USING BUFFER CROPS TO MITIGATE LYGUS MIGRATION IN SAN JOAQUIN VALLEY COTTON

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Abstract

Blackeye beans (*Vigna sinensis*) were evaluated for its host preference by *Lygus hesperus*. Two years of replicated, small plot field trials indicated *Lygus* preferred blackeye beans over cotton for reproduction and residency. A field demonstration was established in 1997 on a commercial scale in which a strip of blackeye beans was placed on the edge of a cotton field. The beans resulted in higher *Lygus* populations then cotton but adjacent cotton was not threatened with excessive fruit loss. These trials demonstrated the practicality and value of buffer or catch crops in mitigating *Lygus* migration.

Background

Lygus hesperus is a key insect pest of cotton in the San Joaquin Valley of CA. Management of this pest after it has migrated in cotton requires the application of broad spectrum insecticides and resulting in the reduction of natural enemies and potential disruption of secondary pests. Such disruption can lead to multiple applications, excessive production costs, and destabilization of the cotton ecosystem.

Many San Joaquin Valley producers are recognizing that *Lygus* must be managed before it comes into a cotton field. IPM practices in cotton have emphasized management of *Lygus* sources to prevent cotton as acting as a sink for this pest. For example, in the late 1960's, strip cutting alfalfa was proposed to maintain preferred habitat for *Lygus* (Stern *et al*, 1967). To prevent migration of *Lygus* from safflower to cotton, *Lygus* phenology prediction was introduced to time insecticide applications in safflower (Sevacherian and Stern, 1977). Both techniques are still widely used in the San Joaquin Valley in varying degrees.

The use of alfalfa strips in cotton fields was introduced in the 1960's as an alternative method to broad spectrum insecticide applications. (Stern *et al*, 1969). Alfalfa is preferred over cotton and provides an alternative host. Alfalfa could be used as refuge for natural enemies and *Lygus* or it could be used as a trap crop to minimize the area to be treated. Widespread adoption of this practice did not occur probably because of the difficulty in maintaining production practices for two such different crops.

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Lygus is the key pest on blackeye beans in the San Joaquin Valley. In the San Joaquin Valley, many cotton growers also grow beans and have practical knowledge of cultivation and production of this crop. This crop is much more similar to cotton in its production demands than alfalfa. For example, similar planting equipment, row spacing, planting dates, and irrigation schedules can be used. Our trials were designed to evaluate blackeye beans over cotton as a preferred alternate host for *Lygus*.

Methods and Material

Small Plot Trials

To determine the preference of beans over cotton, replicated trials were established at Kearney Agricultural Center during 1995 and 1996. The trials were located adjacent to alfalfa fields which were swathed every 28 days. Plots were four rows by 300 feet and randomized in a complete block design, replicated three times. In addition to cotton (cv Maxxa) and blackeye (cv CB 46), lima bean (cv Henderson) was also used in 1995 and a crop mix of blackeye, sorghum, and sunflower in 1996. Results will be presented only for cotton and blackeye beans. Plots were sampled twice weekly in 1995 and weekly in 1996 using a DeVac suction sampler and taking five 20 second samples through the length of the plot. *Lygus* and natural enemies were counted in lab after being subjected to -20 F° for 30 minutes. *Lygus* were sexed and classed by life stage.

Field Demonstration

A large scale demonstration was conducted in 1997. The location was in West Fresno County near Five Points, CA. The field was a quarter section of Maxxa cotton surrounded on the upwind sides by cotton. The prevailing winds during the summer are from the northwest. A strip of blackeye beans (CB46) 30 feet wide was planted on April 15, 1997 simultaneously with the cotton. The bean strip occupied the southern quarter mile of the western field edge and the north quarter mile of the western edge was planted to cotton (Figure 1). Weekly samples were collected from the beans and cotton using a modified yard vac. Rows 1, 5, and 15 adjacent to beans and cotton strip were sampled as well as samples from beans and cotton within the strip. *Lygus* and natural enemies were counted in lab after being subjected to -20 F° for 30 minutes. *Lygus* were sexed and classed by life stage. Weekly cotton plant monitoring was done. The beans were managed identically to the cotton except no insecticides or miticides were applied. No *Lygus* treatments were required but imidocloprid was applied in June for aphids followed by a second application of Lorsban and Dibrom in July.

Results

Lygus populations were greater in blackeye beans than cotton during the two year trial at Kearney Agricultural Center (Figures 2 and 3). In 1995, significant differences between cotton and blackeye beans were found on six dates

for nymphs and ten times for adults out of 13 sampling dates. The first difference was noted within days after the initiation of bloom In 1995, *Lygus* populations in blackeye beans were 10 times greater than in cotton and in 1996, 7 times greater in beans than cotton. This difference was due largely to a lack of reproduction in cotton as compared to beans (Figures 2 and 3).

The demonstration strip successfully attracted *Lygus* in greater numbers than the companion area to the north (Figure 4). Adults and nymphs were at much higher densities in the beans but did not spill over far into the cotton. Beyond the adjoining row, no difference can be seen between the north portion (no beans) and the southern portion adjacent to the beans. This is reflected in the fruit retention of the first position on the first five fruiting branches ("bottom five") which indicates no difference in feeding pressure in rows near the beans compared to cotton located distally from strip (Figure 5).

Discussion

The concept of using strip, buffer, trap, or catch crops has merit but has waxed and waned over the years (Walker and Smith, 1996). For *Lygus*, the use of alfalfa strips were recommended during the late 1960's as an alternative to disruptive broad spectrum insecticides. Limited adoption of the method occurred but use declined as bollworm declined in importance and *Lygus* monitoring improved. At least three drawbacks to the use of alfalfa can be identified:

1) alfalfa has different production demands compared to cotton including irrigation and fertilization needs
2) the necessity to cut the alfalfa to keep it in a vigorous growing state.
3) planting dates which occur well before cotton

In order for this concept to become accepted, buffer crops must be practical and fit well within existing production practices. Blackeye beans have very similar production requirements as cotton. The demonstrations in 1997 showed that growers could place beans on the borders of fields and maintain them in good condition.

Lygus populations in 1997 were light in the demonstration area and the bean strips were not treated. Had the population increased to a sufficient level, the strips and adjoining cotton could have been treated. However, based on *Lygus* densities proximal to the beans, populations did not spill over during the critical fruiting period. This is validated by the excellent retention of first position fruit on the first fruiting branches. Retention in the cotton is well within expected ranges from all areas (Kerby and Hake, 1996) and exceeds expectations in most cases.

Blackeye beans can be integrated into existing cotton culture with little effort or change in equipment. Placing 30-40 ft wide strips on cotton field borders on the side most likely to receive migrating *Lygus* can slow field wide invasion. This stalling tactic can allow for the population to be contained in a concentrated area and would limit the amount of area requiring broad spectrum insecticides. Such action would reduce costs and preserve natural enemies in the remaining portion of the field.

Acknowledgments

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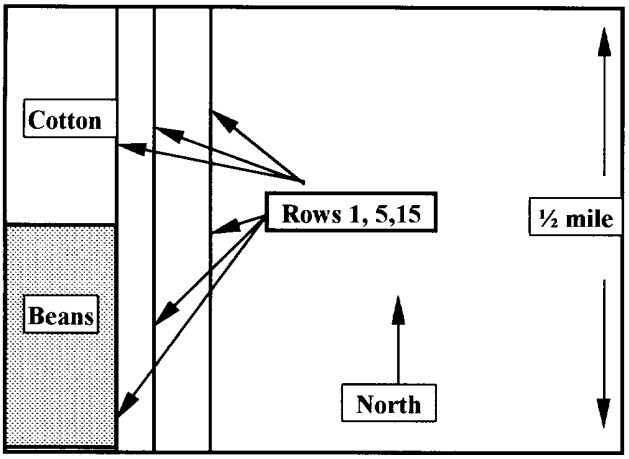

Figure 1. Field demonstration plan for blackeye bean buffer strip, 1997. Cotton and beans on west edge were sampled as were rows 1, 5, and 15 in the main body of the field. Drawing not to scale.

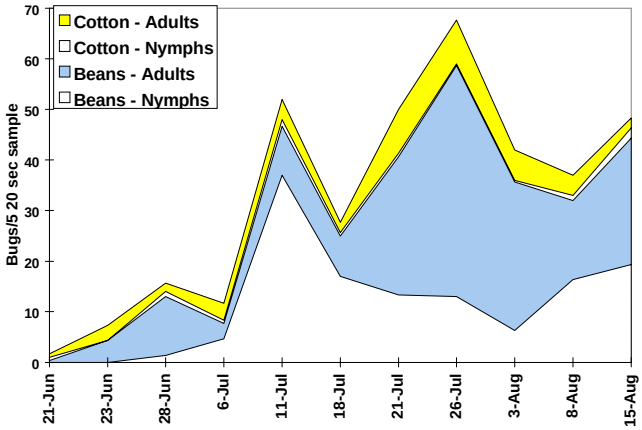

Figure 2. *Lygus* populations in blackeye beans and cotton planted adjacent to each other. Data from Kearney Agricultural Center, 1995.

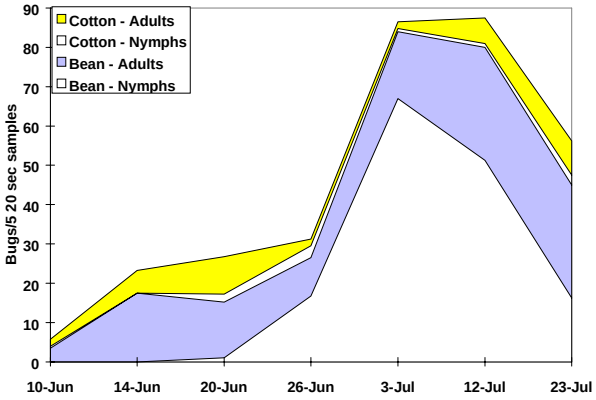

Figure 3. *Lygus* populations in blackeye beans and cotton planted adjacent to each other. Data from Kearney Agricultural Center, 1996.

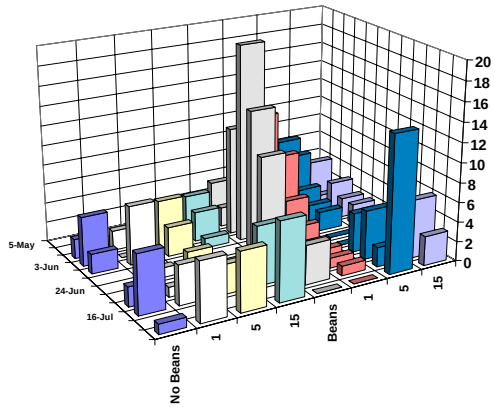

Figure 4. *Lygus* populations in cotton and adjacent blackeye strip , 1997.Data are bugs per 50 paces using a vacuum sampler. Numbers 1, 5, and 15 refer to rows adjacent to strip.

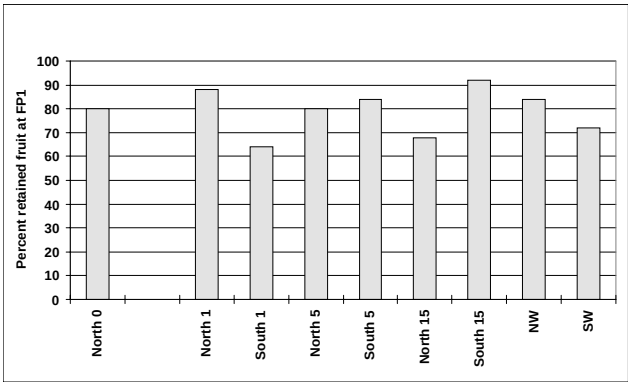

Figure 5. Fruit retention of cotton located adjacent and distal from blackeye bean strip. North refers to rows not adjoining beans, south refers to rows adjoining beans. NW and SW are data from areas of field far removed from border.