What is going on with the western bean cutworm in Mexico?

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Introduction

Western bean cutworm (WBC), *Striacosta albicosta*, is a North American native and emergent maize pest in the USA. However, there are only two reports of WBC as maize pest in Mexico. We have detected economic populations of WBC on landrace maize in southern Coahuila state, Mexico. There is an analogous report from near Mexico City. Maize is the base of Mexican food. Maize agriculture is different in the USA and Mexico. Bt-transgenic maize, pesticide use and other high technology on large areas prevail in the USA. In Mexico, maize landraces produced on small areas (i.e. 2 acres) and receiving no pesticides prevail, with additional areas producing hybrid seed maize. Because growing transgenic maize is prohibited in Mexico, selective pressures on WBC are very different between these two countries. The WBC populations at southern Coahuila are likely to be shaped, at least partially, by factors like plant phenology and interactions with other caterpillar pests present on maize ears (fall armyworm and corn earworm).

Distribution of WBC, Striacosta albicosta in Mexico.

WBC moths are broadly distributed across the USA and Mexico (Figure 1).

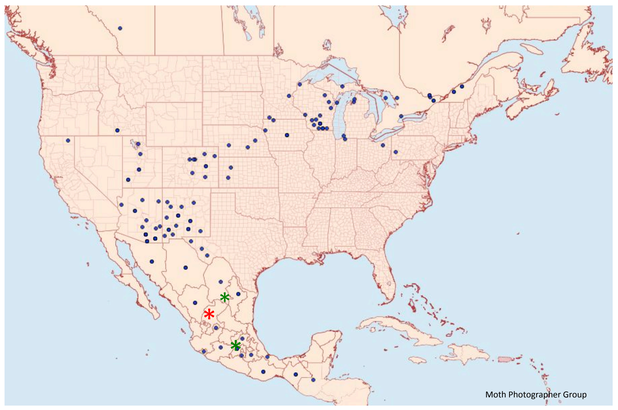

Figure 2. Comparison of WBC larvae from Saltillo, Mexico (left) and several stages from Indiana (right; photo Purdue Univ.)

Figure 1. Collecting sites for *moths* of the WBC in the USA and Mexico. * = The two economic WBC larval infestations on maize reported in Mexico; the northernmost one is Coahuila state; the one further south is near Mexico City. *Economic infestations of larval WBC on dry beans, *Phaseolus vulgaris*, in Zacatecas, Mexico.

There are only two reports of *Striacosta albicosta* in Mexico and no comprehensive reports on its economic damage on maize in Mexico. This should be due to its rarity as maize pest there (see below). One report is near Mexico City at Xochimilco (Pacheco-Marquez et al. 2014), reporting an infestation of WBC on maize ears (Figure 1), at about 2500 m elevation; there, WBC was also more abundant than corn earworm, *Helicoverpa zea* (CEW); fall armyworm, *Spodoptera frugiperda* (FAW) was absent. In October 2013, WBC infested a maximum of 27% of corn ears there. The other report is at Huachichil Coahuila (Sanchez-Peña et al. 2016) (Table 1). Misidentifications are very likely with fall armyworm.

Economic status on dry beans in Mexico

In this decade WBC has become an emergent primary pest of dry beans in the state of Zacatecas, Mexico, (Figure 1) the main bean-producing state in the country (Medina-Garcıa and Mena-Covarrubias 2014).

Interactions with fall armyworm and corn earworm larvae-Displacement hypothesis

FAW and CEW are usually present at the same maize fields along with WBC (Figure 3). FAW and CEW are very aggressive and kill other caterpillars with ease. However, FAW is cold-intolerant, and CEW enters diapause and stops reproducing by late fall. On the other hand, WBC are non -aggressive and can possibly coexist intraspecifically on the same ear. The presence of WBC should be influenced by these interactions (Displacement Hypothesis; see Summary).

Pheromone trapping in Northern Mexico

Twenty Jackson traps lined with glue and synthetic pheromone lure were set up on a 100 km, variable altitude transect going from 800 to 2500 m, from Rinconada, Nuevo Leon, to Huachichil, Coahuila. They were set up on late summer. Sites are in Figure 4. Huachichil is the site of original collecting of the moths. WBC has been found there on late season corn (October-November) on very ripe ear, i.e. Physiological Maturity (R6).

Figure 3. Comparison of WBC larvae from Saltillo, Mexico: top left, FAW; Right, WBC; bottom, CEW.

Figure 4. Sites of pheromone trap and larval collecting.
Pheromone: 1, Rinconada, Nuevo Leon; 2, Saltillo, Coahuila; 3, Huachichil, Cohauila.
Larval collecting: 4, Villa de Reyes, Guanajuato and at Saltillo and Huachichil sites.

Figure 5 . Left, Jackson trap lined with glue and synthetic pheromone lure. Right, Yellow striped armyworm, *Spodoptera ornithogalli*, captured in traps lured with WBC pheromone.

The traps lured with WBC sex pheromone did not capture WBC moths (Figure 5). The lures captured exclusively yellow stripped armyworm, *Spodoptera ornithogalli* Cross-capture of this species on WBC pheromone lures has been reported in Ontario, Canada (Baute et al. 2017)

Larval collecting of WBC on maize and beans At northern Mexico

Locality, date and Crop	No.of caterpillars collected or ears examined Number and Percent WBC
Huachichil, Coahuila, 23 August 2015, landrace maize	8 WBC larvae in 65 ears (12% infested ears)
Huachichil, Coahuila, 28 August 2015, landrace maize	19 WBC larvae in 90 ears (21% infested ears)
Huachichil, Coahuila, 23 and 28 August 2015, dry bean	20 plants with >15 green pods each ; no larvae observed
Huachichil, Coahuila, 25 October 2016 landrace maize	300 ears and 50 late instar WBC (18% infestation)
Huachichil, Coahuila, 5 October 2017 landrace maize	5 WBC larvae on 5 out of 133 corn ears; 100% remaining ears infested with CEW or FAW.
Villa de Reyes, Guanajuato. August 6-7, 2017, Dough stage hybrid maize	150 ears examined. Zero WBC. Only FAW and CEW.
Saltillo, Coahuila 28 September 2017, Dough stage hybrid maize	250 larvae from ears. Zero WBC, all FAW and CEW.
Huachichil, Coahuila 10 October 2017 . Milky stage landrace maize.	6 WBC out of 145 caterpillars from ears (9%). The rest, FAW and CEW
Saltillo, Coahuila 16 October 2017 . Milky stage hybrid maize.	One WBC larva out of a total of six larvae collected (18%), the rest FAW and CEW.
Saltillo, Coahuila 19 October 2017 . Milky stage hybrid maize.	Collected 108 worms; six WBC (6%), and the rest FAW and CEW. About 5% WBC.

Summary

1. The WBC appears to be a rare pest of maize in Mexico.
At Saltillo, Mexico, after >15 years of collecting caterpillars from maize ears, WBC had not been collected prior to 2017.
2. Economic infestations of WBC have been reported only at two sites of Mexico; near Mexico City and near Saltillo.
3. WBC can be misidentified as FAW.
4. Pheromone traps captured only *Spodoptera ornithogalli.*
4. In parts of northern Mexico, WBC is present at sites above 1600 m on maize. Prevalence is usually low (1-20% of collected larvae).
5. Fall armyworm and corn earworm are usually much more abundant (infesting often 100% ears). Aggressive interactions with these widespread, facultatively predatory caterpillars can mediate WBC populations in Mexico. In late fall, when kernels are ripe and hard, they are less atractive to CEW and FAW and therefore WBC can move in and colonize this resource (displacement hypothesis).

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