Mansura University
Faculty of Agriculture
Economic Entomology Department

New approaches for suppressing the population density of certain cotton pests.

By

Abd El-khalek El-Sayed Abd El-Razek Hatem.

B. Sc. Sci. Agricc. co-operation, Ain Shams University 1997

M. Sc. Agric. (Economic Entomology) fac. Agric. Kafr-El-Sheikh University 2014.

Thesis

Submitted in Partial Fulfillment of the

Requirements for the

Degree of

Doctor of philosophy sciences

in

Agricultural Sciences

(Economic Entomology)

((Economic Entomology Department)

Prof. Dr.
Abd El-Badie A. Ghanim
Professor of Economic Entomology
Faculty of Agriculture,
Mansoura University

Prof. Dr.
Gamal A. El-Mezayyen
Chief Researcher of Economic Entomology
Plant Protection Research Institute,
Agricultural Research Center

CONTENTS

LIST OF TABLES:

LIST OF FIGURES

The present study was conducted at the experimental farm, Sakha Research Stations Kafr El-Sheikh region under field and semi-field conditions during the seasons of 2016 and 2017. Therefore, the objectives of the current study were to:

1- Study the seasonal fluctuations of ***S. littolaris*** moths by using sex pheromone trap :
2- Predicting of ***S. littolaris*** generations in cotton fields in relation to accumulated heat units.
3- Toxicity of tested insecticide and insect growth regulators (GRS) against the 4th larval instar of ***S. littolaris***.
4- Effect of two plant growth regulators, Ethephon ® and Gibberellic acetic acid and one Silica nanoparticles ($SiNP_s$) on the 4th larval instar of *s. littoralis*.
5- Efficiency of two insect growth regulators, Ethephen ® and Gibberellic ecetic acid and one Silica nanoparticles ($SiNP_s$) against certain sucking insects, *A. Jossypii*, *B. tabaci* and *Empoasca* spp.
6- Population fluctuations of certain sucking insects, *A. Jossypii*, *B. tabaci* and *Empoasca* spp. during 2016 and 2017 seasons.
7- Effect of Late season Ethephon ® treatment on percentage of bollworms infestation *F. gossypiella* and *E. insulana* during 2016 and 2017 seasons.
8- Effect of Late season Etherhon ® treatment on percentage of boll opening and each of *P. gassepiella* and *E. insulana* infestation in 2016 and 2017 seasons.

1. Study the seasonal fluctuations of ***S. littolaris*** moths by using sex pheromone trap.

Results indicated that ***S. littoralis*** moths had six peaks during the studied seasons. These peaks occurred from the 3rd week of May until the 1st

Week of September. The first peak was occurred on 19th and 22nd May. The corresponding moths were 775 and 229 moth / trap / three days during 2016 and 2017 cotton season, respectively. The second peak secured on 28th June where the captured moths were recorded 655.3 and 255.3 moth / trap / three days during the first and second season; respectively. The third peak was occurred on 18th and 21st June, where the trapped moths equal 1161.8 and 336.3 moth/ trap / three days in the two tested seasons, respectively. The fourth peak was recorded on 21st and 18th July where the trapped moths equal 243 and 63 moth / trap three days in the two tested seasons, respectively. The fifth peak was occurred on 14th August, where the trapped moths were 221.5 and 355.5 moth / trap / three days in both seasons, respectively. The sixth peak recorded on 1st September, where the captured moths reached to 181.3 and 345.5 moth / trap / three days during the two seasons of 2016 and 2017, respectively.

2. Prediction of *S. littoralis* generations in cotton fields and in relation to accumulated heat unit:

Results showed that the observed peak of overwintering generation was occurred on 19th and 18th May in 2016 and 2017 seasons, respectively. On the other hand, the expected peak for the same generation was observed on 18th and 22nd May at 529.02 and 517.45 DD's during the two seasons of 2016 and 2017; respectively with deviation interval +1 and +2 than the real peak for both 2016 and 2017 season. The real peak of the first generation was occurred on the 18th and 21st June in the first and second season while the expected dates of this generation were observed on the 17th and 18th June with an average of 535.34 and 519.27 DD's during 2016 and 2017 season, respectively. The deviations between the observed and expected peaks were +1and +2 days earlier for two season, respectively. The observed and expected peaks at the second generation were occurred on 21st and 18th July

during the two seasons of 2016 and 2017, respectively when the accumulated heat requirements completed 520.36 and 530.90 DD's during both seasons respectively. The deviation between the observed expected peaks were +8 and +5 days earlier for 2016 and 2017, respectively. The actual observed peak of the third generation appeared on 14th August for both seasons. The accumulation degree days of this generation were 534.07 and 526.95 DD's in 2016 end 2017, respectively.

3. Toxicity of tested insecticide and insect growth regulators (IGRs) against the 4th larval instar of *S. littoralis*.

Results indicated that the insecticide chlorpyrifos (Dursban) toxicity had a strong effect on the 4th larval instar of *S. littoralis* which the mortality percentage was 93.6% recorded one day after treatment followed by IGRs lufenuron (Match) and in doxacerb (Flaxe) giving 34.5 and 40.0 %, respectively. The highest mortality percentages were recorded five days after treatments, 98.49, 96.49 and 91.81% for ***Chlorpyrifos, lufenuron*** and ***Indoxacarb***, respectively.

4.* Efficiency of tow plant growth regulators, Ethephon and Gibberellic acetic acid and one silica nanoparticles (SiNPs) against the 4th larval instar of *S.Littoralis

Results exhibited that SiNPs gave the highest efficiency against the of larval instar with LC_{50} values of 258.8843 ppm followed by Gibberellic acetic acid (287.4862 ppm) and Ethephon (320.4196 ppm), recorded three days after treatment. In addition, SiNPs was the most potent treatment until seven days after treatment against the 4th larval instar with LC_{50} values of 14.4177 ppm compared with Gibberellic acetic acid (86.6704ppm) and Ethephon (163.0176 ppm), respectively.

5. Efficiency of two plant growth regulators, Ethephon and Gibberellic acetic acid and one silica nanoparticles (SiNPs) against certain sucking insects.

5.1. White fly, *Bemisia tabaci* (immature stage):

Results indicated that Gibberellic acetic acid was the most effective treatment with LC_{50} values of 207.6859 ppm against ***B.tabací*** (immature stage) followed by Ethephon (285.3632 ppm) and SiNPs (347.0463 ppm), recorded three days after treatment. Also, Gibberellic acetic acid was the most efficiency until seven days after treatment against ***B. tabací*** (immature stages) with LC_{50} values of 54.4262 ppm followed by Ethephon ® (122.88 ppm) and SiNPs (181.2311 ppm), respectively.

5.2 Cotton aphid, Aphis gossypii Glover:

Results exhibited Ethephon was the most efficiency against ***A. gossypii*** which LC_{50} values was 285.3636 ppm in comparison with Gibberellic acetic acid (299.232 ppm) while SiNPs was 328.8570 ppm, recorded one day after treatment. However, Gibberellic acetic acid was the most effective treatment until five days after treatment against ***A. gossypíi*** with LC_{50} values of 224.2301 ppm while SiNPs was 250.4571 ppm followed by Ethophon was 295.872 ppm. SiNPs was the most potent material, recorded ten days after treatment with LC_{50} values of 40.4686 ppm Campansion with Gibberellic acetic acid was 89.3962 and Ethephon was the least (166.416 ppm), respectively.

5.3. Jassid, Empoasca spp:

Results revealed that Gibberellic acetic acid was the most efficiency until five days after treatment against ***Empeasca*** spp. with LC_{50} values of 177.2563 ppm followed by SiNPs (189.6238 ppm) and Ethephon ® (358:558 ppm) respectively.However, SiNPs was the highest effective until ten days

after treatment with LC_{50} values of 179.7592 ppm followed by Gibberellic acetic acid 138.428 ppm) and Ethephon (271.793 ppm), respectively.

6. Populations fluctuations of certain sucking insects.

6.1. The cotton aphid, *Aphis gossypii* Glover.

Results showed that two peaks of ***A. gossypii*** during the two studied seasons. The first peak recorded 11.00 and 13.0 insect / leaf occurred on 17 August and 13 October in the first season while they were 17.00 insect / leaf occurred on 3rd August and 22nd September in the second one-Then, the population started to decrease of gradually towered the end of the season.

6.2 The cotton and tomato white fly, *Bemisia tabaci* Genn.

Results confirmed that two peaks of ***B. tabaci*** during the two tested seasons. The first peak was 10.33 insect/ leaf occurred on 10th and 25th August in the season while they were 9.33 and 11.93 Insect/ leaf. Occurred on 10th august and 1st September during the second one the population declined gradually toward the end of the season.

6.3 Jassed, *Empoasca* ssp.

Results revealed that two peaks of ***Empoasca* ssp** during the two studied seasons. The first peak recorded 19.33 and 20.33 insect/ leaf occurred on 17th August and 8th September in first season while they were 20.00 and 17.00 insect/ leaf occurred on the same date in the second one, the population decreased gradually to wared the end of the season.

7. Effects of late season Ethephon ® treatment on percentage of bollworms infesation *Pectinophora gossypiella* and *Earías insulana* during 2016 and 2017 seasons.

Results indicated that the Ethephon ® treatments significantly reduced percentages of mean ***P. Jossypiella*** and ***E. insulana*** infestation relative to check. The lowest significantly percentage of mean ***P. gossypiella*** infestation recorded 15.64 and 15.60 in Ethephon ® with 3 cm^3 while they were 6.73% of mean ***E. insulana*** infestation with 1.5 and 3cm^3 /L in 2016

and 2017 late cotton seasons, respectively. Ethephon ® treatment gave the highest reduction percentages, 56.68 and 37.60% of ***P. gossypiella*** infestation with 3cm^3 /L in the first and second seasons; respectively.

8-Effects of late season Ethephon ® treatment on percentage of boll opening and each of *P. gossypiella* and *E. Insulana* infestation in 2016 and 2017 seasons.

Results showed that the highest significantly mean number of boll opening / 100 plant was 1276 15 and 1744.40 with 2.5 cm^3/L of Ethephon ® in the first and second season, respectively. At the same trends, concentration of Ethephon ® 25 cm^3/ L gave the highest increasing of percentages of boll opening recording 36.68 and 22.58 % in the two tested seasons, respectively.