POPULATIONAL FLUCTUATION OF *Nysius simulans* ASSOCIATED WITH SOYBEAN AND HAIRY FLEABANE IN BRAZIL

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SUMMARY

This paper reports the first record of the occurrence and the populational fluctuation of Nysius simulans *(Stål) (Hemiptera: Lygaeidae) associated with hairy fleabane (*Conyza bonariensis*) and soybean (*Glycine max*) in Brazil. Fortnightly samplings were carried out in a soybean field weeded with hairy fleabane, in São Vicente do Sul, Rio Grande do Sul, Brazil, between December 2010 and November 2011.* N. simulans *was found on the plants from the beginning of November to the end of June. The largest population density was observed during low rainfall periods and the reproductive stage of soybean. After soybean maturation and harvest, the largest populations of* N. simulans *were found on the weed, indicating that hairy fleabane serves as a host for this species in the absence of soybean from the field.*

Introduction

The family Lygaeidae comprises many species of economic importance, including both phytophagous and predators (Schaefer and Panizzi, 2000). Within the Orsillinae subfamily, there are phytophagous species of agricultural importance, as those belonging to the genus *Nysius*, specially *N. simulans* (Stål) (Hemiptera: Lygaeidae) (Molinari and Gamundi, 2010).

The adults of *N. simulans* measure 3-4mm in length and 1.5mm wide, and have globular eyes. Body colour varies from gray to black, while the legs and antennae are yellow with dark spots. Nymphs are smaller than adults, rosy in the abdomen, with black head and thorax (Bentancourt and Scatoni, 1999; Molinari and Gamundi, 2010). In South America, *N. simulans* is distributed in Argentina, Paraguay, Uruguay, Peru and Brazil (Gonzales-Bustamante and Díaz-Arriola, 1993; Bentancourt and Scatoni, 1999; Melo *et al*., 2004; Cheli *et al*., 2010). In Argentina, where its occurrence is common, this poliphagous species was registered on several important crops, such as *Zea mays*, *Linum usitatissimum*, *Triticum aestivum*, *Gossypium hirsutum*, *Lactuca sativa*, *Nicotiana tabacum*, *Solanum tuberosum*, *Prunus persica*, *Vitis vinifera*, *Glicine max* and other plant species (Di Iorio, 2004). The insect also multiplies on broadleaf weeds, especially on *Gamochaeta* sp., *Capsella bursa pastoris*, *Brassica rapa*, *B. napus* and *Rapistrum rugosum* (Aragón

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FLUCTUACIÓN POBLACIONAL DE *Nysius simulans* ASOCIADO CON SOJA Y RAMA NEGRA EN BRASIL
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RESUMEN

Este trabajo presenta el primer registro de ocurrencia y la fluctuación poblacional de Nysius simulans *(Stål) (Hemiptera: Lygaeidae) asociado con rama negra (*Conyza bonariensis*) y soja (*Glycine max*) en Brasil. Se tomaron muestras quincenales en un campo de soja con rama negra como maleza, en São Vicente do Sul, Rio Grande do Sul, Brasil, entre diciembre 2010 y noviembre 2011. Se encontró* N. simulans *desde principios de noviembre hasta finales de junio. Las poblaciones más abundantes se observaron en períodos de escasez de precipitaciones y durante la etapa reproductiva de la soja. Después de la maduración y la cosecha de soja, densidades grandes de* N. simulans *se encuentran en rama negra, lo que indica que esta planta alberga a esta especie cuando la soja está ausente del campo.*

FLUTUAÇÃO POPULACIONAL DE *Nysius simulans* ASSOCIADO COM SOJA E BUVA NO BRASIL
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RESUMO

Este trabalho relata o primeiro registro de ocorrência e a flutuação populacional de Nysius simulans *(Stål) (Hemiptera: Lygaeidae) associado a plantas de buva (*Conyza bonariensis*) e de soja (*Glycine max*) no Brasil. Foram realizadas amostragens quinzenais em São Vicente do Sul, Rio Grande do Sul, Brasil, entre dezembro 2010 e novembro 2011. A praga foi encontrada desde o início de novembro até o final de junho. As maiores populações foram observadas em períodos de menor precipitação e durante a fase reprodutiva da soja. Após a maturação e colheita da soja, grandes densidades populacionais de* N. simulans *foram encontradas sobre a buva, indicando que essa planta hospeda a praga na ausência da soja.*

and Flores, 2006; Montero *et al*., 2007). In Brazil there are records of *N. simulans* on *Gossypium hirsutum*, *Solanum lycopersicum*, *Oryza sativa*, *Solanum tuberosum*, *Zea mays* and grasses (Silva *et al*., 1968).

The first record of *N. simulans* on soybean (*Glycine max*)in Argentina, in the province of Buenos Aires, was published by Rizzo and Losada (1975). Afterwards, this association was reported in the province of Misiones by Quintanilla *et al*. (1981). This bug has been observed frequently in soybean crops in Argentina since 2001, where it is known as '*chinche diminuta*' or '*chinche de las semillas*' (Gamundi and Sosa, 2007; Molinari and Gamundi, 2010). Infested soybean plants show severe damage in the early stages of development. In this stage, the pest attacks the hypocotyl, cotyledons and shoots, causing seedling death in trouble spots (Molinari and Gamundi, 2010) and requires, in some cases, crop reseeding (Aragon and Flores, 2006). One seedling can present colonies of up to 30 individuals, both adults and nymphs (Gamundi and Sosa, 2007).

Although these bugs feed on seeds, it is common to observe damage of the vascular tissues (Ashlock, 1977). *N. simulans* is a suctorial insect that draws water and nutrients from plants. Also, there is a potential additional damage: their saliva transmits toxins and spreads pathogens. The symptoms of damage are distortion, chlorosis and wilting of cotyledons; on seedlings growth and leaf tip are affected (Molinari and Gamundi, 2010). Many injuries occur when pest populations migrate from weed hosts to crops, especially during periods of drought (Ashlock, 1977; Molinari and Gamundi, 2010). Among the factors that favour the occurrence of *N. simulans*, besides the presence of weed hosts and drought, are no-tillage and delayed weed control. The deferral in weed control allows multiplication of the insect in the spring on uncultivated plants, shortly after the winter period, enabling the development of the first generation of the insect (Aragón and Flores, 2006). Some *Nysius* species produce, on average, two to three generations per year (Molinari and Gamundi, 2010).

In Brazil, mainly in the state of Rio Grande do Sul, large populations of *Conyza bonariensis*, a weed commonly known as hairy fleabane, are common in soybean fields. The availability of the herbicide glyphosate for weeds control allowed no-tillage and cultivation of Roundup Ready® soybean to be successfully adopted by farmers (Christoffoleti *et al*., 2008), which led to the development of resistant populations of hairy fleabane (Vargas *et al*., 2007; Lamego and Vidal, 2008). Another factor is the emergence of hairy fleabane seedlings at two periods during the year: one in autumn and another in spring, when temperatures reach 20°C, ideal for germination (Lazarotto *et al*. 2008). Thus, the occurrence and permanence of this weed in areas of soybean cultivation is common, serving as alternative host for insects and mites.

During the 2010/11 growing season, individuals of *N. simulans* were collected from *G. max* and *C. bonariensis* plants in soybean fields under no-tillage and weeded with hairy fleabane plants. Both the soybean crop and the weed are new hosts of *N. simulans* in Brazil.

From November 2010, fortnightly samples were taken in a commercial soybean field (6.8ha), in São Vicente do Sul, RS (29°43'58''S - 54°41'42''W). The crop was seeded on 11/25/2010 and harvested on 04/12/2011. The cultivar used was BMX Titan RR, sown in rows spaced at 0.45m and 28 plants/m^2. The observations were extended until the beginning of the growing season 2011/12, corresponding to 12 months of study. One hundred plants were collected randomly on each sampling date. Whole plants were bagged quickly (Byerly *et al*., 1978) to avoid insect escape and were removed by cutting close to the soil surface. Plants were then identified and stored in a refrigerator at 6°C for at least 6h to reduce insect mobility before counting, labelling and mounting for later identification. The weed plants sam-

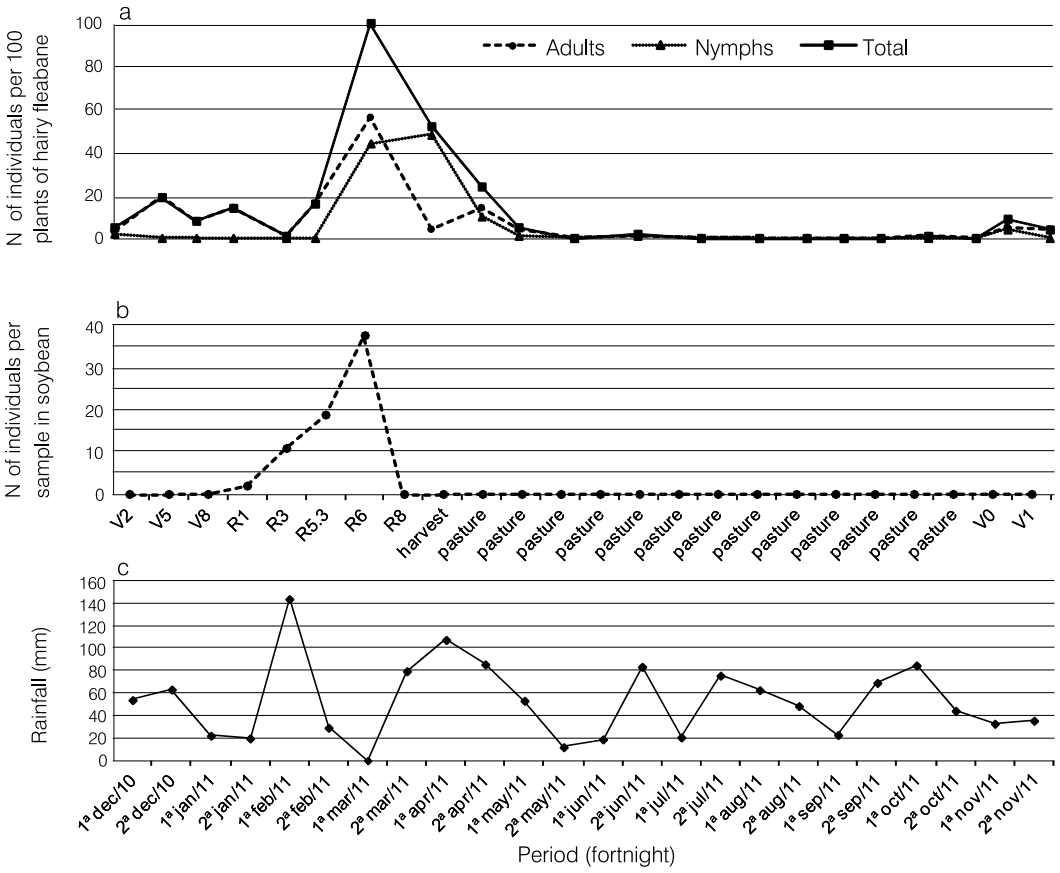

Figure 1. Populational fluctuation of *Nysius simulans* (Stål) (Hemiptera: Lygaeidae) on hairy fleabane (*Conyza bonariensis*) (a) and soybean (*Glycine max*) (b); and accumulated rainfall (mm) per fortnight (c).

pled were located inside the field and along the edges of the field. After the harvest of the soybean crop, hairy fleabane plants were collected along the edges of the field. For surveying the seed bug population on soybean, 50 samples at each sampling date with the beating cloth method (1m long) were performed. The samples of weed and on soybean were taken at random throughout the field at each sampling date. Rainfall data were obtained in the meteorological station of the Instituto Federal Farroupilha, Campus São Vicente do Sul.

The occurrence of *N. simulans* on hairy fleabane plants (Figure 1a) began to be observed from the first fortnight of November, at low populations (nine individuals per sample). In Argentina, the emergence of adults from hibernation sites extends from September through November (Aragón and Flores, 2006), similar to that observed in the present study.

Insect population began to increase from the second fortnight of February, with a peak population of juveniles and adults on the first and the second fortnights of March, respectively. In the latter two sampling dates, 100 and 52 individuals per sample were registered. This fact may be related to low volumes of rainfall accumulated in periods prior to assessments. In the second half of February, rainfall was only 29.6mm, while in the first half of March no precipitation was registered. The occurrence of the bug on hairy fleabane plants has been recorded until the second half of June, being found again only at the end of October. The pattern of population fluctuation of *N. simulans* on soybean plants was similar to that observed in hairy fleabane (Figure 1b). The largest populations coincided with periods of drought (Figure 1c), confirming the observations of Ashlock (1977) and Molinari and Gamundi (2010). From the reproductive period of the soybean crop, the abundance of *N. simulans* increased, and the largest population was observed between the second fortnight of February and the first fortnight of March, when the growth stages of the crop were R5.3 and R6, respectively. In the following evaluations, with the maturation and soybean crop harvest, high populations of *N. simulans* were found in hairy fleabane plants (Figure 1a) indicating that, at least, this plant species is an alternative host for the pest when soybean changes its host quality or in the absence of soybean from the field. During the period between June and early October, when *Lolium multiflorum* was cultivated in the area for pasture, the presence of *N. simulans* on hairy fleabane was not detected (Figure 1a). It also can be observed that only adults were found on the soybean plants (Figure 1b). However, on horseweed plants, nymphs and adults were found (Figure 1a). This indicates that horseweed is a preferred host for reproduction and early stages of the insect. These observations are in agreement with those of Aragón and Flores (2006), who reported that soybean is an alternative host of *N. simulans* and the highest occurrence of the insect occurs in areas with the presence of certain weeds.

The record of the occurrence of *N. simulans* on soybean and hairy fleabane plants in Rio Grande do Sul, coupled with its importance in soybean crops in Argentina, points to the need for monitoring their occurrence in Southern Brazil.

The damage caused by *N. simulans* on soybean was not assessed in this study. However, as the occurrence of this bug was recorded during the reproductive period of the crop, research about the possible damage to the crop during this phase is necessary. Furthermore, studies on the occurrence of *N. simulans* on other weed species and elsewhere would be important. Moreover, whereas populations of glyphosate resistant *Conyza* are increasing in Brazil, drought years are more frequent and the cultivation of soybean cultivars with indeterminate growth habit is more common, extending favorable conditions for the occurrence of Lygaeidae like *N. simulans*. Thus, in addition to surveillance on the occurrence of *N. simulans* in Southern Brazil, studies related to the use of soybean and weeds as places for food and shelter for this pest species are indispensable, as well as studies on the bioecology and soybean yield loss, in order to establish an integrated pest management program.

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