# ECONOMIC IMPORTANCE OF *LYGUS* SPP. IN COTTON

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## Abstract

The importance of *Lygus* spp. in cotton has been and still is a much debated issue. Factors such as cotton variety, fertilization and host plant abundance can impact population levels and the severity of damage inflicted by a *Lygus* infestation. Direct losses to the crop in the form of yield reduction and delayed maturity may result from damage to squares between first square and early bloom. In addition, early season management actions taken against *Lygus* may impact the abundance of other pests and thereby result in further losses. In 1996, *Lygus* infested approximately 46% of the total harvested acres with the estimate of direct losses being $11 per acre.

## Discussion

There has been much disagreement on the importance of *Lygus* spp. in cotton. Importance is related to variations in annual populations; but severity of damage often extends beyond population estimates in the field. Factors such as the number of host plants available, cotton variety, stage of cotton development, soil type, seedling disease, fertilization, planting patterns, planting date and presence of other early season pests may impact population densities and the severity of damage caused by *Lygus*. (Gilliland, 1981; Oakman, 1981). In addition, the impact of *Lygus* on cotton production may be clouded by the fact that cotton plants normally shed fruit, even in the absence of pests, and by the plant's ability to compensate for loss fruit. Fruit shedding is often observed in the field, but it can be difficult to partition the losses among the possible causes (e.g. plant carbohydrate stress or *Lygus* or other pest injury).

Further adding to the difficulty in determining the economic impact of *Lygus* is the fact that each square on the cotton plant does not contribute equally to yield. Bolls from first-position squares have been found to contribute 66 to 75% and bolls from second-position squares 18 to 21% of total yield of modern cultivars with plant spacing of thee to four per row foot (Jenkins et al., 1990 a,b; Kerby et al., 1987). Also, the value of individual fruiting branches can vary with cultivars of different maturities. This is illustrated in Table 1 with a comparison of DES119, representing early maturing cultivars, and DP 90, representing late maturing cultivars (Jenkins & McCarty, Jr., 1995). Total value of the lint was $1,121 and $1,158 for DES 119 and DP 90, respectively. These values are not significantly different. However, DES 119 accumulates lint value at a faster rate than DP 90. It makes its lint at the lower and middle nodes of the plant whereas DP90 makes its lint at the middle and higher nodes. Since these two cultivars mature different amounts of squares/fruits at different nodes, the severity of losses from a *Lygus* infestation occurring at the same time would also vary.

### Direct Losses

*Lygus* can have an impact on cotton production in two ways. First, experimental evidence confirms that *Lygus* has the capacity to cause damage to cotton from emergence through the early lint development stage of the last harvestable bolls.

However, it is during the period between first square and early bloom that cotton is most susceptible to economic damage from *Lygus* (Tugwell, et al. 1976). High populations of *Lygus* (>1 bug per foot of row) during the first 6 weeks of squaring have the capacity to reduce yield or delay maturity. Damage is caused by the feeding on small squares. This usually results in "blasted squares" that abort within a few days, leaving an abscission scar.

Feeding on larger squares may result in the abortion of the squares, but more commonly they remain on the plant. The effect of this type of damage is related to the percent of anthers that are damaged. When less than 30%, there is little or no effect. However, as the level of damage increases there is an increase, in percent of malformed bolls and the number of bolls shed (Pack and Tugwell, 1996).

*Lygus* will also feed directly on small bolls resulting in a dull, dark colored, slightly sunken lesion on the outer boll wall. Again, the extent of the effect of such damage appears to depend on the age of the boll when damaged and the intensity of feeding. Small to medium sized bolls that have been heavily damaged may eventually abscise or fail to open. On larger bolls with more developed lint, *Lygus* feeding rarely destroys the entire boll, but may result in damaged seed, discolored lint and reduced weight of the harvestable lint (Pack & Tugwell, 1976). Although *Lygus* has the capacity to damage bolls, and high levels of this type of damage will obviously affect yield, most studies have shown no yield effects due to infestations during late season.

The second type of direct loss occurs from excessive loss of fruit and of apical growing points. This type of damage often results in secondary vegetative growth. A multi-branched plant with little fruit is produced which is sometimes referred to as "crazy cotton". Loss of fruit can also stimulate vegetative growth that may result in tall, whip-like plants. Economic impact of such damage is questionable, especially when a small percentage of plants is affected, as some studies have found no effects on yield from this type of injury (Tugwell, et al. 1976).

Each year scientists attempt to document the direct losses attributed to *Lygus* in the Insect Losses report at the

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Beltwide Cotton Conferences. The 1996 report showed that *Lygus* infested approximately 46% of total harvested cotton acres in 1996 (Table 2). Ranking third behind boll weevil and the bollworm/budworm complex in importance, *Lygus* was responsible for losses totaling $11 per acre. In comparing regions of the belt, the Mid-South and the Far West typically sustain more damage form *Lygus* than the Southeast and Southwest (Table 3). However, the Blacklands region of Texas and some parts of Alabama often experience *Lygus* infestations equaling those found in the Mid-South.

**Indirect Losses**

Early season pest management decisions can have season long consequences of significant economic importance. *Lygus* is recognized as a key pest of cotton. As such it often requires treatment during the early part of the growing season when insecticides might not otherwise be used. Applications of insecticides at this time destroy important beneficial insects that would otherwise aid in suppressing populations of other pests and reduce the likelihood of having to treat for them, at least until later in the season. Potential damage caused by these pests and the cost of their control can indirectly add to losses attributable to *Lygus* spp.

## References


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Table 1. Dollar value per acre per fruiting site on DES 119, an early season cultivar and DP 90, a full season cultivar. Mean of two years. (from Jenkins & McCarthy, 1995)

| DELTAPINE 90 | | | | DES 119 | | |
|---|---|---|---|---|---|---|
| POS 3 | POS 2 | POS 1 | NODE | POS 1 | POS 2 | POS 3 |
| | | $ 3 | **21** | | | |
| | | $11 | **20** | | | |
| | $1 | $21 | **19** | $3 | | |
| | $3 | $32 | **18** | $8 | | |
| $1 | $8 | $47 | **17** | $22 | | |
| $1 | $12 | $65 | **16** | $33 | $ 3 | |
| $2 | $15 | $73 | **15** | $40 | $ 8 | |
| $2 | $21 | $79 | **14** | $62 | $10 | $ 1 |
| $2 | $25 | $86 | **13** | $80 | $12 | $ 1 |
| $4 | $26 | $79 | **12** | $84 | $14 | $ 2 |
| $3 | $24 | $69 | **11** | $85 | $22 | $ 3 |
| $4 | $20 | $77 | **10** | $80 | $33 | $ 3 |
| $5 | $22 | $75 | **9** | $92 | $31 | $ 1 |
| $1 | $16 | $68 | **8** | $103 | $32 | $ 2 |
| $2 | $9 | $38 | **7** | $93 | $29 | $ 3 |
| $1 | $3 | $14 | **6** | $47 | $16 | |
| | | $ 1 | **5** | $ 5 | $ 3 | |

Table 2. Estimated 1996 Cotton Insect Losses (from 1997 Beltwide Cotton Production Research Conference)

| Pest | Acres Infested (%) | Acres Treated (M) [1] | Control Cost (A) [2] | Revenue Lost [3](A) | Total Losses [3](A) |
|---|---|---|---|---|---|
| Boll Weevil | 55 | 4.2 | $8 | $13 | $21 |
| Boll/ Budworm | 79 | 6.3 | $13 | $16 | $29 |
| *Lygus* | 46.0 | 3.1 | $6 | $5 | $11 |
| Thrips | 71 | 1.9 | $2 | $3 | $5 |
| Aphids | 71 | 2.3 | $1 | $3 | $4 |

[1] In Millions
[2] Per Treated Acre
[3] Per Total Harvested Acre; 480 lb Bale; $0.70/lb

Table 3. Estimated 1996 *Lygus* Losses (from 1997 Beltwide Cotton Production Research Conference)

| Region | Acres Infested (%) | Acres Treated (M) [2] | Control Cost (A) [3] | Revenue Lost [4] (A) | Total Losses [4] (A) |
|---|---|---|---|---|---|
| Far West [1] | 58 | 0.64 | $15.04 | $16.03 | $31.07 |
| Southwest | 9 | 0.05 | $0.07 | $0.29 | $0.36 |
| Mid-South | 74.0 | 2.14 | $10.08 | $9.84 | $19.91 |
| Southeast | 50 | 0.21 | $0.26 | $0.87 | $1.13 |

[1] Arizona & San Joaquin Valley in CA
[2] In Millions
[3] Per Treated Acre
[4] PerTotal Harvested Acre; 480lb/Bale; $0.70/lb