

## New host plants records for the froghopper *Notozulia entreriana* (Hemiptera: Cercopidae) with new data on its occurrence in diverse ecological zones in Argentina

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### Nuevos registro de plantas hospedadoras para el “salivazo” *Notozulia entreriana* (Hemiptera: Cercopidae) con nuevos aportes sobre su ocurrencia en diversas zonas ecológicas de la Argentina

**RESUMEN.** Los Cercopidae afectan a la agricultura y ganadería en la región Neotropical. En el norte y centro de la Argentina causan un deterioro considerable en la calidad de los pastos que sustentan la producción ganadera. No existen en la Argentina estudios que integren aspectos taxonómicos y biológicos de estas chicharritas, registrándose sólo unos pocos aportes taxonómicos que datan de principio del siglo pasado. *Notozulia entreriana* Berg es una de las especies más abundante de salivazo que habita la región subtropical del país, pero en la Argentina sólo existen registros de tres localidades. A través del estudio de los ejemplares depositados en las colecciones del Museo de La Plata y los obtenidos a campo, se analiza su rango de distribución y plantas hospedadoras asociadas. Se amplía aquí la distribución de *N. entreriana* a quince provincias argentinas y se dan a conocer por primera vez las plantas hospederas. Sus poblaciones están asociadas a las siguientes monocotiledóneas: caña de azúcar, sorgo de Alepo, gramón y los pastos pangola, guinea y grama rhodes; se verificó que esta especie completa todo su ciclo de vida en el sorgo de Alepo, gramón y grama rhodes.

**PALABRAS CLAVE.** Auchenorrhyncha. Plantas Hospedadoras. Distribución geográfica. Pastura.

**ABSTRACT.** Spittlebugs represent a widely distributed group of Auchenorrhyncha, being one of the most important assemblies affecting farming and cattle rising in the Neotropics. They attack a wide range of forage species causing considerable deterioration in the quality of pastures that sustain livestock production, particularly in northern and central Argentina. In Argentina, there are no studies integrating the taxonomy and biology of spittlebugs and only a few taxonomic contributions dating back to early past century do exist. *Notozulia entreriana* (Berg, 1879) is one of the most common spittlebug species inhabiting the subtropical region of the country but it was previously cited for only three Argentinian localities. Throughout the study of specimens housed in Museo de La Plata collection and field captured specimens, we analyzed its distributional range and associated plants. We extend the distribution of *N. entreriana* to fifteen different provinces, and new host plant records in Argentina are given. Its populations are associated to sugar cane, pan-

gola grass, guinea grass, Johnson grass, Rhodes grass and Bermuda grass, but we stated that Bermuda grass, Johnson grass and Rhodes grass are true "Host-plants", where this froghopper completes its immature to adult life cycle.

**KEY WORDS.** Auchenorrhyncha. Host plants. Geographical distribution. Grass.

Spittlebugs (Cercopidae) are an important threat for forage, grasses and several crops in tropical and subtropical areas of the Americas. Spittlebugs inflict heavy economic damage to grass crops worldwide (Heinrichs & Barrion, 2004), including rice (Pacheco & Silva, 1984), sugarcane (Rodman & Miller, 1992), corn (Peck, 2001) and improved pasture grasses such as *Brachiaria* sp. and *Axonopus* sp. (Pires *et al.*, 2000; Holmann & Peck, 2002); for example, spittlebugs in the genera *Aeneolamia* Fennah, *Mahanarva* Distant, *Zulia* Fennah, *Deois* Fennah, *Notozulia* Fennah and *Prosapia* Fennah are considered serious pests of grasses in Central and South America, causing up to 70% reduction in agricultural yields within infested areas (Thompson, 2004; Leite *et al.*, 2005). Cercopoid damages to host plants is often less obvious than damages resulting from infestations of other agricultural pests (i.e. grasshoppers, or beetles) and could be underestimated (Kosztarab *et al.*, 1990).

Comprising approximately 1450 species, they are distributed all around the world, but the highest number of species inhabits the Neotropical region (Fennah, 1953, 1968; Hamilton, 1977; Remes Lenicov *et al.*, 2004; Carvalho & Webb, 2004; Soulier-Perkins, 2013). Despite this, taxonomic studies on the group in Argentina are insufficient and, except for some sporadic mentions, most of them were performed over 40 years ago (Torres, 1946, 1950; Hayward, 1960). So far, only 15 species in seven genera are mentioned occurring in the Argentinean territory (Soulier-Perkins, 2013).

One of the most common spittlebug species inhabiting the subtropical region of the country is *Notozulia entreriana* (Berg). It was described by Berg in 1879 as *Tomaspsis entreriana* and lately was mentioned as *Monecphora entreriana* (Torres, 1946). Fennah (1968) located the species into the genus *Zulia* under a new subgenus named *Notozulia* and later Carvalho (1995) stated that *Notozulia* should be risen as a new genus considering the differential shape

of the post-clypeus and some features of the male genitalia, among other characters. *N. entreriana* is a Neotropical species cited from Brazil, Paraguay, and Argentina (Carvalho, 1995), and later Holmann & Peck (2002) mentioned that the distribution of the species is one of the widest in America (from south of USA to north of Argentina). In Argentina, the species was previously recorded in the following localities: Concepción del Uruguay (Entre Ríos) (Berg, 1879), El Colmenar (Tucumán) (Box, 1929) and La Mendieta (Jujuy) (Carvalho, 1995). Recently, we began a research program on the Cercopidae of Argentina, collecting in diverse agricultural environments and forage crops.

A total of 502 specimens were examined, 271 males and 231 females. Genitalia of the specimens were prepared for microscopic examination according to Brentassi *et al.* (2010). Identifications were done using specific keys (Fennah, 1968, 1953). Voucher specimens were deposited in the entomological collection of Museo de La Plata, Buenos Aires, Argentina (MLP).

The spittlebugs were collected from 11 provinces of Argentina and preserved in 70% ethyl alcohol. Most of the specimens were obtained by sweeping, using entomological nets, from diverse crops, forage plots and/or their surrounding vegetation, both in human modified environments and pristine ones. In many instances, the nymphs were collected with their host plant and moved to the laboratory until they reached the adult stage in order to confirm its specific identity.

Also, the holotype and additional material deposited in MLP were studied.

The aim of this contribution is to provide new information on the distribution and associated plants of argentinean populations of *N. entreriana*. Records show that, the range of distribution of *N. entreriana* is extended to Misiones, Chaco, Salta, Catamarca, La Rioja, Santiago del Estero, Corrientes, San Juan, San Luis, Córdoba, Santa Fe and Buenos Aires provinces. The new records showed that this species has a wide distribution in the country, occurring in locations ranging

from 14 to 3634 m.asl (Fig. 1). So, this species is present not only in the biogeographical provinces of Pampa, Yungas and Chaco, but also in Prepuna, Parana Forest and Monte, according to the biogeographic approach of Morrone (2006) where the environmental characteristics of these provinces are thoroughly described.

*N. entreriana* is mostly associated to natural communities of grasses, although it was cited in Brazil affecting forage grasses (*Brachiaria* sp., *Brachiaria decumbens* Stapf, *Brachiaria ruzizien-sis* Germ, *Pennisetum* sp.) and crops as rice and sugar cane (Valério & Oliveira, 2005; William & Peters, 2006); no data on host plants were previously provided for Argentina. Our observations and results confirmed the association of this species to diverse monocots. In Tucumán province, specimens of the spittlebugs were obtained affecting sugar cane, "pangola grass" (*Digitaria decumbens* Stent), "Guinea grass" (*Panicum maximum* Jacq.), "Johnson grass" (*Sorghum halepense* (L.) Pers.), Rhodes grass (*Chloris gayana* var "epica"), and "Bermuda grass" (*Cynodon dactylon* (L.) Pers). In Córdoba and Buenos Aires

provinces, several specimens were collected from spontaneous vegetation surrounding corn, oat and alfalfa crops, mostly integrated by monocots. Field observations allow us to state that *N. entreriana* completes its immature to adult life cycle, that is to say "host-plants", on Bermuda grass, Johnson grass and Rhodes grass.

We observed the occurrence of different patterns of color polymorphism in the forewings of *N. entreriana*. Frequencies of color patterns in different populations of the species and their possible association with seasonal changes according to temperature and photoperiod, host plants, geographical distribution, and presence of predators, among other factors, deserve further studies.

Examined material (provinces in uppercase). HOLOTYPE: ♀, ENTRE RIOS: Concepción del Uruguay, Berg Leg. (MLP). Other specimens: JUJUY: Abra Pampa (22°40'31.23"S 65°42'15.03"W, 3634 m.asl), 1♂, 7/II/1958, Biraben-Bezzi Leg.; San Salvador de Jujuy (24°10'56.35"S 65°17'43.40"W, 1355 m.asl), 8♂8♀, 29/II/1958, Torres-Ferreyra Leg.; Cali-

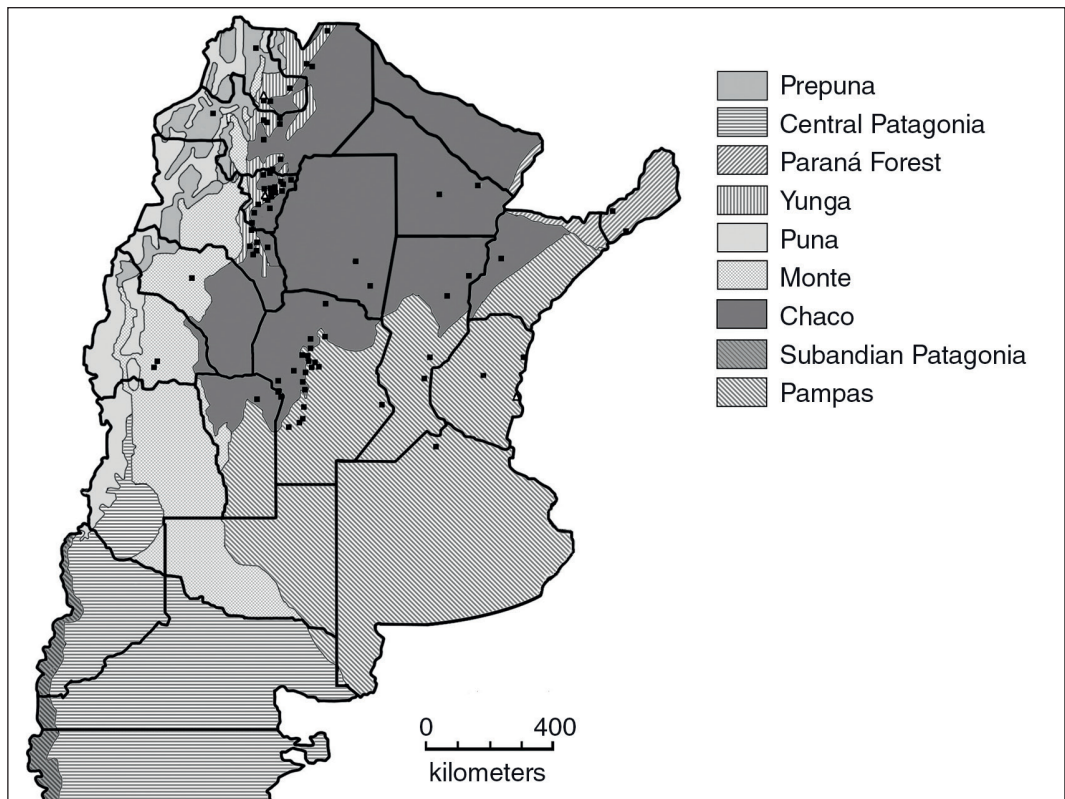


Fig. 1. Distributional map of *N. entreriana*

legua (23°50'16,51''S 64°43'50,16''W, 574 m.asl), 1♀, XII/1945, Poore Leg.; Laguna de Yala (24°06'28,29''S 65°28'36,37''W, 2079 m.asl), 1♂4♀, 13/02/1951, Willink-Monros Leg.; Terma de Reyes (24°10'18,89''S 65°29'10,72''W, 1765 m.asl), 1♂, 03/02/1948, Willink-Monros Leg.. CHACO: Pres. Roque Saenz Peña (26°47'57,97''S 60°27'19,94''W, 93 m.asl), 1♀, 01/12/1980, Willink Leg.; Zapallar (26°56'63,00''S 59°35'11,00''W, 77 m.asl), 6♂6♀, 10/03/1959, Biraben Leg.. SALTA: Embarcación (23°13'11,89''S 64°05'51,64''W, 298 m.asl), 1♀, 1/IV/?, Alauet Leg.; Salta (24°47'05,82''S 65°23'29,33''W, 1345 m.asl), 1♂1♀, 18/04/1946, R. Maldonado-Bruzzone Leg.; San Lorenzo (24°43'51,39''S 65°29'12,37''W, 1407 m.asl), 1♀, 12/11/1948, Willink-Monros Leg.; Ruiz de los Llanos (24°43'51,39''S 65°29'12,37''W, 819 m.asl), 2♀, II/1918, 4♀, II/1947, Golbach Leg.; Oran (23°09'36,86''S 64°15'38,19''W, 429 m.asl), 2♂6♀, 28/02/1962, 1♀, 10/05/1969, Willink-Teran Leg.; Campo Duran (22°12'15,95''S 63°39'57,34''W, 491 m.asl), 1♀, 21/03/1984, Willink-Claps Leg.; Cabeza de Buey (24°47'28,22''S 65°01'44,61''W, 765 m.asl), 1♀, 18/03/1957, Willink-Monros Leg.; Itinuyo (24°31'06,95''S 66°56'04,51''W, 3824 m.asl) 1♂, 28/09/1968, Willink-Monros Leg.; Rosario de la Frontera (25°48'55,46''S 64°58'14,75''W, 829 m.asl) 1♂, 18/01/1948, Monros Leg.; Coronel Moldes (25°48'55,46''S 64°58'14,75''W, 1359 m.asl) 4♂, 03/02/1960, Ajmat-Bennasar Leg.. MISIONES: Loreto (27°18'48,41''S 55°32'01,15''W, 155 m.asl), 1♀, Kochler Leg.; San Javier (27°51'48,78''S 55°08'28,42''W, 180 m.asl) 1♂3♀, 21/12/1973, Escobar-Claps Leg.. TUCUMÁN: San Miguel de Tucumán (26°47'48,50''S 65°18'37,31''W, 592 m.asl), 11♂36♀, 8/V/2012-31/V/2012, Foieri Leg.; same locality, 1♂ 2♀, 8/VI/2012-25/VI/2012, Foieri Leg.; same locality, 10♂1♀, 12/XI/2012-28/XI/2012, Foieri Leg.; San Pablo (26°52'19,52''S 65°18'24,02''W, 902 m.asl), 2♂3♀, 23/XI/06, Salvatore Leg.; Trancas (26°13'01,41''S 65°17'00,38''W, 780 m.asl), 1♂, 11/II/200, Virla Leg.; Leales (27°11'59,80''S 65°18'26,01''W, 327 m.asl), 32♂10♀, 8/XI/2001, Carlino Leg.; Chilcas (26°21'56,23''S 64°40'56,36''W, 527 m.asl) 2♂, 25/IV/2000, Virla Leg.; Alpachiri (27°19'44,23''S 65°44'57,45''W, 1507 m.asl), 2♂, 1/IV/1945, Araujo Leg.; Escaba (27°37'55,58''S 65°49'02,66''W, 1814 m.asl), 1♂, 21/II/2013,

Foieri Leg.; El Cadillal (26°39,317 S 65°13,601 W, 1502 m.asl), 40♂20♀, 3/XII/2012, Foieri Leg. El Timbo (26°41'59,50''S 65°08'00,16''W, 551 m.asl), 2♂, 16/04/2012, Foieri Leg.; Las Salinas (26°43'19,00''S 65°10'15,07''W, 513 m.asl), 3♂4♀, 16/04/2012, Foieri Leg.; Rta. Provincial 307 (27°84'05,78''S 65°39'55,34''W, 623 m.asl), 2♀, 17/04/2012, Foieri Leg.; El Manantial (26°50'46,95''S 65°17'00,87''W, 437 m.asl) 2♂2♀♂, 07/02/2013, Foieri Leg.; El Nogalito (26°27'01,38''S 64°59'58,90''W, 1040 m.asl), 3♂2♀, 07/02/2013, Foieri Leg.; Lules (26°56'39,00''S 65°21'42,03''W, 409 m.asl), 1♂1♀, 07/02/2013, Foieri Leg.; Rta. Provincial 341 (26°53'53,08''S 65°23'45,28''W, 1053 m.asl), 6♂3♀, 07/02/2013, Foieri Leg.; Potrero de las Tablas (26°51'46,04''S 65°25'87,06''W, 692 m.asl) 1♀, 07/02/2013, Foieri Leg.; Raco (26°38'15,15''S 65°26'44,95''W, 1502 m.asl), 2♂, 07/02/2013, Foieri Leg.; Tapia (26°36'18,97''S 65°16'06,17''W, 689 m.asl) 3♀, 08/04/1947, Maldonado-Bruzzone; Parque provincial Aconquija (26°81'83,20''S 65°26'48,30''W, 1201 m.asl) 1♀, 17/12/1946, Golbach Leg.; Rio Nio (26°26'28,99''S 64°58'31,11''W, 986 m.asl) 1♂1♀, 19/12/1981, Golbach Leg.; Sierra de la Ramada (26°32'19,19''S 64°57'31,28''W, 1045 m.asl) 2♂2♀; Aguadita (26°45'09,30''S 65°09'17,08''W, 479 m.asl), 2♀, 26/01/1941, Fernandez Leg.; San Pedro de Colalao (26°13'14,19''S 65°27'52,42''W, 1114 m.asl) 1♀, 04/1/2013, Foieri Leg.; La Ramada (26°41'39,37''S 64°57'14,53''W, 562 m.asl) 2♂2♀. CATAMARCA: La Merced (28°09'16,08''S 65°39'41,06''W, 899 m.asl), 1♂1♀, 21/II/2013, Foieri Leg.; Balcozna (28°27'02,24''S 65°46'30,95''W, 536 m.asl), 5♂3♀, 21/II/2013, Foieri Leg.; Higuera (27°46'44,1''S; 65°47'28,3''W, 1004 m.asl), 1♂, 21/II/2013, Foieri Leg.; Sumalao (28°26'52,85''S 65°46'43,25''W, 535 m.asl) 1♂, 05/02/1958, Golbach Leg.; El Rodeo (28°15'36,09''S 65°52'19,36''W, 1956 m.asl), 2♀, 28/01/1959, Golbach leg.; El Alto (28°18'00,63''S 65°21'59,46''W, 969 m.asl), 1♀, I/1958, Argarañas Leg.. LA RIOJA: Chilecito, Finca Samay Huasi (29°09'57,80''S 67°29'59,84''W, 1549 m.asl), 2♂2♀, III/1984. SAN JUAN: San Juan (31°31'43,36''S 68°31'15,52''W, 634 m.asl), 1♂1♀, III/1940; same locality, 1♂, I/1984, Kochler Leg.; Villa Aberastain, Dpto. Pocito (31°38'55,84''S 68°34'55,01''W, 625 m.asl), 8♂6♀, 23/II/1964. SANTIAGO DEL ESTERO: Ica-

ño (28°42'01,73"S 62°53'25,06"W, 104 m.asl), 1♂, 24/01/1983, Willink-Lobo-Abdala Leg.; Malbran (29°21'19,41"S 62°26'19,41"W, 83 m.asl), 1♂1♀, 14/04/2014, Frias Leg.. SAN LUIS: San Martín (32°34'41,64"S 65°40'30,43"W, 1067 m.asl), 1♂, 31/01/1958, Willink Leg.; Merlo (32°20'59,34"S 65°02'02,51"W, 798 m.asl), 1♂2♀, 31/01/1958, Willink Leg.; Cortaderas (32°30'03,81"S 65°00'03,54"W, 1067 m.asl), 2♀, 28/01/1958, Willink-Tomsic Leg.. CÓRDOBA: Río Segundo (31°38'33,20"S 63°54'28,23"W, 341 m.asl) 1♀, 11/III/2011; Río Cuarto (33°07'51,78"S 64°20'59,92"W, 446 m.asl), 1♀, 11/II/2011; Holmberg (33°11'59,02"S 64°25'58,62"W, 434 m.asl), 3♂3♀, 14/III/2011; Barranca Yaco (30°51'56,62"S 64°04'58,23"W, 688 m.asl), 1♂, 21/I/2011; same locality 1♀, 2/II/2011, 2♂4♀, 23/II/2011, 10♂2♀, 4/III/2011, 2♂, 11/III/2011, 2♂2♀, 16/III/2011, and 1♂, 31/III/2011; General Paz (31°08'03,22"S 64°08'16,31"W, 526 m.asl), 1♂2♀, 16/III/2011; Coronel Olmedo (31°28'59,77"S 64°10'00,62"W, 440 m.asl), 2♀, 13/IV/2011; Capilla del Sitón (31°20'11,17"S 64°17'32,63"W, 458 m.asl), 3♂5♀, 11/II/2011; Los Cóndores (32°17'37,37"S 64°17'49,30"W, 522 m.asl), 1♂4♀, 11/II/2011; Despeñadero (31°48'48,72"S 64°17'01,50"W, 429 m.asl), 11♂3♀, 14/III/2011; Marcos Juarez (32°41'36,64"S 62°06'10,43"W, 116 m.asl), 2♂1♀, 3/II/2011; San Pedro (31°45'59,82"S 64°37'59,69"W, 1056 m.asl), 1♂, 13/IV/2011; Villa de María (29°53'13,89"S 63°43'13,06"W m.asl), 1♂, 4/III/2011; Villa del Totoral (30°49'04,30"S 63°42'53,76"W, 229 m.asl), 1♂2♀, 4/III/2011; Alcira Gigena (32°45'14,44"S 64°20'00,81"W, 538 m.asl), 1♂3♀, 11/II/2011; Las Bajadas (32°06'06,88"S 64°19'38,74"W, 497 m.asl), 1♀, 14/III/2011; Lozada (31°38'58,29"S 64°05'03,45"W 381 m.asl), 1♂, 6/V/2011; Sampacho (33°21'46,29"S 64°45'09,91"W, 540 m.asl), 1♂, 14/III/2011; Toledo (31°33'13,43"S 64°00'24,34"W, 370 m.asl), 1♀, 11/III/2011; Diquecito (31°21'08,34"S 64°21'51,85"W, 514 m.asl), 1♂3♀, 10/01/1958, Willink Leg.; Yacanto de San Javier (32°02'30,01"S 65°03'23,14"W, 731 m.asl), 2♀, 14/01/1982, Willink Leg. (all the samples mentioned for Córdoba province were collected by Gimenez Pecci and collaborators). SANTA FE: Candiotti (31°23'42,73"S 60°44'56,58"W, 24 m.asl), 1♂, 21/XI/1939, Torres-Ferreira Leg.; Coronda (31°58'23,28"S 60°55'09,16"W, 20 m.asl), 1♂, 21/XI/1939 Bi-

raben-Bezzi Leg.; Margarita (29°41'25,60"S 60°15'10,78"W, 60 m.asl), 1♂1♀, 23/XI/1939 Biraben-Bezzi Leg.; Reconquista (29°06'29,31"S 59°39'06,02"W, 40 m.asl), 1♂, 26/XI/1939, Biraben-Bezzi Leg.. CORRIENTES: San Roque (28°34'18,98"S 58°42'33,82"W, 65 m.asl), 9♂ 8♀, II/1920, Bosq Leg.; 2♂, I/1921, De Carlo Leg.. ENTRE RÍOS: Concordia (31°23'30,23"S 58°01'01,42"W, 36 m.asl), 3♂, 19/XII/1941, Torres-Ferreira Leg.; Villaguay (31°52'08,02"S 59°01'37,88"W, 50 m.asl), 8♂ 12♀, 09/12/1959, Ajmat-Bennasar Leg.. BUENOS AIRES: Pergamino (33°53'51,13"S 60°33'10,05"W, 76 m.asl) 7♂2♀, 30/XII/2010, and same locality 2♂5♀, 18/I/2011, 1♀, 28/I/2011, 1♂, 16/II/2011, 51♂69♀, 20/III/11, Catalano Leg.

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