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Ain Shams University

EVALUATION OF SOME INTEGRATED COTTON PEST MANAGEMENTS UNDER EL-FARAFRA OASIS CONDITIONS.

A Thesis Submitted

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In the name of ***ALLAH*** the beneficent the merciful

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ABSTRACT

During 2003 and 2004 cotton growing seasons, the present study aimed to estimate the faunastic composition of El-Farafra cotton fields (both beneficial and herbivorous arthropods). Then to evaluate the effectiveness of releasing *Trichogramma evanescens* against pink and spiny bollworms in El-Farafra Oasis cotton fields.

Faunastic composition of Fl-Farafra arthropods declared higher representation of beneficial species than herbivorous ones. On the contrary, herbivorous texa (individuals) were higher represented than beneficials. High percent similarity (homogeneity) was recorded between 2003 and 2004 arthropod communities. Among surveyed cotton attackers, spiny bollworm (SBW) was the herbivorous species achieved economic injury, consequently *Trichogramma* based program was designed to rebalance and suppress its population build up. Under El-Farafra Oasis conditions *Trichogramma* egg parasitoid with 5 releases successfully declined SBW population due to the ability of *Trichogramma* to parasitize SBW eggs and consequently prevented their hatching. Accordingly, higher percent reduction in cotton boll infestation in *Trichogramma* released area than control one was achieved. *T. evanescens* program with 6 releases was also applied and evaluated. As similar reduction in cotton boll infestation percentage was attained in both five and six *Trichogramma* received areas, the low releasing rate was most cost effective method as comparable net benefits was attained upon using high releasing rate. Under shortage of water supplement, 5 releasing schedule was designed and evaluated. Although *T. evanescens* successfully diminished bollworm population under poor water supplement, the negative influence on the net crop yield was of bad irrigation. So integration of all agricultural practice in

general and proper irrigation in particular with the released *Trichogramma* may attain maximum crop yield.

Keywords: New Valley governorate, El-Farafra Oasis, cotton arthropods (pests and beneficials), arthropod communities, insect scouting, population fluctuation, egg parasitoid, *Trichogramma* spp., cotton bollworms.

DISCUSSION

I- Cotton scouting.

From prementioned scouting data it was obvious that, as comparatively lower herbivorous species (14 species) were monitored inhabiting El-Farafra cotton plantation (Table, 2), higher representation of beneficial ones (25 species) were noticed (Table, 4). More than one reason may use to explain this concern:

1- The reasonable key point of such note may be the scarcity of chemical insecticide practices at El-Farafra plantations, cotton in particular, which may conserve and enhance population built-up of naturally occurring beneficials. Such endemic beneficials may express their role in retarding cotton pests through their predation or parasitization behaviours.

In harmony, **Schmutterer (1985)** stated that, excessive and repeated chemical pesticide applications against cotton pests resulted not only to the occurrence of resistance and cross-resistance strains of such pests but also repressed the role of naturally occurring beneficials due to their high sensitivity to chemicals. In Oklahoma cotton plantations, built up of aphid, boll weevil and spider mite populations were noticed by

Miles (1987) after certain insecticidal applications with reverse built up of bollworm predators and parasitoids, so the author concluded that satisfactory results were only obtained when safe insecticides especially microbial ones were applied in a timely manner. **Steven (2002)** concluded that, indiscriminate usage of broad spectrum insecticides were typically induced outbreaks of certain cotton pests (especially lepidopterous ones). However, potential of natural enemies in cotton plantation according to **Steven *et al*. (2003)** was rarely realized due to the widespread use of insecticides with broad toxicity, which not only disrupted natural control of key pests but also caused outbreak of secondary pests. Results of bioassay tests carried out by **Stoltz and Stern (1978)** and **Wilson *et al*.** (**1998)** showed comparable trend in such concern.

2- It was worthy to note that; absence of certain cotton invader species at El-Farafra cotton plantation may enhance the previous note. Where, along the whole scouted period each of cutworm, spider mites and loopers were never monitored.

Either climatic conditions or naturally occurring beneficials characterized El-Farafra cotton plantation may be responsible for their scarcity. Where, roles of naturally occurring beneficials as egg feeder ants, *Lasius neoniger*, **(Lopez and Potter, 2000)**, entomopathogenic nematodes, *Steinernema* spp. and *Heterorhabditis indica*, **(Hussaini *et al*.,**

2000) and entomopathogenic viruses **(Fediere *et al*., 2003)** were the main factor for suppressing population built up of cutworm. Similar trend was stated by **Ronald (1999)** on both spider mites and loopers, where both of which were highly susceptible to the naturally existing predators and entomopathogens.

Upon continues field investigation and contrary to its absence in summer crops, cutworm larvae expressed their damage symptoms on El-Farafra winter crops as cutting off young plants just above ground level. In Egypt, **Zidan *et al*. (1998)** mentioned that pest density of *A. ipsilon* recorded its peak during winter and was lowest during summer. Hence, unfavorable climatic conditions during summer months may be the cause of its absence through cotton plantation. Such interpretation was in harmony with **Maree *et al*. (1999)** who recorded the peak of *A. ipsilon* on cabbage crop on 2nd February then it disappeared after March.

3- Certain predators such as *Oxytelus nitidulus*, *Anthicus* sp. and predator wasps which were rarely or poorly represented within Nile valley cotton plantation were detected within El-Farafra cotton one (Table 3). Such note may also confirm the high representation of beneficial species than herbivorous ones.

Scarcity of insecticidal applications within all agricultural systems at El-Farafra provinces may protect the

biological makeup of its environment from any chemical pollutants leading to such detection. Comparable trend was stated by **Ronald (1999)**.

Contrary to the recorded arthropod species, recovered individuals or specimens of cotton attackers were higher than that for beneficials.

Agricultural extension of certain crops at El-Farafra province in particular and New Valley governorate in general may be the practical key for elucidating such concern. Where, cultivated hosts of such herbivorous species as well as the distributed wild hosts may maintain and enhance population built up of them. Accordingly, pest outbreak was logically expected with unparallel expansion for beneficial populations. Similar disturbance of naturally established balance upon agricultural extension was also stated by **Zanuncio *et al.* (1998)**.

Dominance and abundance percentages of cotton arthropods were also reported to verify the previous note.

Where, depending on these percentages, as beneficial species were more represented than herbivorous ones, vice versa for the recovered individuals were noticed (Tables 21: 25). Agricultural extension at El-Farafra province may disrupt

the natural occurring balance between pests and their natural enemies leading to the outbreak of the pests. Similar trend of dominance and abundance percentages was also stated by **Mohamed (2004)** in Egypt.

II- Population fluctuation of cotton arthropods.

1- Sampling procedures.

Estimation of cotton faunastic communities required suitable scouting techniques which must be coincided with the behaviour of each sampled species. Monitors should be performed in a proper time to cover all inspected areas and followed the same pattern every time.

According to **Richard (2005)**, as sweeping net was occasionally effective method to sample flying arthropods, it generally captured only a small portion of immature stages. In addition, estimates was low for all stages when sweeps were taken in an improper time, during the heat of the day, as insects tended to move lower on the plant searching of more shade. Semiochemicals in general and pheromones in particular proved an important new tool in forecasting process of lepidopterous moths than conventional ones. **El-Zanan and El-Hawary (1999)** and **Mizukoshi (1999)** mentioned that pheromone traps appeared to be more sensitive than light traps

in monitoring early season occurrence of male moths.

2- Population fluctuation of herbivorous inhabiting cotton fields.

Certain herbivorous in El-Farafra cotton fields were normally found in low population densities throughout the growing season (such as pentatomid and plant bugs, locust and grasshoppers). However, according to **Miles (1987)** their minor induced defoliation may actually be beneficial through allowing sunlight and air more readily enter plant canopy, drying out the soil and reducing boll rot, then they were finely destroyed by naturally occurring pathogens. Also defoliations of such low represented pests may enhance the plant to recover and/or may encourage the formation of new vegetative or fruiting branches.

Through whole investigation periods, considerable variations between *A. gossypii* populations were noticed. Where, as no aphids were monitored attacking cotton seedling during both seasons, cotton bolls during 2004 growing season were attacked. Hot weather in El-Farafra province as shown in Table (1) may responsible for the scarcity of *A. gossypii* on cotton seedlings. Such note was in agreement with **Ronald (1999)** who recorded sever damage of *A. gossypii* on cotton

seedling during cool weather. Contrary to cotton seedling, field observations revealed that, upper and young cotton bolls were severely attacked comparing with both middle and lower ones. Where, through its piercing sucking feeding behaviour, *A. gossypii* favored young boll with soft cuticle more than old one with rigid cuticle. Similar remark was also stated by **George *et al*. (1987)** and **Ronald (1999)** who recorded cotton aphid as a cotton boll feeder.

Poor monitoring of *Frankliniella* sp. were noticed during the whole scouting period. Limited representation of thrips may be due to the hot climatic conditions characterized El-Farafra Oasis (Table, 1). Comparable trend was stated by **George *et al*. (1987)** who recorded sever thrips infestation during a prolonged cold period. Considering thrips as early to mid season cotton invader was also concluded by **Abou-Elhagag (1998)** in Egypt, who detected thrips on 2nd week of April till June 24th then it completely disappeared. In agreement, **Miles (1987)** scouted large number of *Frankliniella occidentalis* on cotton during the growing season when cotton was in blooming time.

Since adult stage of *B. tabacci* by its flying ability was oriented mainly to the upper cotton leaves to suck their juice,

which were fleshier than middle and lower leaves, eggs were highly concentrated on the upper leaves. Upon the emergence of immature nymphal stages, they started to perform their role in piercing and sucking leaf juice. But due to their immobile behaviour and by the cotton growing progress, they became extensively founded on both middle and lower leaves. Comparable behaviour was stated by **Naranjo and Flint (1995)**. To avoid hot weather and searching for more shade both adult and juvenile stages of *B. tabaci* were mainly harboured within the lower surface of cotton leaves. The hypothesis that why a specific life form of insect preferred a specific site within the plant was also noticed by **Silvia *et al*. (2005)**. At the present study, minor representation of white fly during early cotton season was also stated by **Abou-Elhagag (1998)**, while its population peak during mid to late season may coincide according to **Bishnoi *et al*. (1996)** with the maximum cotton leaf area.

Reliance on their final catchments, detected species of stinkbugs which were categorized according to **Michael and Bobby (2005)** as cotton boll feeders, was moderately represented. Where, field observations illustrated that they particularly attracted to and laid their eggs on wild grasses and weeds (especially common sow-thistle, *Sonchus* sp., الجعضيض)