SPATIAL AND TEMPORAL PATTERNS OF BOLL WEEVILTRAP CAPTURES IN NORTHEASTERN MEXICO

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Abstract

Preliminary results of an extensive trapping study consisting of 18 sites in the Mexican state of Tamaulipas and adjacent areas of Nuevo Leon and San Luis Potosi states are reported. Eighteen trapping sites were established to determine spatial and temporal patterns of boll weevil response to pheromone traps in northeastern Mexico. Sites were established in the vicinities of both major cotton production systems of Tamaulipas state, the northern subtropical system and the southern tropical system, as well as at sites distant from cotton production. Trap captures were highest at sites near cotton producing regions, but weevils were captured at all sites. Patterns of trap capture were relatively distinct at sites near cotton, with peaks of capture suggesting dispersal from a maturing crop. Patterns of capture at sites more distant from cotton tended to be less distinct, but peaks often appeared to align with those of sites near cotton. Low but consistent weevil captures at sites far removed from cotton production suggest the potential for a persistent if low level interchange between weevil populations of all cotton producing regions of Tamaulipas.

Introduction

In February of 1995 we established an extensive trap line in northeastern Mexico in anticipation of informational needs of the Boll Weevil Eradication Program scheduled to initiate operations in the Lower Rio Grande Valley of Texas in the spring of the same year. Although the dispersal abilities of the boll weevil have been well demonstrated (e.g., Beckham and Morgan 1960, Davich *et al*. 1970, Johnson *et al.* 1975, 1976, Lukafahr *et al*. 1994), potential for reinfestation of eradicated areas of South Texas from Mexican cotton production regions has not been thoroughly investigated. Guerra (1988) used marked and released weevils to examine the potential for movement of weevils between the northern cotton production region of Tamaulipas state, Mexico, and the Texas Lower Rio Grande Valley, but did not examine the possibility of weevil immigration from the southern production area. Jones *et al*. (1992) examined trap capture patterns and pollen content of weevils in Tamaulipas, but restricted trapping activities to the central part of the state. We surmised that the temporal relationships between northern and southern Tamaulipas cotton production systems may facilitate exchanges of weevil populations between these areas. Our objective was to determine the spatial and temporal patterns of boll weevil response to pheromone traps in the state of Tamaulipas to gain insight into the potential for population interchanges between these regions.

Materials and Methods

Eighteen trapping sites were established across the state of Tamaulipas and adjacent areas of Nuevo Leon and San Luis Potosi states during February and March of 1995 (fig. 1) . Cotton production in the state of Tamaulipas is primarily concentrated in two regions. The northern production region includes the Lower Rio Grande Valley of Tamaulipas and the region east of San Fernando, and is characterized by 5,000 to 50,000 ha of cotton each year, produced on the same calendar season as cotton in the Lower Rio Grande Valley of Texas (planted in February and March, harvested in August and September). The second production system is located in southern Tamaulipas in an area roughly delimited by El Limon, Ciudad Valles, Tampico, and Gonzalez. Timing of this production system is dependent upon monsoonal rains, with planting commencing in June and July and harvest occurring in December and January. Sites were located so that each of these cotton production regions was represented, as well as the extensive, noncotton producing areas of Central Tamaulipas.

Three traps were mounted about 1 m above ground level on 1.9-cm diameter metal pipes at each site. Traps at a site were separated by approximately 50 m. Arrangements were made for local personnel to service and bait the traps. Traps were serviced twice weekly on consecutive days and captured weevils were placed in labelled vials filled with Kahle's solution. Pheromone baits were replaced biweekly and vials were retrieved from the trapping sites monthly. Weevils captured in the single day interval were counted and dissected to determine mating, reproductive, gut, and fat body conditions. Weevils captured during the 6-d interval were counted and sexed. We report here only the totals of the 6-d captures.

Results and Discussion

Trap captures tended to be greatest, and capture patterns most distinct, at sites close to cotton producing areas (Valle Hermoso and San Fernando, fig. 2; Gonzalez and El Limon, fig. 6; Ebano, Valles, and Cuauhtemoc, fig. 7), although substantial numbers of weevils were captured at some sites relatively distant from cotton (Mendez, fig. 2; Abasolo, fig. 3; Aldama, fig. 6). At least some weevils were captured at all sites regardless of the proximity to cotton. The most distant site from cotton, General Teran, is approximately 90

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mi. from the nearest cotton, and about 150 mi. from the nearest cotton that is situated upwind of that site.

Peak trap captures at the northernmost sites (fig. 1) tended to occur during the period spanning normal cotton crop maturity, harvest, and destruction in that area. However, we cannot explain the absence of a capture peak in the fall of 1996 at San Fernando. Peak trap captures at sites within or adjoining the southern production region (figs. 6, 7) also tended to occur at the end of the respective cotton production season. Trap capture patterns tended to be less distinct at sites distant from cotton (General Teran and Villagran, fig. 3; Soto La Marina, fig. 4; fig. 5; Aldama, fig. 6). However, when patterns were distinct (Abasolo, fig. 3; La Pesca and Casas, fig. 4) they tended to be similar to those of the northern production region in 1995, but not in 1996. Alignment of these peaks with those of the northern production region are likely coincidental, unless boll weevils are capable of migrating long distances in short time intervals against or across prevailing wind patterns. It seems more likely that trap captures at noncotton sites were produced by a more extended dispersal of weevils from cotton producing areas.

Collection of additional data is planned and should aid in interpretation of trap capture patterns. Also, results from dissections should be helpful because preliminary indications are that weevils captured at noncotton sites tend to be mated, nonreproductive, and poorly fed, while many of the weevils captured near cotton producing areas tend to exhibit reproductive development and evidence of substantial recent feeding.

Presence of alternate reproductive hosts of the boll weevil in the noncotton producing regions has not been documented, and reproductive and gut conditions of weevils captured at those sites seem to suggest the absence of such hosts. If these hosts are absent, our trap captures from noncotton producing sites reconfirm the substantial powers of the boll weevil to disperse and may indicate the potential for a persistent if low level interchange between boll weevil populations of all cotton producing regions of Tamaulipas.

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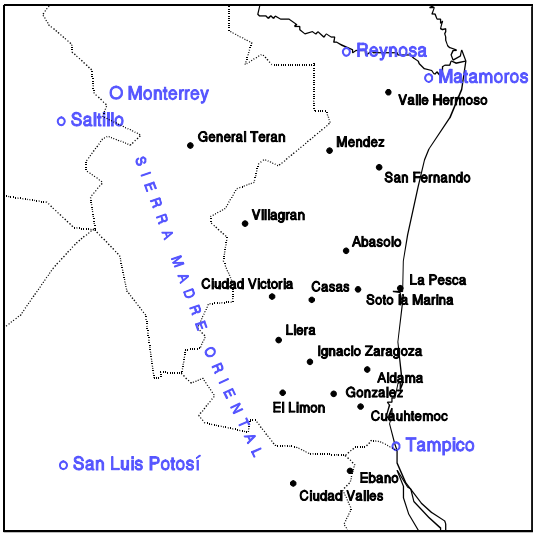


Fig. 1. Trapping sites (●) in trapping survey of boll weevil populations in northeastern Mexico.

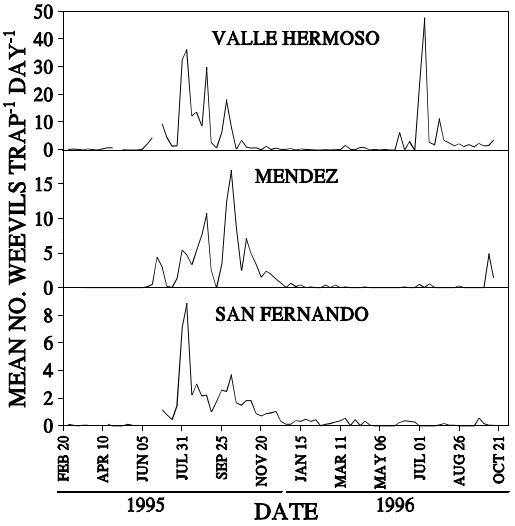


Fig. 2. Boll weevil trap captures from trapping sites near northern Tamaulipas cotton production areas.

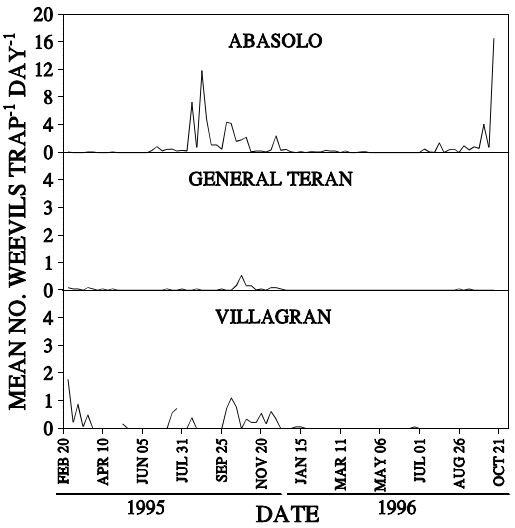


Fig. 3. Boll weevil trap captures from trapping sites in noncotton producing areas of Central Tamaulipas and eastern Nuevo Leon.

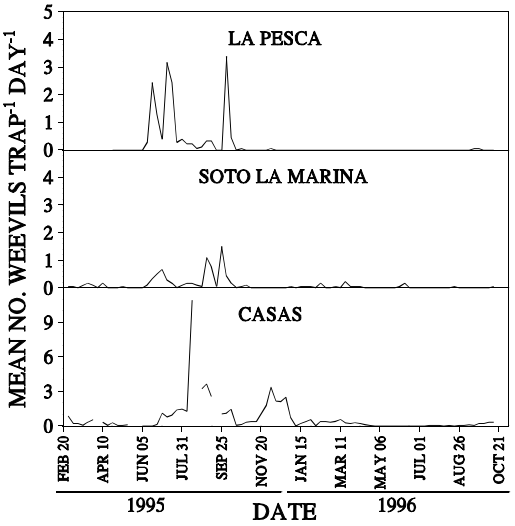
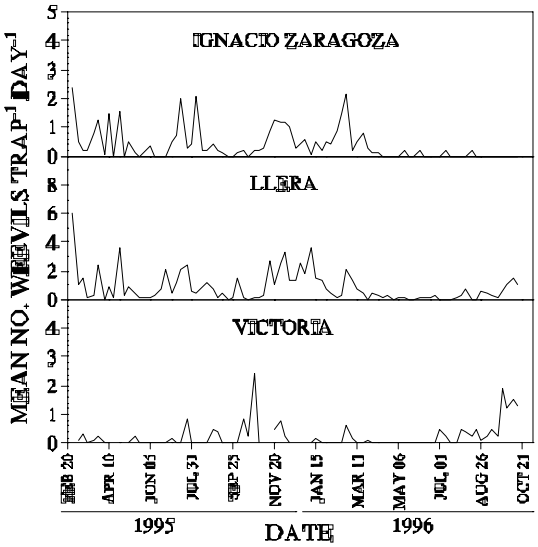


Fig. 4. Boll weevil trap captures from trapping sites in noncotton producing areas of Central Tamaulipas.



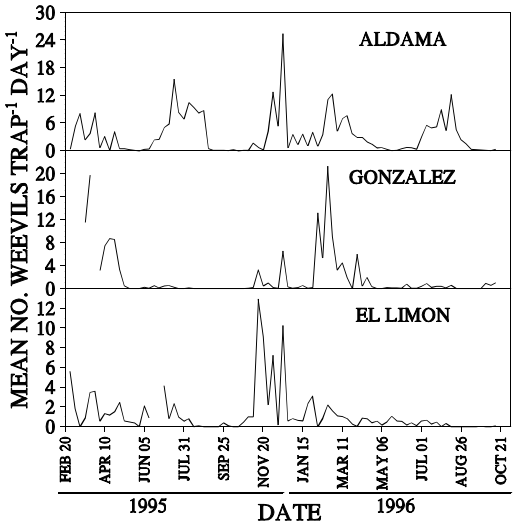


Fig. 6. Boll weevil trap captures from trapping sites near southern Tamaulipas cotton production areas.

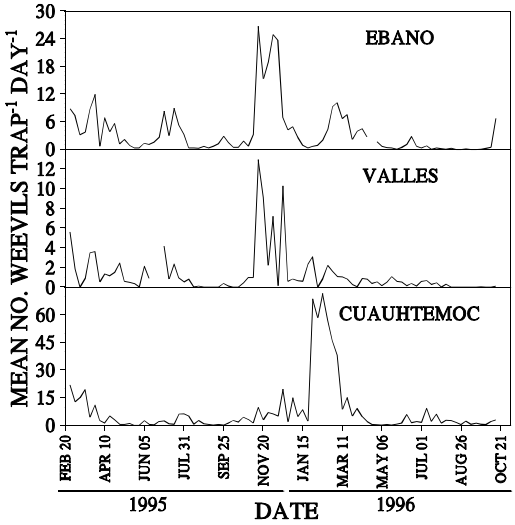


Fig. 7. Boll weevil trap captures from trapping sites near southern Tamaulipas and eastern San Luis Potosi cotton production areas.