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First records of *Melilotus albus* Medik. (Fabaceae, Faboideae) in Santa Catarina, southern Brazil

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Abstract: *Melilotus albus* Medik. is a cosmopolite and invasive species, native to the Old World, which in Brazil had its occurrence hitherto recorded only in the states of São Paulo, Paraná and Rio Grande do Sul. This study extends its distribution to Santa Catarina state, southern Brazil, due to the recent discovery of populations in the municipalities of Florianópolis and Xanxerê. These new records are *ca.* 250 km distant from the nearest records, in Paraná state, also in southern Brazil.

Key words: distribution extension, invasive species, new records, ruderal plant, South America

The legume family, Fabaceae, is the third largest family of angiosperms, including *ca.* 730 genera and over 19400 species spread worldwide (Wojciechowski *et al.* 2004). This family has an immense ecological and also agricultural importance as nitrogen fixers (Soltis *et al.* 1995; Crews 1999; Yan *et al.* 2000; Mafongoya *et al.* 2004; Bromfield *et al.* 2010) and is second only to Poaceae in agricultural and economic importance (Wojciechowski *et al.* 2004). Within the subfamily Faboideae tribe Trifolieae, the subtribe Trigonellinae includes three closely allied genera, *Medicago* L., *Melilotus* (L.) Mill., and *Trigonella* L. (Steele and Wojciechowski 2003; Steele *et al.* 2010).

Melilotus includes 20–25 species native to Eurasia and North Africa (the Palearctic) (Rogers *et al.* 2008; Özbek *et al.* 2014), but many species have been introduced to and are now naturalised in various temperate and subtropical regions worldwide (Halvorson and Guertin 2003; Hussey *et al.* 2007), mainly because of its agricultural uses as forage crops and soil builders (Stevenson 1969; Rogers *et al.* 2008; Özbek *et al.* 2014). Some of these species are considered invasive, and have been accounted for negative environmental impacts (Wolf *et al.* 2003, 2004).

Melilotus albus Medik. is one of the two *Melilotus* species that occur in Brazil (the other is *M. indicus* (L.) All.), and was hitherto only recorded in the Brazilian states of São Paulo, Paraná and Rio Grande do Sul (de Lima *et al.* 2010, 2014). However, during recent (September 2011) collection efforts on Santa Catarina Island, in the municipality of Florianópolis, eastern Santa Catarina state (SC), southern Brazil, we found a population of about 50 adult plants, and a great many of seedlings, in a landfill in the locality of Saco dos Limões (Figures 1 and 2). Three months later, we discovered another population in the municipality of Xanxerê, western SC. These are the first records of *M. albus* in SC (Figure 3), which are *ca.* 250 km distant from the nearest locality recorded, in Curitiba, Paraná state, southern Brazil. In addition to the fieldwork, we also revised the entire collections of *Melilotus* at EFC, FLOR, FURB, HBR, MBM and UPCB (acronyms according to Thiers 2014; Appendix 1).

Melilotus albus are biennial or annual herbs, the stem 0.3–2.6 m high, upright or ascending, coarse or fine, grooved or channelled, usually pubescent or pilose near the tip; leaflets of the lower leaves broadly ovate, obovate or rhomboidal, rounded or truncate at the tip, irregularly dentate, 1.5–5 cm long; those of the upper leaves oblong-lanceolate, usually rounded or truncate at the tip, dentate or almost entire; stipules 7–10 mm long, entire, narrowly cuneate, those of the lower leaves with one or two teeth near the broadened base; raceme 40–80, rarely 120 flowered, elongated at maturity, 8–15 cm long or occasionally up to 28 cm in some annual varieties; pedicels 1.5–2 mm long; flowers white, 4–6 mm long; calyx 2–2.5 mm long, teeth as long as the tube, rarely shorter, triangular-lanceolate;

Figure 1. One of the populations of *Melilotus albus* discovered in a landfill in Saco dos Limões, Florianópolis, southern Brazil.

Figure 2. Detail of *Melilotus albus* from Florianópolis.

wings and standard more or less equal and longer than the keel; pod 3–4 mm long, 2–2.5 mm broad, 1.5–2 mm thick, obliquely ovate, reticulately nerved, black, dark grey or tawny, tip obtuse, base of style persisting; seed oval, 2–2.5 mm long, 1.5 mm broad, yellow or rarely greenish-yellow; radicle about half as long as the cotyledons (Stevenson 1969).

Synonyms of *Melilotus albus* Medik. include *M. albus* Desr., *M. angulatus* hort. ex Trautv., *M. giganteus* hort. ex Trautv., *M. kotschyi* O.E.Schulz, *M. leucanthus* Koch ex DC., *M. melanospermus* Besser ex Ser., *M. rugosus* Gilib., *M. rugulosus* hort. ex Trautv., *M. rugulosus* Willd., *M. strictus* hort. ex Trautv., *M. urbani* O.E.Schulz and *M. vulgaris* Willd. (Stevenson 1969).

Originally native to Eurasia and northern Africa (Halvorson and Guertin 2003), *Melilotus albus* is now introduced and naturalised to temperate and subtropical areas in the Americas (Halvorson and Guertin 2003) and Australasia (Hussey *et al.* 2007). This species is adapted to a wide range of conditions, being drought and cold tolerant, although it does not tolerate shade or flooding (Halvorson and Guertin 2003). In Brazil it is ruderal in open and well-drained areas, mainly in farmland, gardens and wastelands. Its conservation status, according to the IUCN criteria (IUCN 2012, 2014), is Least Concern (LC). Because of the invasiveness potential of this species, it is very important the continuous monitoring of its geographical distribution and of the ecological dynamics of its populations in areas where it is not native.

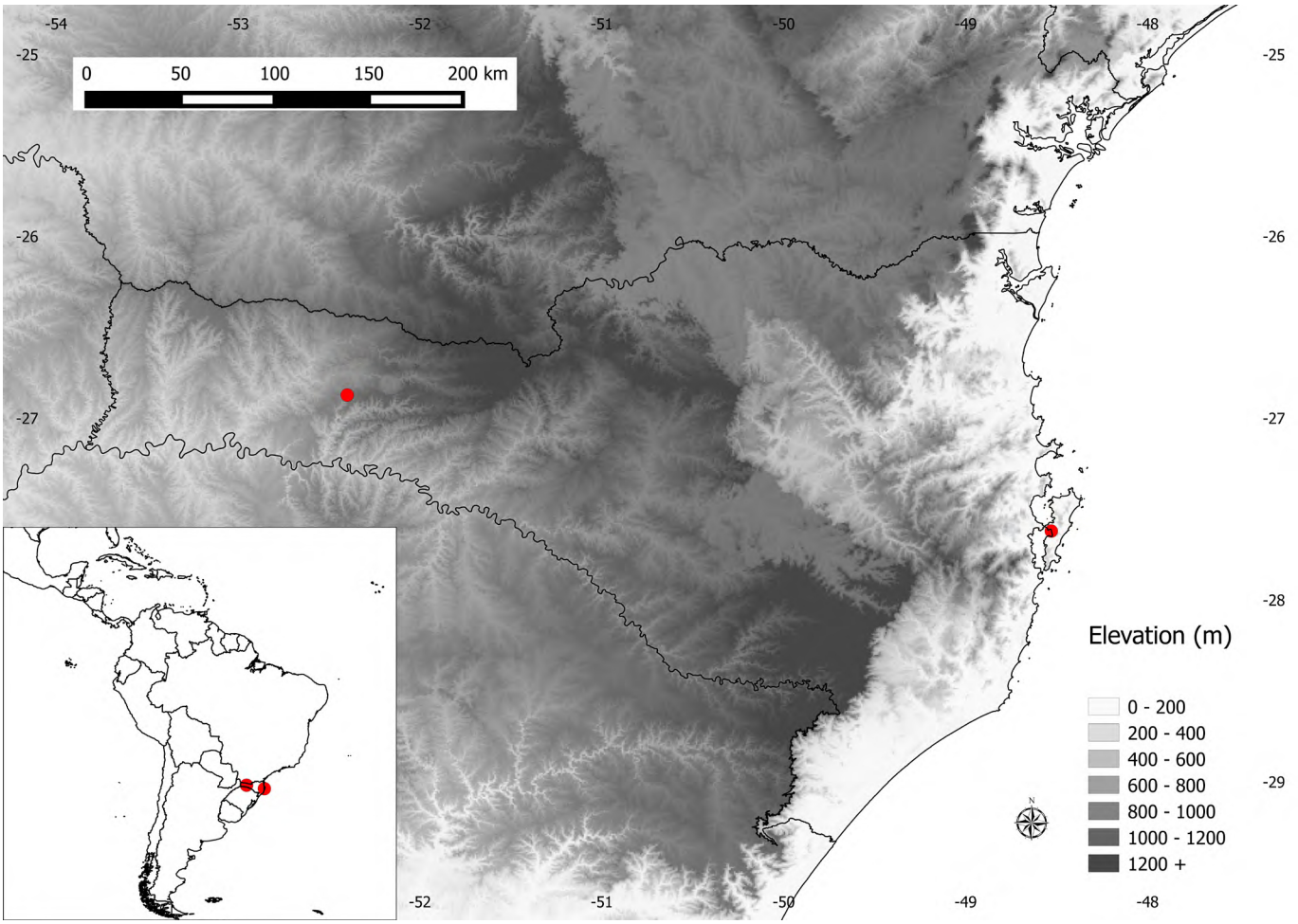

Figure 3. Location of the new records of *Melilotus albus* in Santa Catarina state, southern Brazil.

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LITERATURE CITED

Bromfield, E.S.P., J.T. Tambong, S. Cloutier, D. Prévost, G. Laguerre, P. van Berkum, T.V.T. Thi, R. Assabgui and L.R. Barran. 2010. *Ensifer*, *Phyllobacterium* and *Rhizobium* species occupy nodules of *Medicago sativa* (alfalfa) and *Melilotus alba* (sweet clover) grown at a Canadian site without a history of cultivation. *Microbiology* 156(2): 505–520 (doi: 10.1099/mic.0.034058-0).

Crews, T.E. 1999. The presence of nitrogen fixing legumes in terrestrial communities: evolutionary vs ecological considerations. *Biogeochemistry* 46(1–3): 233–246.

Halvorson, W.L. and P. Guertin. 2003. *Factsheet for* Melilotus *P. Mill. spp. USGS Weeds in the West Project: Status of Introduced Plants in Southern Arizona Parks*. Tucson: U.S. Geological Survey, National Park Service. 43 pp. Accessible at http://usgsbrd.srnr.arizona.edu/data/sdrs/ww/docs/meli_spp.pdf. Captured on 18 October 2014.

Hussey, B.M.J., G.J. Keighery, J. Dodd, S.G. Lloyd and R.D. Cousens. 2007. *Western Weeds, a Guide to the Weeds of Western Australia*. 2nd ed. Perth: The Weeds Society of Western Australia. 312 pp.

IUCN Species Survival Commission. 2012. *IUCN Red List Categories and Criteria*. Version 3.1. 2nd ed. Gland: IUCN. 32 pp. Accessible at http://jr.iucnredlist.org/documents/redlist_cats_crit_en.pdf. Captured on 18 October 2014.

IUCN Standards and Petitions Subcommittee. 2014. *Guidelines for Using the IUCN Red List Categories and Criteria*. Version 11. 87 pp. Accessible at http://jr.iucnredlist.org/documents/RedListGuidelines.pdf. Captured on 18 October 2014.

de Lima, H.C., L.P. Queiroz, M.P. Morim, V.C. Souza, V.F. Dutra, R.L.C. Bortoluzzi, J.R.V. Iganci, R.H. Fortunato, A.M.S.F. Vaz, É.R. de Souza, F.L.R. Filardi, J.F.M. Valls, F.C.P. Garcia, J.M. Fernandes, R.C.V. Martins-da-Silva, A.P.F. Perez, V.F. Mansano, S.T.S. Miotto, A.M.G.A. Tozzi, J.E. Meireles, L.C.P. Lima, M.L.A.A. Oliveira, A.S. Flores, B.M. Torke, R.B. Pinto, G.P. Lewis, M.J.F. Barros, R.D. Ribeiro, R.S. Rodrigues, T. Pennington, B.B. Klitgaard, J.G. Rando, V.R. Scalon, D.B.O.S. Cardoso, L.C. da Costa, M.J. da Silva, T.M. Moura, L.A.V. de Barros, M.C.R. Silva, R.T. Queiroz, A.L.B. Sartori and R.A. Camargo. 2010. Fabaceae; pp. 989–1102, in: R.C. Forzza *et al.* (orgs.). *Catálogo de Plantas e Fungos do Brasil*. Vol. 2. Rio de Janeiro: Andrea Jakobsson Estúdio and Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Accessible at http://reflora.jbrj.gov.br/downloads/vol2.pdf. Captured on 18 October 2014.

de Lima, H.C., L.P. Queiroz, M.P. Morim, V.F. Dutra, R.L.C. Bortoluzzi, J.R.V. Iganci, R.H. Fortunato, A.M.S.F. Vaz, É.R. de Souza, F.L.R. Filardi, F.C.P. Garcia, J.M. Fernandes, R.C.V. Martins-da-Silva, A.P.F. Perez, V.F. Mansano, S.T.S. Miotto, L.C.P. Lima, M.L.A.A. Oliveira, A.S. Flores, B.M. Torke, R.B. Pinto, G.P. Lewis, M.J.F. Barros, R. Schütz, T. Pennington, B.B. Klitgaard, J.G. Rando, V.R. Scalon, L.C. da Costa, M.J. da Silva, T.M. Moura, L.A.V. de Barros, M.C.R. Silva, R.T. Queiroz, A.L.B. Sartori, R.A. Camargo, I.B. Lima, J. Costa, M.V.B. Soares, J.F.M. Valls, C. Snak, W. São-Mateus, M.J. Falcão, D.B.O.S. Cardoso, A.M.G.A. Tozzi, V.C. Souza, M.V. Martins, J.E. Meireles and I.P. Reis. 2014. Fabaceae; in: *Lista de Espécies da Flora do Brasil*. Jardim Botânico do Rio de Janeiro. Accessible at http://floradobrasil.jbrj.gov.br/jabot/floradobrasil/FB115. Captured on 18 October 2014.

Mafongoya, P.L., K.E. Giller, D. Odee, S. Gathumbi, S.K. Ndufa and S.M. Sitompul. 2004. Benefiting from N_2-fixation and managing rhizobia; pp. 227–242, in: M. van Noordwijk, G. Cadisch and C.K. Ong (eds.). *Below-ground Interactions in Tropical Agroecosystems: Concepts and Models with Multiple Plant Components*. Wallingford: CABI (doi: 10.1079/9780851996738.0000).

Özbek, F., M.U. Özbek and M. Ekici. 2014. Morphological, anatomical, pollen and seed morphological properties of *Melilotus bicolor* Boiss. & Balansa (Fabaceae) endemic to Turkey. *Australian Journal of Crop Science* 8(4): 543–549 (http://www.cropj.com/ozbek_8_4_2014_509_514.pdf).

Rogers, M.E., T.D. Colmer, K. Frost, D. Henry, D. Cornwall, E. Hulm, J. Deretic, S.R. Hughes and A.D. Craig. 2008. Diversity in the genus *Melilotus* for tolerance to salinity and waterlogging. *Plant and Soil* 304(1–2): 89–101 (doi: 10.1007/s11104-007-9523-y).

Soltis, D.E., P.S. Soltis, D.R. Morgan, S.M. Swensen, B.C. Mullin, J.M. Dowd and P.G. Martin. 1995. Chloroplast gene sequence data suggest a single origin of the predisposition for symbiotic nitrogen fixation in angiosperms. *Proceedings of the National Academy of Sciences* 92(7): 2647–2651 (doi: 10.1073/pnas.92.7.2647).

Steele, K.P. and M.F. Wojciechowski. 2003. Phylogenetic analyses of tribes Trifolieae and Vicieae, based on sequences of the plastid gene *mat*K (Papilionoideae: Leguminosae); pp. 355–370, in: B.B. Klitgaard and A. Bruneau (eds.). *Advances in Legume Systematics*. Part 10, Higher Level Systematics. Kew: Royal Botanic Gardens.

Steele, K.P., S.M. Ickert-Bond, S. Zarre and M.F. Wojciechowski. 2010. Phylogeny and character evolution in *Medicago* (Leguminosae): evidence from analyses of plastid *trn*K/*mat*K and nuclear *GA3ox1* sequences. *American Journal of Botany* 97(7): 1142–1155 (doi: 10.3732/ajb.1000009).

Stevenson, G.A. 1969. An agronomic and taxonomic review of the genus *Melilotus* Mill. *Canadian Journal of Plant Science* 49(1): 1–20 (doi: 10.4141/cjps69-001).

Thiers, B. 2014. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Accessible at http://sweetgum.nybg.org/ih. Captured on 18 October 2014.

Wojciechowski, M.F., M. Lavin and M.J. Sanderson. 2004. A phylogeny of legumes (Leguminosae) based on analysis of the plastid *mat*K gene resolves many well-supported subclades within the family. *American Journal of Botany* 91(11): 1846–1862 (doi: 10.3732/ajb.91.11.1846).

Wolf, J.J., S.W. Beatty and G. Carey. 2003. Invasion by sweet clover (*Melilotus*) in montane grasslands, Rocky Mountain National Park. *Annals of the Association of American Geographers* 93(3): 531–543 (doi: 10.1111/1467-8306.9303001).

Wolf, J.J., S.W. Beatty and T.R. Seastedt. 2004. Soil characteristics of Rocky Mountain National Park grasslands invaded by *Melilotus officinalis* and *M. alba*. *Journal of Biogeography* 31(3): 415–424 (doi: 10.1046/j.0305-0270.2003.00983.x).

Yan, A.M., E.T. Wang, F.L. Kan, Z.Y. Tan, X.H. Sui, B. Reinhold-Hurek and W.X. Chen. 2000. *Sinorhizobium meliloti* associated with *Medicago sativa* and *Melilotus* spp. in arid saline soils in Xinjiang, China. *International Journal of Systematic and Evolutionary Microbiology* 50(5): 1887–1891 (doi: 10.1099/00207713-50-5-1887).

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APPENDIX 1. *Melilotus albus* material examined.

Argentina. Córdoba: Santa Maria: National Route #20, between Yocsina and Cuesta de San Roque, 13 January 1956, *A.T. Hunziker 11536* (MBM). Corrientes: Capital: Escuela de Agricultura, 8 September 1975, *J.I. Maidana 38* (MBM). Entre Ríos: Paraná: road access to the Río Paraná tunnel, 1 November 1970, *A. Burkart & N. Troncoso 27972* (MBM).

Brazil. Paraná: Almirante Tamandaré: 10 December 1999, *W. Amaral & B.S.N. Amaral 640* (UPCB); Curitiba: Bairro Alto, ruderal, 16 December 1977, *G. Hatschbach 40285* (MBM); cultivated, 25 March 1985, *N. Imaguire 5796* (MBM); Bairro Santo Inácio, 5 November 1998, *A. Dunaiski Jr. 872* (MBM); Bairro Santo Inácio, 10 February 1999, *W. Amaral 475* (MBM); Guabirotuba, ruderal, 10 May 2002, *A.C. Cervi 8470* (UPCB); Jardim das Américas, ruderal, 30 December 2004, *A.C. Cervi & J.A. Cunha 8820* (UPCB). Rio Grande do Sul: Santa Maria: on roadside, in quarry, 4 May 1985, *M. Sobral 3877* (MBM). Santa Catarina: Florianópolis: landfill in Baía Sul (Costeira), sandy soil, 27°37′13.45″ S 48°31′44.69″ W, 4 m, 28 September 2011, *G. Hassemer 418* (FLOR); landfill in Baía Sul (Costeira), sandy soil, 27°37′13.45″ S 48°31′44.69″ W, 4 m, 3 September 2012, *G. Hassemer & J.P.R. Ferreira 565* (FLOR); Xanxerê: Centro, in marshy vacant lot, 26°52′20.31″ S 52°23′57.94″ W, 793 m, 17 December 2011, *L.A. Funez 206* (FURB).

France. Vaucluse: Roussillon: forest edge with red sand subsoil, 250 m, 20 July 1981, *Geerinck-Coutrez 2713* (MBM).

Mexico. Durango: Tepehuanes: southeast of Tepehuanes, secondary vegetation, 23 July 1982, *P. Tenorio L. & C. Romero T. 1235* (MBM).

Sweden. Stockholm: Järfälla: Lake Mälaren, Görväln, roadside, 10 July 2004, *G. Herner 04-49* (MBM).

U.S.A. New York: Rockland: gravelly areas along railroad and power lines, Sloatsburg, 24 July 1993, *M. Nee et al. s.n.* (MBM 164428). Texas: Travis: 5 miles west of Loop 360 and Bee Caves Rd., end of Grace Lane, mixed open-woodland areas, 22 April 1994, *J. Kane 41* (MBM).