are broadly and short-ovate, the lateral asymmetrical, the median diamond-shaped. Annual or biennial herbaceous plant with leaflets 4 to 8 cm long and 3 to 6 cm wide. The base of the leaflet is truncated or broadly rounded, with a wide wedge for the median leaflet, apex with an acute wedge, mucronate. The triribbed base with three other ribs on the apex of the median. Inflorescence, branched and spreading, inserted in the leaf axils. White flowers, 10 to 12 mm long, with a very curved obtuse keel. Calyx urceolate short, with shallow teeth .....*Phaseolus lunatus Linn*

1'. Plant whose inflorescence is a raceme:

2. Fruit slightly arched towards the top the fruit is flat, linear pods, about 10 cm long, 10 mm wide, containing 7 to 13 seeds. Seeds 6mm long and wide, angular. Annual or biennial herbaceous plant with alternate trifoliate leaves. Leaflets broadly and short-ovate, the lateral asymmetrical, the median diamond-shaped. The base of the leaflet is tri-veined and three other veins on the apex of the median. ……*Phaseolus adenanthus* G.F.W. May.

2'. Fruit slightly arched and constricted towards the middle

Annual or perennial herbaceous plant, erect, with erect and pubescent branches. It can reach 1-1.4 m in height with a decumbent habit with a cylindrical section. It has trifoliolate leaves, alternate with oval to lanceolate leaflets, sometimes elliptical. The leaves are 3.5 to 8 cm long and 1.3 to 3.5 cm wide, with a pointed top and a wedge-shaped base. The leaflet has a glabrous upper side and a hairy underside. The margin of the leaflet is entire, provided with small navicular hairs. The lateral leaflets are asymmetrical. The petiole is 2.5-7 cm long and the petiolule 2-3 mm. The pod usually contains 17 to 25 seeds. ……*Macroptilium lathyroides* (L.) Urb

4.3. Origin and distribution *Macroptilium lathyroides* (L.) Urb

Macroptilium lathyroides is native to tropical America, (Central America, Caribbean Islands, South America) and in tropical and subtropical regions [17]. It is naturalized in the tropics, including Colombia, Venezuela, Paraguay, Belize, Panama, Brazil and the Caribbean (Jamaica, Antigua, St Vincent and Cuba) and Australia [8]. It has been introduced to India, Australia and Africa.

It grows from 23°N to 30°S and from sea level to an altitude of 1800-2000 m. It is mainly found in moist places along roadsides, in waste places, in open fields, pastures and in open areas [6].

4.4. Ecology *Macroptilium lathyroides* (L.) Urb

Macroptilium lathyroides has a wide ecological plasticity. The species practically adapts to different types of soil (well or poorly drained soils of deep sands and heavy clays) and with a very variable pH range of 5, 6, 7 and 8 [15]. It adapts to moderate salinity, but sensitive to high doses of manganese and aluminum in the soil. The species grows in arid, semi-arid and humid areas with rainfall ranging from 400 to 3500 mm. It grows on flood-prone soils. It can survive temporary frosts. It tolerates light to moderate shade, although the seedlings suffer from it. Its ability to twist allows it to compete with tall grass for light.

Flowering and fruiting: occur throughout the year, when conditions are favorable.

4.5. Uses/applications *Macroptilium lathyroides* (L.) Urb

The species is mainly used as fodder for animals, alone or mixed with grass. In the agricultural field, this plant is very efficient in fixing nitrogen and can be used as a green manure or cover crop in rotations (Anonymous, 2020).

5. Conclusion

Botanical surveys can be carried out in transit and or high agricultural production localities in regions such as Dakar and Saint Louis. They can reveal new plant species for the flora of Senegal. For example, *Macroptilium lathyroides* (L.) Urb is a new species for the flora of Senegal. If properly exploited, this species could partly solve the problem of livestock feed, which is a bottleneck for livestock development in Senegal.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

References

[1] Berhaut J. Flora of Senegal. Clairafrique: Dakar; 1967, 485 p

[2] Berhaut J. Illustrated flora of Senegal. Dakar, Senegal, Ministry of Rural Development and Hydraulics, Directorate of Water and Forests, 1976, 658 p.

[3] Berhaut J. Illustrated Flora of Senegal. Government of Senegal. Ministry of Rural Development & Hydraulics, Directorate of Water and Forests, Dakar, 1971-1979. Volumes 6.

[4] Camara, A. A., Mbaye, M. S., Bassene, C., Sambou, H., Sarr, M., Ka, S. L., & Noba, K. A new species of the genus Indigofera L. Fabaceae Lindl.(Leguminosae Juss.) Faboideae in the flora of Senegal. International Journal of Biological and Chemical Sciences, 2019, 13(1), 399-410

[5] Carteret, X. "Michel Adanson in Senegal (1749–1754): A great naturalistic and anthropological journey of the Enlightenment." Revue dhistoire des sciences 65.1 (2012) : 5-25.

[6] Cook BI, Smith TM, Mann ME. The North Atlantic Oscillation and regional phenology prediction over Europe. Global Change Biology. 2005 Jun;11(6):919-26.

[7] Dubois J. Some trials in lower Senegal of drought-resistant herbaceous and arboreal forage plants. In: Colloque sur l'élevage. Maisons-Alfort: IEMVT, 1971, p. 424-429. Colloque sur l'Elevage, Fort-Lamy (TD), 1969/12/08-13.

[8] Henty EE, Pritchard GS. Weeds of New Guinea and their control. Weeds of New Guinea and their control.. 1973(7).

[9] Hutchinson J, Dalziel JM, Keay RWJ, Hepper FN. Flora of West Tropical Africa (Vol I., II and III, 2nd edn). Whitefrias Press Ltd: London, Tonbridge, England. 1954-1972.

[10] Lavie P. Vitaceae of West Africa: Senegalese species. Ministère de la coopération et du développement, Paris. 1990.

[11] Lebrun JL. New contribution to the knowledge of the flora of the Republic of Senegal and Senegalese botanical bibliography 1941-1969. Bull. Soc. Bot. Fr, 1969, 116: 249-277.

[12] Marnotte, P. (2015). Report of a weed science mission to the Compagnie Sucrière Sénégalaise in Richard-Toll (Senegal) from 23 to 31 May 2015.

[13] Mballo R. Angiosperms of Senegal: diversity and family determination key. Master thesis Taxonomy, Biodiversity, Ethnobotany and Conservation of Natural Resources (TABEC-RN). Laboratoire de Botanique et Biodiversité, Université Cheikh Anta Diop de Dakar, Senegal.2013.

[14] Miège, J, Bodard, M and Carrère P. Floristic evolution of fallow vegetation according to cultivation methods in Darou (Senegal). Jouve, 1966.58p

[15] Mugnier J. New illustrated flora of Senegal and neighboring regions. Senegal, 2008. 2162 p

[16] Nunes, D. R., de Araújo, J. F., Prata, E. G., da Silva Freitas, N. M., de Freitas, M. C. D. C., & Correia, L. M. Indicador ácido-base : extrato hidroalcoólico da flor da espécie Macroptilium lathyroides (L.) Urb. Scientia Naturalis, 2021, 3(1).

[17] Prabhukumar KM, Hareesh VS, Bhaskar V, Sreekumar VB, Nirmesh TK, Balachandran I. Impatiens glabrata (Balsaminaceae)—A new species from southern Western Ghats, India. Phytotaxa. 2016 Jun 17;266(1):33-9.

[18] Raynal A, Raynal J. Contribution to the knowledge of Senegalese flora. Adansonia, 1968, 2(7): 301-381

[19] Republic of Senegal, National Biodiversity Strategy and Action Plan 2015 (NBSAP) 2015, 89p.