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# DETERMINATION OF SPATIAL DISTRIBUTION OF *SPHENOPHORUS INCURRENS* (COLEOPTERA: CURCULIONIDAE) USING GIS IN MORELOS, MEXICO

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*Sphenophorus incurrens* Gyll. (Coleoptera: Curculionidae) has a New World distribution, from Mexico to Panama (Champion 1909; Vaurie 1951; Anderson 2002). Host records include rice (*Oryza sativa* L.; Poales: Poaceae), sugarcane (*Saccharum* spp.; Poales: Poaceae) and *Leucaena* sp. (Zwaluwenburg 1926; Flores & Abarca 1958; Maes & Tellez 1988; Maes & O'Brien 1990 van). Distribution data for Mexico are localities from Chihuahua to Chiapas (Vaurie 1951, 1954; Flores & Abarca 1958). van Zwaluwenburg (1926) reported occasional outbreaks of *S. incurrens* in older sugarcane fields in Puebla and Veracruz. However, no author has provided specific distribution data and the sugarcane varieties affected.

Since 2010, reports began to register the presence of *S. incurrens* as a rootstock pest damaging sugarcane in some localities of the Mexican state of Morelos. To design a management program for this pest at the regional level, we determined the potential distribution of this weevil using Geographical Information Systems (GIS). GIS techniques have proven to be useful tools for analyzing spatial distribution of pests in sugarcane (Ganeshaiah et al. 2003). This tool has never been applied in Morelos to analyze the spatial distribution of sugarcane pests.

From Mar 2012 to Mar 2013, 107 sugarcane plots (each 1 ha) were randomly selected across the state. Within each plot, 5 sampling points were established; 4 in each corner and one in the center. One plant was extracted at each sampling point, including the original stem cutting and basal stem. Vegetative structures were dissected with a small curved knife and the number and development stage of the weevil was counted.

Coordinates and altitudes of all plots were taken with a handheld Global Positioning System (GPS) (eTrex Vista® Hcx, Garmin Intl. Inc., Olathe, Kansas, USA), using UTM units (Universal Transverse Mercator). Additional data (locality, sugarcane variety, crop age, and stage of the weevil detected) was recorded for each sampled plot. Field data was incorporated into an Excel© sheet and incorporated into IDRISIÓ ver. 17 (Clark Labs, Worcester, Massachusetts, USA).

For elaboration of prediction models, the weevil presence data were analyzed with Maxent (Phillips et al. 2006), and bioclimatic variables were obtained from WorldClim (Hijmans et al. 2005). The spatial resolution was 1 $km^2$.

*Sphenophorus incurrens* was collected in 100% of the sampled plots in 14 municipalities across Morelos. Rootstock damage was observed in fields with the varieties 'CP 72-2086', 'ITV 92-1424', 'MEX 69290', 'MEX 79-431' and 'MY 5514'. The age of the plantations affected was from 2 to 3 yr.

The distribution model calculated for *S. incurrens* included all known collected points and predicted the existence of this weevil in the sugarcane area cultivated in Morelos to the east on the border with state of Puebla (Fig. 1). This coincides with previous records of *S incurrens* in Puebla (van Zwaluwenburg 1926; Romero et al. 1996). The most important variable determining the potential distribution of the pest was the mean temperature of the coldest quarter. With the potential distribution of this rootstock pest now established, the next step is to determine if population levels exceed economic thresholds and estimate the rate of spread within regions where the sugar cane is at risk (Baker et al. 2000).

## SUMMARY

The potential distribution of the sugarcane rootstock, *Sphenophorus incurrens* Gyll. (Coleoptera: Curculionidae), in the Mexican state of Morelos was calculated using GIS techniques.

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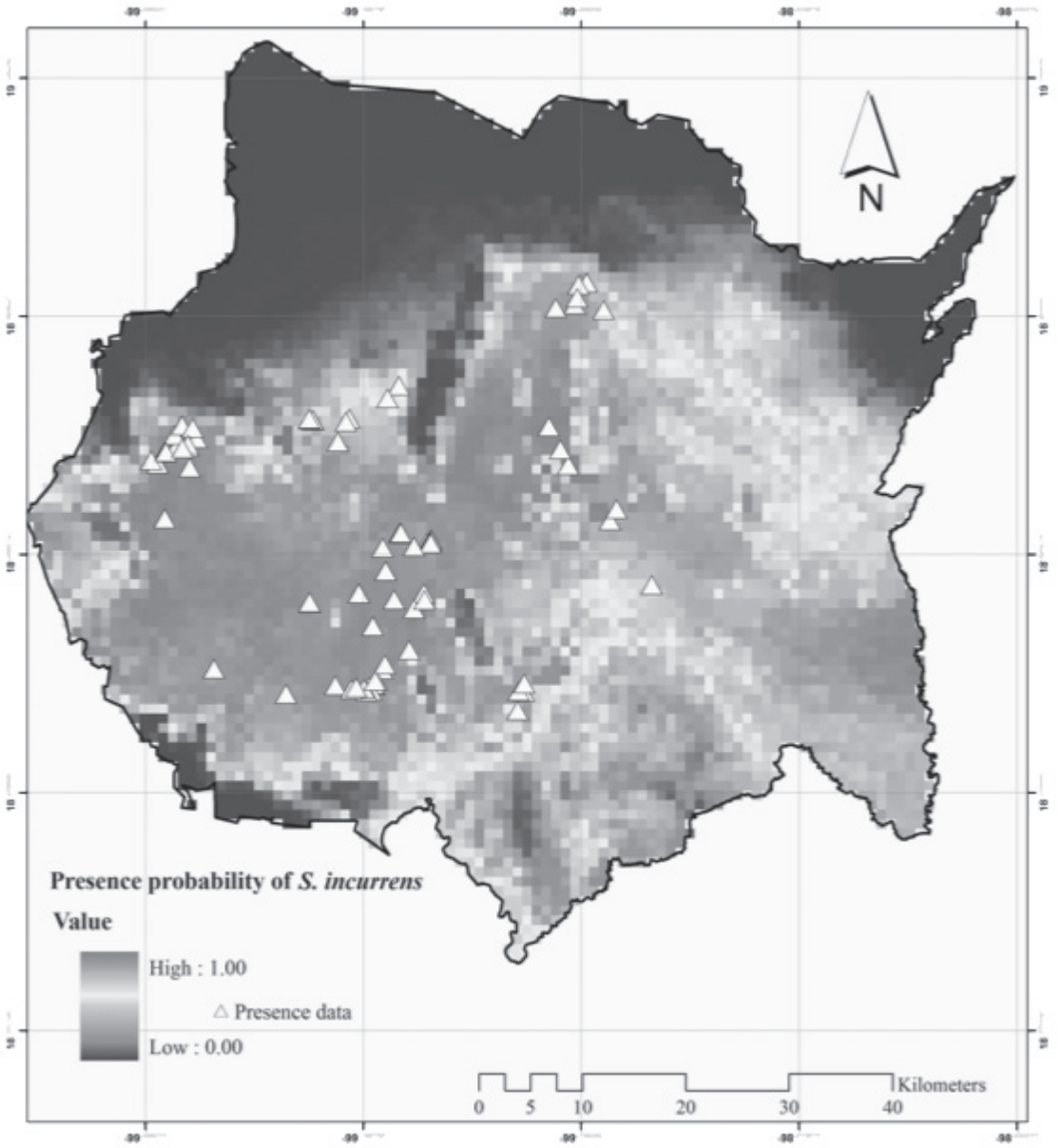


Fig. 1. The predicted distribution of *Sphenophorus incurrens* in the state of Morelos, Mexico. This figure in color is shown online as Suppl. Fig. 1 in a supplementary document at http://purl.fcla.edu/fcla/entomologist/browse.

Damage in all sampled fields was reported in 5 sugarcane varieties in the plots sampled.

Key Words: Sugarcane, rootstock pest, mean temperature

## Resumen

Se calculó la distribución potencial del picudo barrenador del tallo radical de la caña de azúcar, *Sphenophorus incurrens* Gyll. (e: Curculionidae), empleando técnicas SIG. El daño en campo fue ocasionado a 5 variedades de caña de azúcar.

Palabras Clave: Caña de azúcar, plaga del tallo radical, temperatura media

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