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SUMMARY

Cotton (*Gossypium hirsutum* L.) is one of the most strategic and important crops, in Egypt cotton is sown on a large scale nearly one million feddan yearly for its fibers and oil. Numerous and serious insects invade cotton plants and cause a lot of damage. Recently, whitefly, *Bemisia tabaci* (Genn) is one of those serious sucking insects which economically reduces the yield. Reliance on chemical control of the whitefly leads to insect resistance make this insect very difficult to manage. The need of safer means of pest management has become very essential, therefore, now it has become necessary to search of safe alternatives methods of whitefly control which can minimise the use of traditional synthetic pesticides.

The present investigation was carried out through cotton seasons of 1997, 1998, 1999 and 2000 in Sakha Agricultural, Research Station, Kafr El-Sheikh Governorate to study (1) the susceptibility of some Egyptian cotton varieties to the infestation with whitefly *B. tabaci* (2) field evaluation of the insecticide alternatives against whitefly, *B. tabaci*. (3) The effect of systemic insecticide Gaucho (imidacloprid) and sulfur as seed treatment, root dip treatment and foliar spray on *B. tabaci*.

1. Susceptibility of some Egyptian cotton varieties to infestation with whitefly, *Bemisia tabaci* (Genn.):

The results revealed that Giza 89 variety had the highest rate of infestation (762, 484 and 501.6 adults/9 leaves) during 1997, 1998 and 1999 seasons, respectively. As for the immature stages this variety was very susceptible which the rate of infestation was 111, 130.9 and 156.9 insects/9 in² during 1997, 1998 and 1999 seasons, respectively. As for the

least infestation level occurred on case of variety Giza 45 with mean of 176 and 304.2 adults/9 leaves during 1997 and 1999 seasons, respectively, but during season 1998, Giza 88 was the least infested varieties (157.2 adults/ 9 leaves). As for the immature stages, the least infestation level occurred on case of variety Giza 45 (18.5, 18.9 and 25.8 immature stages/9 in²) during 1997, 1998 and 1999 seasons, respectively.

Finally, results indicated that the highest infestation with adults of whitefly was found in case of variety Giza 89 with harbouring mean number of 5140.4 adults/9 leaves through the three successive seasons 1997-1999. But the least infestation level occurred in case of cotton variety Giza 88 with mean number 1923.0 adults/ 9 leaves during the three seasons. Also the variety Giza 89 was susceptible for the infestation of immature stages with a mean number of 1122.6 immature stages/9 in². On the other hand the least infestation was detected in case of Giza 45 with a mean number of 177.8 immature stages/9 in².

The infestation of cotton with whitefly, *B. tabaci* began in relatively low number at the end of July, then the population increased gradually reaching the peak on August, while number of all stages decreases again until the first week of October.

3. Field evaluation of the insecticide alternatives against whitefly, *B. tabaci*:

Mean number of adults per 9 leaves before treatment ranged between 225 and 470.8 in 1999 season as compared with 311 and 400 in 2000 season, the corresponding ranges of nymphs or pupae stages were 216.5-300 and 250-400/g in². As for the egg stages, the ranges were 23.8-35.8 and 30-55/9 in² during 1999 and 2000 seasons, respectively. Data

Summary

showed that the adults stages were, however, more susceptible to the action of the majority of the tested compounds as compared with the immature stages. Sharp decrease in the population of all stages took place 2 days after compounds treatments, the population began to increase gradually reaching the initial number of adults, nymphs and pupae after 11 days; the population increased gradually during third week. Concerning the initial reduction in adult stages for thirteen compounds, it ranged from 59 to 95.5% and from 62.4 to 96.9% for glue and confidor during 1999 and 2000 seasons, respectively. The initial reduction for glue was 59, 77 and 51% for adults, immature stages and eggs respectively during 1999 season. As for the second year 2000, the initial effect of glue was 62, 75 and 56 for adults, immature stages and eggs, respectively. It is obviously clear that glue induced the lowest initial kill against all stages in the two seasons where, the percentage of reduction were 59, 77 and 51.6% against adult, nymphs and pupae and egg for 1999 season and 62.4, 75 and 56% in respective order for 2000 season. On the other hand, Biofly, Nore film, Saliant film, Agral and Sol gave a reasonable effect against adults and nymphs and pupae for the two tested seasons. But they induced less effect against eggs for the same seasons, where they exhibited a percentage of reduction of 74.5, 72.0, 77.9, 68.0 and 75%, respectively against eggs in 1999 season and 78.6, 75.9, 74.8, 73.3 and 77.5%, respectively against eggs at 2000 season in the same respective order. Compared with Confidor which exhibited significantly effect against all tested stages at the two seasons. Where the percentage of reduction was 95.5, 96.6 and 93 against adults, nymphs and pupae and eggs for 1999 season, respectively, followed by Applaud, which reduced the infestation by 94.6, 96.6 and 92% against adults, nymphs and pupae and eggs for 1999 season and 95.6, 96.7 and 93.6 for 2000 season.

Regarding the residual activity of tested compounds (the period from the 3rd day till the 21st day after spray), it is clear that Confidor and applaud showed the highest residual activity against adult and nymphs and pupae stages of whitefly infested season. The corresponding figures of adult stages were 92 and 90% for 2000 season. As for the larvae or pupae, the residual effect recorded 93% (Confidor) and 90% (Applaud) for the first season while during the second season Confidor and applaud recorded 91.2% and 98.6%, respectively. Data showed that admiral and Consalt had the highest residual activity against egg stage where the corresponding figures were 78.6% and 77% for 1999 season. In 2000 season Confidor and Consalt exhibited the highest residual effect of 81% for the two compounds. For IGR, applaud had highly effect against the three tested stages where it significantly ranks second order after Confidor as initial kill and against adult and nymphs and pupae as residual kill.

As for oils (mineral or vegetative) reasonable activity was noticed against all stages of whitefly *B. tabaci* on cotton plants. The initial effect for Sol, Caple 2 and Jojoba against adult stage were 86.8, 86.6 and 84.3, respectively during 1999 season and 87.0, 90.7 and 82.9, respectively during 2000 season. While the residual effect were 68.0, 74.0 and 72.0, respectively in 1999 season and 68.9, 74.6 and 67, respectively during 2000 season.

As for nymphs and pupae stages the initial effect ranged from 86 to 95 and from 81.9 to 94.5 during 1999 and 2000 seasons, respectively. The residual effect ranged from 65.5 to 76.3 and from 52 to 79.8 for 1999 and 2000 seasons, respectively. On the other hand, % initial effect against egg ranged from 75.9 to 84.0 and 81.9 to 94.5 during 1999 and 2000 seasons,

respectively. The residual effect were 69 and 76.9 for 1999 and 2000 seasons, respectively. On the other hand, % initial effect against eggs was 67.5 and 65.0 during 1999 and 2000 seasons, respectively. The residual effect was 57.7 and 60.7 for two seasons, respectively.

As for the efficiency of the entomopathogenic fungi, Biofly, *Beauvaria bassiana*, results showed that all stages of whitefly, *B. tabaci* were affected by this microbial insecticide, where the initial effect for adults nymphs and pupae and eggs was 90.6, 92.0 and 74.5 during 1999 season and was 85.8, 91.8, 91.6 and 78.6 respectively during 2000 season. The residual effects for the three stages were 71.5, 71.4 and 57.0 for 1999 season, respectively, while they were 62.9, 73.2 and 60.9 during 2000 season, respectively.

As for sticky compounds, results indicated that all stages of whitefly, *B. tabaci* on cotton plants was affected by these compounds; where their % initial kill effect against adults stages ranged from 59-86.7 and 62.4-83.8 during 1999 and 2000 seasons, respectively and had residual effect ranged from 24 to 46.5 and from 31.7 to 45 during two season, respectively. For nymphs and pupae stages, the initial effect ranged from 76.0 to 81.0 and from 75.0 to 87.8 during 1999 and 2000 seasons, respectively. The residual effect was ranged from 52.0 to 67.4 and from 48.9 to 70.3 for 1999 and 2000 seasons, respectively. On the other hand, % initial effect against egg stages was ranged from 51.6 to 77.9 and from 56.0 to 75.9 during 1999 and 2000 seasons, respectively, the residual effect was ranged from 24 to 57.0 and from 60.7 to 55.0 for 1999 and 2000 seasons, respectively.

3. The effect of systemic insecticide Gaucho (imidacloprid) and sulfur applied as seed treatment, root dip treatment and foliar spray on *Bemisia tabaci* (Genn.) infesting cotton plants:

A. Effect of Gaucho:

There were eight treatments of Gaucho and control as follows

1. Gaucho at the rate of 7 gm/1 kg cotton seed
2. Gaucho at the rate of 3.5 gm/1 kg cotton seed.
3. Treatment No. 1 + the same rate of Gaucho (7 gm) mixed carefully with one kg moisted sand put in digged hills about 25 cm from each planted hills, covered with soil and irrigated at July. 27th and 20th for 1999 and 2000 cotton season, respectively.
4. Treatment No. 2 + the same rate of Gaucho (3.5 grams) mixed carefully with 1 kg moisted sand put in digged hills, covered with soil and irrigated at July; 27 and 20 for 1999 and 2000, cotton season, respectively.
5. Treatment No. 3 + foliar spray by Confidor at the concentrate 1 cm²/1 liter at September; 11 and 14 for 1999 and 2000 cotton season, respectively.
6. Treatment No. 4 + foliar spray by Confidor the concentrate cm²/1 liter at September; 11 and 14 for 1999 and 2000 cotton season, respectively.
7. Only Gaucho on the rate of 7 gm mixed carefully with 1 kg moisted sand put in digged hills about 25 cm from each planted hills covered with soil and irrigated directly at July; 27 and 20 for 1999 and 2000 cotton seasons, respectively.
8. Only Gaucho on the rate of 3.5 gm mixed carefully with 1 kg moisted sand put in digged hills about 25 cm from each planted hills and

covered with soil and irrigated directly at July; 27 and 20 for 1999 and 2000 cotton season, respectively.

9. four plots planted with untreated seeds and considered as a check.

Results showed that all Gaucho treatments were significantly reduced the whitefly infestation than untreated (control). The treatments from 1 to 9 had the mean ranged 22.1 to 208.6 adults/9 leaves during 1999 season, while during 2000 season ranged from 34.2 to 205.4 adults/9 leaves. the highest infestation was occurred on the Gaucho treatment Number 8, where the mean number of adults per 9 leaves was 40.3 and 54.2 insects during 1999 and 2000 seasons, respectively. On the other hand, the least infestation levels occurred on case of Gaucho treatment number 3, where the mean number of adults per 9 leaves was 22.1 insects, the same order of infestation was occurred on the case number 5 with the mean number of adults per 9 leaves 21.1 insects during 1999 season but during season 2000 the least infestation occurred in Gaucho treatment number 7, where the mean number of adults per 9 leaves was 34.2 insects, also the highest infestation during 2000 season occurred on case of Gaucho treatment number 2, where the mean number of adults per 9 leaves was 66.8 insects.

As for the effect on immature stages, all Gaucho treatments significantly affected the infestation of *B. tabaci*. The higher infestation occurred on the case of Gaucho treatment No. 2 where the mean number of immature stages per 9 in² was 71.8 and 43.5 insects during 1999 and 2000 seasons, respectively. On the other hand, the least infestation levels occurred on case of Gaucho treatment No. 4 during 1999 season where the mean number of immature stages per 9 in² was 13.9 insects. As for the least infestation occurred in the case of Gaucho treatment No. 7 during

2000 season, where the mean number of immature stages was 17.9 insect/9 in².

B. Effect of sulfur:

The highest infestation of adults occurred on the case of sulfur treatment No. 8, where the mean number of adults per 9 leaves was 94.6 insects during 1999 season, but during 2000 the highest infestation occurred on the case No. 2, where the mean number of adults per 9 leaves was 71.4 insects. On the other hand, the least infestation level significantly occurred on case of sulfur treatment No. 5, with the mean number of adults per 9 leaves 49.1 insect during 1999 season. As for the second season 2000, the least infestation levels occurred on case No. 3 with the mean of 45 adults per 9 leaves.

As for the effect of sulfur on immature stages, results indicated that the highest infestation during 1999 season occurred on case No. 1, where the mean number of immature stages per 9 in² was 112 insects. During 2000 season the highest infestation occurred on case No. 4, the mean number of immature stages was 46 immature stages/9 in². On the other hand, the least infestation during 1999 season occurred on the case No. 5 and 6, the mean number of immature stages per 9 in² was 47.5 for both treatments. During season 2000, the least infestation levels occurred on the case treatment No. 7, the mean number of immature stages per 9 in² was 29.3 immature stages. Statistical analysis of data exhibited significantly differences between the eight treatments.