

Alysicarpus ovalifolius (Fabaceae, Desmodieae), a new record for the flora of Brazil

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ABSTRACT – *Alysicarpus ovalifolius* (Schumach. & Thonn.) J. Léonard is a legume species used as forage plant, which is originally native to Africa but today has a pantropical distribution. This species is probably expanding its distribution in the neotropics and therefore can be considered a potentially invasive species. In Brazil, the only species of *Alysicarpus* Neck. ex Desv. hitherto recorded was *A. vaginalis* (L.) DC., which is also non-native in the Americas. This study presents the first account of the occurrence and distribution of *A. ovalifolius* in Brazil, including notes on its taxonomic status and potential invasiveness. Brazilian specimens of *A. ovalifolius* had been so far misidentified as *A. vaginalis*. We also present here the first records of the genus *Alysicarpus* in Santa Catarina state, southern Brazil, and provide an identification key to the two species of *Alysicarpus* that occur in Brazil.

Keywords: *Faboideae*, ruderal plant, Santa Catarina

RESUMO – *Alysicarpus ovalifolius* (Fabaceae, Desmodieae), novo registro para a flora do Brasil. *Alysicarpus ovalifolius* (Schumach. & Thonn.) J. Léonard é uma leguminosa empregada como forrageira, originária da África, mas que atualmente tem distribuição pantropical. Esta espécie provavelmente está expandindo a sua distribuição nos neotrópicos, e por causa disso pode ser considerada potencialmente invasora. No Brasil, a única espécie de *Alysicarpus* Neck. ex Desv. registrada até agora é *A. vaginalis* (L.) DC., que também não é nativa nas Américas. Este estudo apresenta os primeiros registros acerca da ocorrência e distribuição de *A. ovalifolius* no Brasil, incluindo comentários sobre a situação taxonômica desta espécie e seu potencial invasor. Espécimes brasileiros de *A. ovalifolius* vinham até agora sendo erroneamente identificados como *A. vaginalis*. Além disso, apresentamos aqui os primeiros registros do gênero *Alysicarpus* no estado de Santa Catarina, Sul do Brasil, e fornecemos uma chave de identificação para as duas espécies de *Alysicarpus* que ocorrem no Brasil.

Palavras-chave: *Faboideae*, planta ruderal, Santa Catarina

INTRODUCTION

Alysicarpus Neck. ex Desv. (Fabaceae, subfamily *Faboideae*) includes ca. 34 species native to the Old World Tropics (Huang & Huang 1987, Endo & Ohashi 1990, John & Thengane 1994, Pedley 2001, Huang & Ohashi 2010, Torres-Colín *et al.* 2011), and is most diversified in southern Asia, especially India (Chavan & Sardesai 2012, Chavan *et al.* 2013). This genus is part of tribe *Desmodieae*, which includes ca. 26 genera and 520 species (Schrire 1988, Chen & Huang 1993, Bailey *et al.* 1997). Species of *Fabaceae* have an immense ecological, agricultural and economic importance as nitrogen fixers (Soltis *et al.* 1995, Crews 1999, Mafongoya *et al.* 2004, Wojciechowski *et al.* 2004, Tobita *et al.* 2011).

Despite being native to the Old World tropics, some *Alysicarpus* species have been introduced and are now naturalised in other tropical and subtropical areas, mainly

the neotropics (Sánchez-Blanco *et al.* 2012) and Australia (Cowie & Werner 1993). Three *Alysicarpus* species, *A. bupleurifolius* (L.) DC. (Linné 1753:745-746; Candolle 1825:352-353), *A. ovalifolius* (Schumach. & Thonn.) J. Léonard (Schumacher 1827:359-360; Léonard 1954:88-92) and *A. vaginalis* (L.) DC. (Linné 1753:746; Candolle 1825:353), are known to occur in the Americas (Huang & Ohashi 2010), where they are not native. The introduction of plants of these species is usually intentional, due to their use as forage crops (Gramshaw *et al.* 1987, John & Thengane 1994, Tobita *et al.* 2011), and secondarily also because of their medicinal properties, especially for treating wounds and fractures (Huang & Ohashi 2010). However, these *Alysicarpus* species have also raised conservation concerns, as they can be considered potentially invasive species (Cowie & Werner 1993, Sánchez-Blanco *et al.* 2012).

The genus *Alysicarpus* was hitherto represented in Brazil only by *A. vaginalis*, which has been recorded

in the following states: Bahia, Espírito Santo, Goiás, Mato Grosso, Mato Grosso do Sul, Paraná, Piauí, Rio de Janeiro, São Paulo and Tocantins (Lima 2015). However, we recently (April 2014) discovered populations of *A. ovalifolius* in landfill areas on Santa Catarina Island, Florianópolis municipality, Santa Catarina state (SC), southern Brazil. This has led us to investigate the occurrence and distribution of this species in Brazil. To this end we revised the *Alysicarpus* collections at ASE, C, EAC, EFC, FLOR, FURB, GB, HBR, HRB, HUEM, HURB, MBM, RB, TEPB and UPCB herbaria (acronyms according to Thiers 2016). To identify the new collections and produce a short description for *A. ovalifolius*, we consulted the following taxonomic works: Endo & Ohashi (1990), Pedley (2001) and Huang & Ohashi (2010).

RESULTS AND DISCUSSION

Identification key to the genus *Alysicarpus* in Brazil

1. Annual plants. Pods internally septate and jointed, releasing all the seeds at once when broken at one of the joints *A. ovalifolius*
 1. Perennial plants. Pods internally septate and jointed, breaking up into 1-seeded segments *A. vaginalis*

Alysicarpus ovalifolius (Schumach. & Thonn.) J. Léonard, Bull. Jard. Bot. État Bruxelles 24(1):88-92. 1954. ≡ *Hedysarum ovalifolium* Schumach. & Thonn., Beskr. Guin. Pl.:359-360. 1827. ≡ *Desmodium ovalifolium* (Schumach. & Thonn.) Walp., Repert. Bot. Syst. 1:737. 1842. ≡ *Desmodium thonningianum* D. Dietr., Syn. Pl. 4:1147. 1847.

Type (designated by Hassemer 2016): “Ada Guineae”, 1784, *P.E. Inert s.n.* (lectotype C 10003960!). See Fig. 2 in Hassemer (2016).

(Figs. 1A-F, 2)

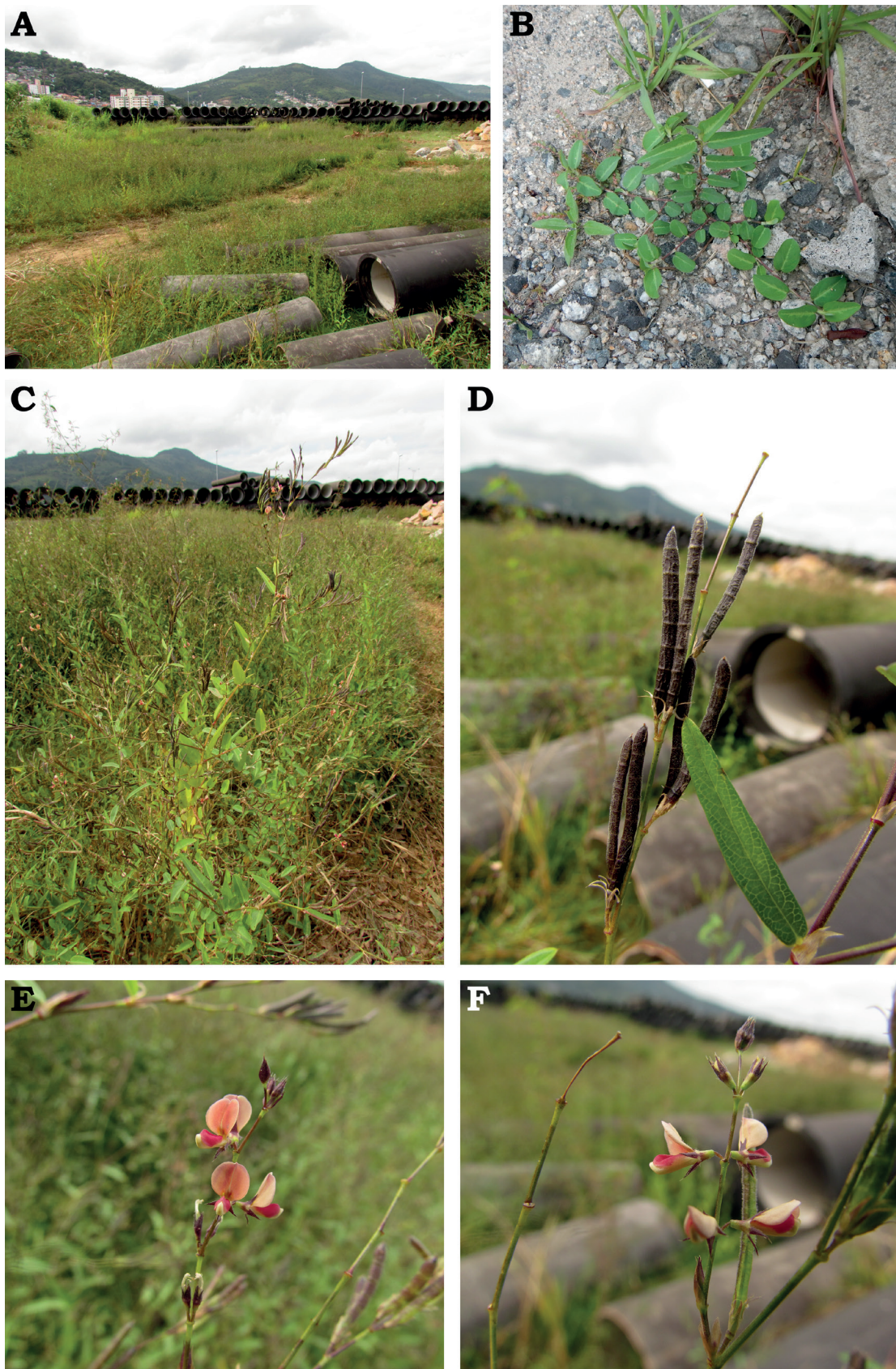
Annual herbs, 10–100 cm tall. Stem erect or prostrate, often woody at the base, strigose or rarely glabrous. Leaflets usually dimorphic, elliptic or oblong in lower part and lanceolate in upper part, 1–10 × 0.6–3 cm. Inflorescences terminal or leaf-opposed, laxly flowered; bracteoles absent. Pedicel 1–2 mm, with spreading hooked hairs. Calyx glumaceous, scarious, persistent, 4-lobed, with minute spreading hooked hairs and sparsely ciliate straight hairs; lobes not imbricate, subequal, narrowly triangular-ovate, 3–4 mm, ciliate, apex acuminate. Petals orange, pink or reddish purple, subequal with calyx at anthesis. Legume (1–)4–6(–8)-jointed, (0.5–)1.5–2.2 cm × 1.8–2.3 mm, indehiscent, with dense minute hooked hairs, mostly without septa inside and with ridges at joint. Seeds laterally transversely ellipsoid. This description is based on Endo & Ohashi (1990), Pedley (2001) and Huang & Ohashi (2010), and also on the Brazilian specimens.

Alysicarpus ovalifolius is originally native to Africa, but now has a pantropical distribution (Pedley 2001, Huang & Ohashi 2010). Outside its native range, this species is mostly ruderal, occurring in disturbed habitats, with a strong preference for open, well-illuminated areas.

The classification of *Alysicarpus* has historically been troublesome, which has resulted in varying species concepts and circumscriptions among different authors. For instance, Meeuwen *et al.* (1961) and Adema (2003) concluded that *A. ovalifolius* should be a synonym of *A. vaginalis*, based on the considerable morphological similarity between these two species, and also on the morphological variation within each of them. However, based on our morphological examination of herbarium specimens, and on the available taxonomic literature we follow the treatment of Léonard (1954), Schubert (1963), Verdcourt (1971, 1974), Endo & Ohashi (1990), Pedley (2001) and Huang & Ohashi (2010) in recognising these two species as distinct. *Alysicarpus ovalifolius* and *A. vaginalis* have considerable differences in their pods (see identification key above). Most notably, *A. ovalifolius* has septate pods, which when mature rather easily break apart at any of their joints, releasing all seeds at once. Conversely, *A. vaginalis* has septate pods, which when mature very easily separate into one-seeded segments; each seed is completely enclosed within septa and part of the pericarp. These morphological differences in the pods and seeds make for different dispersal mechanisms for these two species (Endo & Ohashi 1990). Furthermore, *A. ovalifolius* is native to Africa (Pedley 2001)—we conjecture that it originated in tropical western Africa—whereas *A. vaginalis* is native to tropical eastern Africa and southern Asia; however, both species have a pantropical distribution today.

We noticed that *A. ovalifolius* and *A. vaginalis* are commonly confused with one another among herbarium collections, especially at Brazilian herbaria. Furthermore, many examined specimens were not possible to identify, because they lacked mature fruits. For the reliable identification of specimens of *Alysicarpus*, it is critically necessary that they include mature fruits. The present study should help towards the correct identification of these two species in the Americas.

Our collections of *A. ovalifolius* from Santa Catarina Island are the first records of the genus *Alysicarpus* in SC. This is also the second record of a vascular plant new to SC which has been collected in landfills on Santa Catarina Island (the other is *Melilotus albus* Medik. (Medikus 1787:382) (Fabaceae), whose populations were discovered in 2011; see Hassemer *et al.* 2015). We believe that these species have been introduced to the Island when the landfills were created, most probably by seeds carried on the wheels of the construction vehicles. Both *A. ovalifolius* and *M. albus* are additions to the recorded ruderal vascular flora of Santa Catarina Island (Hassemer & Trevisan 2012). In Brazil, we confirmed the occurrence of *A. ovalifolius* in the following states: Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Paraná, Rio de Janeiro and SC. However,



Figs. 1A-F. *Alysicarpus ovalifolius* from Santa Catarina Island, southern Brazil. **A.** Overview of the landfill of Saco dos Limões, where the first population of this species in Santa Catarina state was discovered; **B.** *A. ovalifolius* growing in cracks by the roadside; **C.** Adult specimen of *A. ovalifolius* in the landfill of Saco dos Limões; **D.** Mature pods; **E, F.** Flowers. Photograph credits **Figs. 1A, C-F:** L. A. Funez, on 15 April 2015; **Fig. 1B:** G. Hassemer, on 16 February 2015.



Fig. 2. Herbarium specimen of *Alysicarpus ovalifolius* (G. Hassemer & J.P.R. Ferreira 745, C) collected on Santa Catarina Island on 25 April 2014.

the actual distribution of *A. ovalifolius* in Brazil is most probably much wider than this, and we believe that plants of this species have the potential to reach all Brazilian states, with only the possible exception of Rio Grande do Sul, which at a higher latitude has a more temperate climate. The conservation status of *A. ovalifolius* is least concern (LC) according to the IUCN (2012, 2016) criteria.

Because of its use as a forage plant, it is probable that plants of *A. ovalifolius* have been intentionally introduced to Brazil and subsequently escaped from cultivation, began occurring spontaneously and has now become a naturalised species in the region. This species may also be expanding its distribution elsewhere in South America. However, we believe that is unlikely that this species may become invasive based on our field observations and on studies about its distribution and ecology in Mexico (Sánchez-Blanco *et al.* 2012). We noticed that this species does not seem able to colonise natural (i.e., non-disturbed) environments on Santa Catarina Island. However, plants of non-native species can become more aggressive colonisers with time, as they get acclimated to new environments, consequently threatening local biodiversity and environmental integrity. It is therefore very important from a biological conservation standpoint to continuously monitor the geographical distributions and the ecological dynamics of populations of non-native species such as those discussed here.

Examined material: “Guinea”, *P. Thonning s.n.* (C-10003958, C-10003959). “Ada Guineae”, 1784, *P.E. Isert s.n.* (C-10003960 [lectotype], C-10003961). BRAZIL. GOIÁS: Iporá: GO-060, sentido Iporá-Piranhas, 16°24'44" S, 51°15'43" W, 12.I.2009, *L.C.P. Lima et al.* 514 (RB-568903); MATO GROSSO: Cuiabá: Coxipó da Ponte, 21.I.1989, *A. Krapovickas & C.L. Cristóbal* 43075 (C); Vila Bela da Santíssima Trindade: ao longo de estrada vicinal 6 km NW do centro de Vila Bela, 14°59'22" S, 59°59'2" W, 214 m, 23.III.2014, *M.F. Simon et al.* 2279 (RB-609230); MATO GROSSO DO SUL: Corumbá: Nhecolândia, Fazenda Pouso Alto, 14.VI.1995, *S.M. de Faria & A. Pott* 956 (FLOR); MINAS GERAIS: São João del-Rei: terreno baldio atrás do posto Texaco, 2009, *M. Sobral* 14521 (RB-560369); pátio da garagem da viação Presidente, 8.III.2012, *M. Sobral & O.C. Carvalho* 14812 (RB-560320); PARANÁ: Santa Isabel do Ivaí: Fazenda 5 As, 13.II.2012, *M.C. Souza* 2564 (HUEM-22235); Uraí: Sítio Santa Gabriela, 4.V.2005, *H. Pansard s.n.* (RB-560384); RIO DE JANEIRO: Seropédica: UFRRJ, km 47, 27.IV.1979, *C.R. Campêlo* 786 (FLOR); SANTA CATARINA: Florianópolis: aterro da Baía Sul, no Saco dos Limões, Ilha de Santa Catarina, ruderal, 27°36'35.07" S, 48°32'10.83" W, 5 m, 25.IV.2014, *G. Hassemmer & J.P.R. Ferreira* 745 (C, FLOR); Costeira do Pirajubaé, aterro da Baía Sul, 27°36'34.9" S, 48°32'11.8" W, 15.IV.2015, *J.P.R. Ferreira & L.A. Funez* 736 (FLOR); Tapera, em aterro sobre Floresta Ombrófila Densa de Terras Baixas, 27°41'0.61" S, 48°31'29.42" W, 20.IV.2015, *L.A. Funez* 4280 (FURB). ETHIOPIA. GOJJAM: on road from Guba-Mankush to Bambudi, 525 m, 24.X.2010, *I. Friis et*

al. 13563 (C); ILLUBABOR: ca. 20 km south of Gambela, along the road to Abobo, 650 m, 30.X.1996, *I. Friis et al.* 7973 (C). GUINEA. BOKÉ: Gaoual, 15.IX.1958, *J.-G. Adam* 8940 (C). GUINEA-BISSAU. Mansoa-Uague, 26.XI.1961, *J.A. Pereira* 1960 (C). MADAGASCAR. ATSIMO-ANDREFANA: near Beza Mahafaly Reserve, E of Betioky, Ambinda stream E of Sakamena, 150 m, 15.I.1989, *P.B. Phillipson & S. Rabesihanaka* 3182 (C). NIGERIA. Jebba, at the Niger, 35 m, 12.XII.1927, *O. Hagerup* 742 (C). TANZANIA. Dar es Salaam: University College, 20.V.1967, *E. Jaasund* 2013 (GB); Selous Game Reserve, ca. 2 km NW of Kingupira, 125 m, 22.IV.1975, *K. Vollesen* 2269 (C); Selous Game Reserve, Muhinje Area, 300 m, 13.I.1978, *K. Vollesen* 4879 (C). UGANDA. along the Bahr el Jebel, between Nimule and Gondokoro, 4-25. II.1910, *E.A. Mearns* 2974 (C); Murchison Falls, 660 m, 6.VII.2001, *J. Kalema* 2670 (C); Ajai Wildlife Reserve, 24.VII.2001, *J. Kalema* 2343 (C); Ajai Wildlife Reserve, 13.XII.2001, *J. Kalema* 3373 (C). UNITED STATES OF AMERICA. ALABAMA: Baldwin: roadside by Ala 225, 0.8 mi. n. jct. US 31 at Spanish Fort, 22.IX.1969, *R. Kral* 37414 (C); FLORIDA: Alachua: on dirt road E. of US 441, ca. 2 mi. S. of Gainesville, 5.X.1967, *W.G. D'Arcy* 2169 (C); Lake: along Fla. 470, near Sumter county line, 9.XI.1970, *L. Baltzell* 2550 (C).

Alysicarpus vaginalis (L.) DC.

Examined material: BRAZIL. MATO GROSSO DO SUL: Miranda: rodovia BR-262, 19.V.2002, *G.G. Hatschbach et al.* 73125 (C, HRB-50919); PERNAMBUCO: Fernando de Noronha: Morro Branco, 9.IV.1999, *A.M. Miranda* 3231 (RB-516715); RIO DE JANEIRO: Armação de Búzios: entre a Ponta do Criminoso e a Praia Brava, Alto da Brava, 21.V.2004, *R.D. Ribeiro et al.* 238 (FLOR); Rio de Janeiro: Jacarepaguá, laboratório da FEEMA, 28.IV.1987, *J. Caminote s.n.* (RB-287562); São Pedro da Aldeia, Via Lagos, km 39,5, antes do SOS Via Lagos, 22°48.57' S, 42°17.55' W, 12.II.2007, *H.C. de Lima et al.* 6495 (RB-436834). CHINA. HONG KONG: Chung Chi College, 28.IX.1972, *S.Y. Hu* 12143 (GB). DOMINICAN REPUBLIC. Puerto Plata, 6.IV.1906, *C. Raunkiaer* 1222 (C); La Cumbre, 8.IV.1906, *C. Raunkiaer* 1140 (C); BARAHONA: 1912, *M. Fuertes* 481 (C). INDIA. JHARKHAND: Ranchi: 2.X.1952, *K.Å. Dahlstrand s.n.* (GB). SURINAME. Paramaribo, Zorg en Hoop, Commewijnestraat, 21.XI.1955, *A.M.E. Jonker-Verhoef & F.P. Jonker* 20 (C). TAIWAN. 24.VI.1932, *T. Tanaka & Y. Shimada s.n.* (GB). TANZANIA. Dar es Salaam: University College, X.1967, *A. Jaasund & E. Jaasund* 2198A (GB). THAILAND. CHIANG MAI: Fang: 350 m, 22.II.1958, *T. Sorensen et al.* 1517 (C).

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