Some Aspects of the Life History and Biology of the Green Mirid *Creontiades dilutus* (Stal) in Cotton

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Introduction

The green mirid , *Creontiades dilutus* (Stal) is one of the early season pests of cotton. This insect was identified in the late 1970's and can cause considerable damage to cotton seedlings and squares resulting in significant delays in growth and maturity of the plant (Bishop 1980; Adams and Pyke, 1982). Currently green mirids are suppressed by synthetic insecticide sprays targeted for the control of *Helicoverpa* spp. in commercial cotton. With the proposed introduction of Bt cotton, green mirids are going to be very important since chemical sprays against *Helicoverpa* spp. are expected to be reduced (Fitt, pers. communication). Despite the importance of the green mirid within the Australian cotton industry, there is no detailed information on the life cycle and general biology of this insect. A detailed biological information can provide a basis for ecological studies and the development of a sustainable pest control system. We report here the life cycle, oviposition behaviour, and the pest status of the green mirid.

Life cycle of the Green Mirid

In order to study the life cycle and biology of the green mirid, a mass rearing technique for consistent production of large numbers of the insect was developed using beans and cotton.

Green mirid lays banana-shaped eggs, about 1.6mm in length. The only visible part of the egg is a kidney-shaped egg cap on top which is used for respiration. The eggs are laid in single and inserted into plant tissue. They are colourless when laid, turning to pale yellow before hatching. After hatching, the green mirid passes through 5 nymphal stages before becoming an adult (Table 1).Under laboratory conditions, the green mirid eggs take 7±0.11 days to hatch. Nymphal development took 16 days. The mean time required for development was 22.4±1.18 for males and 22.8±1.44 for females. The range was 12-36 days for males and 12-37 days for females. The female can lay an average of 36±5.45 eggs. The range was 14-82 eggs. The preoviposition period is 13.7±1.58 days and the oviposition period is 8.5±1.28 days.

Table 1. Time in days required for GM to develop on beans under laboratory conditions (25°c± 1°c and 40-60% RH)

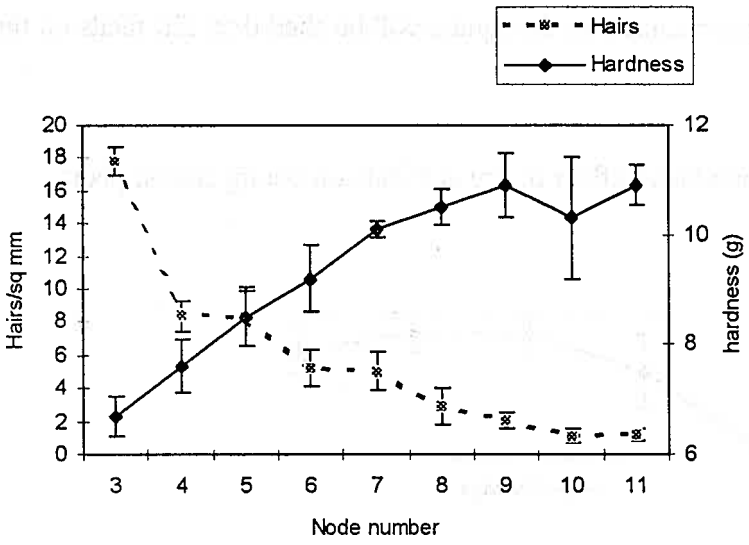
Stage	Average duration ± se	Range
Egg	7.0±0.11	6-11
1st instar	3.0±0.07	2-4
2nd instar	3.0±0.11	2-4
3rd instar	3.1±0.08	2-4
4th instar	3.2±0.08	2-5
5th instar	3.7±0.15	2-5
Adults (male)	22.4±1.18	12-36
Adults (female)	22.8±1.44	12-37
Female fecundity	36±5.45 eggs	14-82
Preoviposition period	13.7±1.58	8-21
Oviposition period	8.5±1.28	3-15

Oviposition Behaviour

Green mirid deposits their egg mainly at the end of leaf petioles between the 4th and the 8th main stem nodes of the cotton plant. Experiment with different plant ages revealed that green mirids prefer to lay in squaring plants rather than seedlings or

plants that are more mature. Factors affecting the attractiveness of the petioles for oviposition by green mirid females were studied and the results indicated that physical hardness and hairiness of the petiole are some of the plant factors that influence green mirid oviposition (Figure 1). The insects prefer to lay in soft petiole tissues which are usually found at the plants terminal. However, the plants terminal is more hairy as such the female mirid deposits fewer eggs at this site. The 5th main stem node is the breakeven point between these two characteristics, hence green mirids deposit most eggs at this site(Figure 1). The incorporation of moderate levels of hardness and hairiness into the cotton breeding program could deter heavy mirid egg lay on these plants.

Figure 1. Oviposition of green mirids in relation to hardness and hairiness of leaf petiole



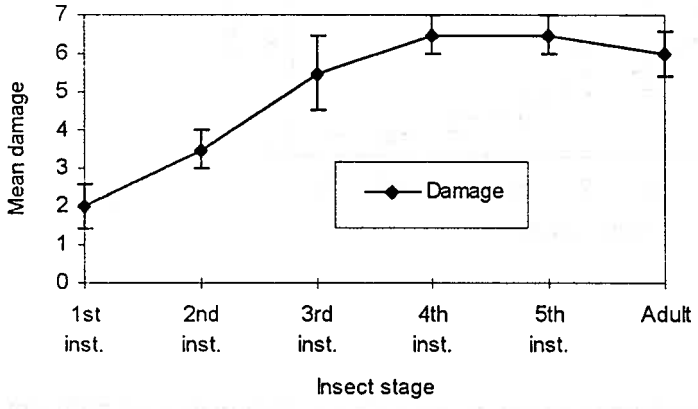
Mechanism of Damage

Studies into the feeding behaviour of green mirids using cotton plants at different growth stages showed that they preferred to feed on plant tips, squares and small bolls. The insects fed by inserting their pin like mouthparts into the plant tissue . The saliva secreted during feeding contains pectinase and this enzyme destroys the cells

surrounding the feeding site (Hori and Miles 1993). Examination of the feeding site under light microscopy, revealed that the green mirid feeding forms a tube which extends to the phloem of the plant indicating that the insect may be feeding on the host plants carbohydrates. The insects feeding result in wilting of terminals, leaves and shedding of squares. If the green mirid feeds on young cotton plants (4-6 leaves), the plants will become deformed, broom shaped on top and bushy.

The feeding damage caused by green mirids to cotton is cumulative and greatest when the insect reaches the 4th and 5th nymphal stage in its life cycle (Figure 2). Though there is a trend of increasing damage with increased mirid numbers, damage is independent of green mirid densities as the shedding of squares is more dependent upon the site that feeding takes place. If the insect feeds directly on the square and the stalk, there is a higher chance that the square will be shed than if it feeds on the square alone.

Figure 2. Cumulative effect of green mirids on young cotton plant



Conclusion

* The green mirid will assume far greater importance within the Australian cotton industry with the advent of transgenic cotton which is expected to reduce insecticide sprays.

* The development of a sustainable pest management system for this insect will require detailed biological and ecological information.

* The green mirid passes through an egg and five nymphal stages. Eggs hatched within 7 days and nymphal development took 16 days under laboratory conditions.

* Green mirid females prefer to lay on squaring plants rather than seedlings or more mature plants.

*Eggs are usually laid in the leaf petioles of cotton plants between the 4th and the 8th main stem nodes.

* The attractiveness of the cotton plant for oviposition is influenced by the physical hardness and hairiness of the plant.

* Green mirids prefer to feed on plant tips, squares and small bolls.

* The feeding damage caused by green mirids to cotton plants is cumulative and greatest when the insect reaches the 4th and 5th stage in its life cycle.

* The shedding of cotton squares as a result of green mirid feeding depends mostly on the site that feeding takes place and not necessarily the density of the insect.

* The incorporation of moderate levels of hardness and hairiness into the cotton breeding programmes will help to reduce green mirids oviposition on these plants.

Acknowledgments

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