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EVALUATION OF CERTAIN INSECTICIDES AND ALTERNATIVE CHEMICALS AGAINST CEREAL APHIDS IN EGYPTIAN WHEAT FIELDS

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Summary: A trial to evaluate the efficiency of several recommended materials; the insecticide, Malathion, Mineral oil KZ, Natural oil (Soybean oil), Bio-insecticide, Nutralis (*Beauveria bassiana*) and Detergent against cereal aphids in wheat fields in Egypt was undertaken at Zagazig, Sharkia, Governorate for two successive growing seasons 2000/01 and 2001/02. Number of aphids/tiller/treatment was counted to estimate the initial and residual effects of each material. Data were statistically analyzed. Results indicated that all the tested materials were effective in reducing the number of aphids for a period of two weeks with relatively significant differences among them. Initial effect ranged between 62.77 and 92.42% in the first season and between 61.63 and 90.29% in the second season. Average residual effect ranged between 51.03 and 73.77% and between 53.10 and 66.30% in the two seasons, respectively. Malathion always gave the highest reduction percentage compared with all other materials. Statistical analysis showed highly significant differences. The oils and detergents have showed relative potential to control the cereal aphids with less harm to the natural enemies, therefore, they might be recommended for application in wheat fields.

Key Words: Cereal aphids, insecticides, alternatives, wheat, Egypt.

Aphids are the major insect pests attacking wheat plants in Egypt. Wheat yield damage due to aphids' infestation was estimated by 7-23% (El-Heneidy, 1994). Cereal aphids are also efficient vectors of different strains of barley yellow-dwarf virus (BYDV). *Rhopalosiphum padi* L., *R. maidis* F., *Schizaphis graminum* R. and *Sitobion avenae* F. are the main aphid species on wheat plants in Egypt (El-Hariry, 1979). Chemical control is still the most powerful tool for controlling many insect pests, including aphids, in most of the field crops. Although controlling aphids with insecticides has many risks, including destruction of the balance between aphids and their natural enemies (Smith *et al.*, 1985 and El-Heneidy *et al.*, 1991) and accelerated development of insecticide resistance in aphids species (Shotkoski *et al.*, 1990).

For years, the only control method available to farmers, against aphids in Egyptian wheat fields, has been depending upon insecticides. The crop regularly receives 2-3 insecticidal applications during the growing season. Recently, an integrated pest management (IPM) program has been implemented in wheat fields in Egypt to avoid the insecticide hazards to the crop and the environment. One of the new approaches in the IPM program is searching for safe chemicals (as alternatives to insecticides), less hazardous to the environment and natural enemies and efficient against aphids. This approach has been considered in Egypt as well as in many other countries (Price, 1983; Ramadan, 1987; Buttler *et al.*;1988, Toscano *et al.*,1997; Megahed, 2000 and Ibraheem, 2001).

The objective of this study is to evaluate the efficiency of some recommended chemicals, as alternatives, compared with the insecticides against cereal aphids in Egyptian wheat fields.

MATERIALS AND METHODS

A trial to evaluate several recommended chemicals and/or insecticides against cereal aphids in wheat fields in Egypt was undertaken at Zagazig, Sharkia Governorate for two successive growing seasons 2000/01 and 2001/02. An area of about ½ feddan (= ½ acre about 2000 m^2) cultivated with the commercial variety Sakha 69 was chosen to carry out the trial. The area received regular cultural practice, except using the insecticides throughout the two growing seasons. A factorial design was used. Experimental field was divided into 20 sub-plots (6 X 7 m each) to test the five chemicals; Organophosphorous insecticide, Malathion (15 cm/10 Liter Water), Mineral oil KZ (150 cm/10 L. W.), Natural oil (Soybean oil) (60 cm/10 L.W.), Bioinsecticide Nutralis (*Beauveria bassiana*) (7.5 cm/10 L.W.) and Detergent (150 cm/10 L.W.).

Number of aphids/tiller/treatment was counted 6 times; before spraying (pre-count), 2, 5, 8, 11, and 14 days after spraying to evaluate the efficiency of each material by estimating its initial effect, within the first two days, and its residual effect. Three replicates for each treatment plus a control were sampled for the number of aphids. Single application was applied for each compound in both seasons. Conventional knapsack sprayer (12 Liter Vol.) was used for application. Treatments were applied annually by early March, almost during anthesis wheat growing stage, in both seasons (to coincide with the peak of cereal aphids' infestation in wheat fields in the area (El-Heneidy, 1994).

Data were recorded and evaluated according to Henderson and Tilton's (1955) formula. Data were statistically analyzed using analysis of variance.

RESULTS AND DISCUSSION

Obtained results indicated that all the tested chemicals were effective in reducing the number of aphids for a period of two weeks with significant differences compared with the control (Table 1). Initial effect of the tested materials was estimated by the reduction in aphid numbers within the first two days. It varied from one material to another. It ranged between 62.77 and 92.42% in the first season, while it ranged between 61.63 and 90.29% in the second season (Table 2).

Table (1): Mean number of cereal aphids / wheat tiller before and after spraying with different materials at Sharkia Goveronorat during 2000/01 and 2001/02 seasons.

Treatments	Appl. rate /10 L.W.	Pre-count		Indicated days after application									
				2		5		8		11		14	
		1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Malathion	15 ml	32.40	20.70	5.67	2.33	4.20	5.90	8.32	9.00	15.00	13.70	27.00	20.00
Mineral oil KZ	150 ml	25.33	35.30	11.67	8.00	7.00	10.70	14.40	15.30	24.30	24.00	31.30	36.10
Natural oil	160 ml	27.66	39.80	12.20	8.00	9.50	14.50	14.70	18.60	22.41	27.50	27.40	35.00
Bioinsecticide	7.5 ml	33.50	31.00	28.80	13.80	7..32	8.50	19.34	14.90	30.21	25.10	40.20	32.70
Detergent	150 ml	26.66	23.20	15.33	6.30	4.50	10.00	7.23	16.00	15.51	20.60	30.60	28.30
Control	-	20.33	20.90	47.00	24.23	19.00	29.10	29.12	32.26	33.72	37.80	37.52	40.70

1st = 2000 /01 season 2nd = 2001 / 02 season

Table (2): Reduction percentages in cereal aphid numbers infesting wheat plants before and after spraying with different materials at Sharkia Govornorate during 2000/01 and 2001/02 seasons.

Treatments	Appl. rate /10 L.W.	Initial effect		Indicated days after application								Residual average	
				5		8		11		14			
		1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Malathion	15 ml	92.42[a]	90.29a	86.13	79.54	82.08	71.83	72.08	63.40	54.80	50.43	73.77a	66.30a
Mineral oil KZ	150 ml	80.05a	80.46c	70.43	78.24	60.32	71.91	42.15	62.40	33.03	47.53	51.48c	65.00ab
Natural oil	160 ml	80.90a	82.67b	63.25	73.84	62.90	69.72	51.15	61.79	46.31	54.88	55.90c	65.50a
Bioinsecticide	7.5 ml	62.77a	61.63e	76.62	80.31	59.70	68.85	45.62	55.22	34.96	45.89	51.03c	62.50b
Detergent	150 ml	75.08a	76.59d	81.94	69.05	81.07	55.31	64.92	50.89	37.79	37.42	66.43b	53.10c
F values		1.696	275.67									25.43	386.6
L.S.D $_{05}$		ns	2.05									7.23	1.07

1st = 2000 /01 season 2nd = 2001/ 02 season

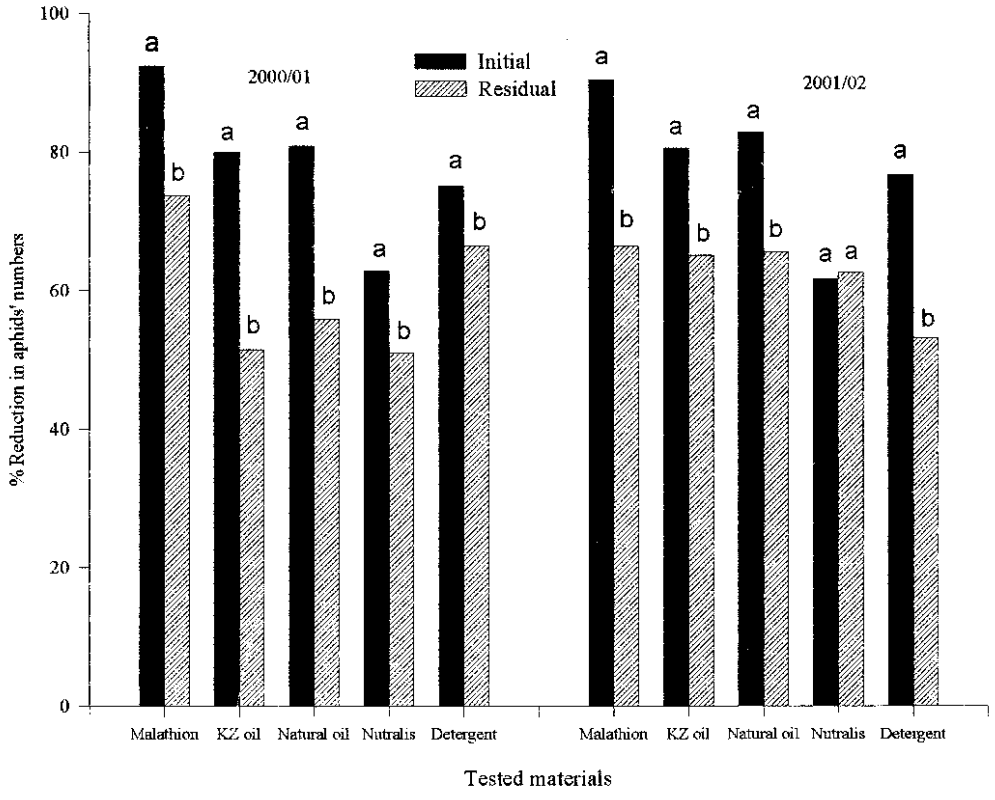

Fig. (1): Initial and residual effects of different materials on wheat aphid numbers at Sharkia Governorate during 2000/01 and 2001/02 seasons. For each compound, columns with the same letter are not significantly different.

Due to different degrees of degradation of the tested chemicals, the effect of each material on the number of aphids was different during the successive days followed the application but generally, the numbers decreased gradually. Such reduction was estimated for each material throughout a period lasted two weeks by counting numbers of aphids (Table 1) and calculating % reduction on days 5, 8, 11 and 14 after applications (Table 2).

Average residual effect ranged between 51.03 and 73.77% and between 53.10 and 66.30% in the two seasons, respectively (Table 2). As shown in the table, the insecticide Malathion always gave the highest reduction percentage compared to all other materials.

As a conclusion, obtained data indicated that Malathion (the insecticide) was the most persistent material; therefore, it ranked first among the tested chemicals for its averages of initial and residual effects, 91.36 and 70.04% respectively (Fig. 1). On the contrary, the lowest effect was recorded by the bioinsecticide, which had the averages of 62.20% initial effect and 56.77% residual effect in the two seasons (Fig. 1). This phenomenon could be attributed to the different mode of action between the two chemicals, the insecticide and the bioinsecticide. The bioinsecticide requires a relatively longer period to show an efficient action (Miranpuri and Khachatourians, 1996, and Metwally *et al.* 2000). As shown also in the figure, the other materials; the oils and detergent ranked between the insecticide and the bioinsecticide in their effects.

Statistical analysis showed highly significant differences among the initial and the residual effects of the tested materials n suppressing the aphid numbers within two weeks (Fig. 1).

Obtained results were in agreement with those of Ramadan (1987), Buttler *et al.* (1988), El-Hariry and El-Sisi, (1991), Toscano *et al.* (1997) and Shahinaz, (2000). They stated that the plant extracts and detergents had relatively achieved a relative good control for piercing insects and at the same time they had a little influence on natural enemies on various crops. Also, Megahed (2000) and Ibraheem, (2001) found that the detergent, mineral oil KZ, natural oil (soybean oil) and Bio clean, a biological mixture of the fungus *B. bassiana* and the bacteria, *Bacillus thuringiensis,* gave moderate toxic effect against aphids in cotton fields.

Since the oils and detergents have given relative potentials to control the cereal aphids, with fewer harms to the natural enemies and with low costs, they might be recommended for application in the wheat fields (Emara *et al.,* 1999). The insecticide can be used only in highly infested spots within the frame of the IPM program.

REFERENCES

Buttler, G.D.; D.L. Coudriet, Jr and T.J. Hennberry (1988). Toxicity and repellency of soybean and cotton seed oil to sweet potato whitefly and the cotton aphid in green house studies, Southern, Western Entomologist, 13 (2): 81-86.

El-Hariry, M.A. (1979). Biological and ecological studies on aphids attacking corn and wheat in Egypt. M.Sc. Thesis, Fac. of Agric., Ain Shams University, Egypt, 213 pp.

El-Hariry, M.A. and A.G. El-Sisi (1991). Correlation between phisico-chemical properties of some local surfactants and their insecticidal activity against the faba bean aphid, *Aphis craccivora* (Koch.). Egypt J. Agric. Res., 69 (1), 289-295.

El-Heneidy, A.H.; Y.H. Fayad and M.A. Shoab (1991). Influence of insecticidal application on aphid populations and their natural enemies in wheat fields in Egypt. Egypt. J. Biol. Pest Control 1 (2): 79-85.

El-Heneidy, A.H. (1994). Efficacy of aphidophagous insects against aphids at wheat fields in Egypt. Egypt. J. Biol. Pest Control, 4 (2): 113-123.

Emara, S.A.; A.M. Taha; M.Z. Dawood and K.K. El-Rafie (1999). Effect of oils, insecticides and the entomopathogenic fungus, *Beauvaria bassiana* on the cotton whitefly, *Bemesia tabaci* Genn. and its natural enemies on cotton plants in Menoufia Governorate. Egypt. J. Appl. Sci., 14 (8): 282-295.

Henderson, C.F. and E.W. Tilton (1955). Tests with acarcides against the brown wheat mites. J. Econ. Entomol., 48: 157 -161.

Ibraheem, M.M.A. (2001). Studies on some piercing-sucking insect pests infesting cotton plants. Ph. D Thesis, Fac. Agric. Zagazig. University, 230 pp.

Megahed, H. (2000). Studies on Aphids. Ph.D. Thesis, Fac. Agric. Zagazig University, 220 pp.

Metwally, A.G.; S.A.M. Gaber and F. El-Sayed (2000). A trial to minimize *Aphis craccivora* damage and population on kidney bean plants in Fayoum by using fungi application. Egypt. J. Appl. Soc., 15 (6): 271-278.

Miranpuri, G.S. and G.G. Khachatourians (1996). Bionomics and fungal control of wolly aphid. J. Insect Sci., 9 (1): 33-37.

Price, J.F. (1983). Field evaluation of new pesticides for control of leaf miners, mites and aphids on flower crops. Proc. Fla. St. Hort. Soc. 96: 287-291.

Ramadan, M.S. (1987). Effect of some plant extraction on insects. Ph.D. Thesis, Fac. Agric. Zagazig University, 181 pp.

Shahinaz, A.A. (2000). Field evaluation of some native safe materials against *Aphis gossypii* (Glov.) and *Bemesia tabaci* (Genn.) infesting cotton plants. Bull. Ent. Soc. Egypt, Econ. Ser., 77(1): 1-6.

Shotkoski F.A.; Z.B. Mayo and L.L. Peters, L.L. (1990). Induced disulfoton resistance in green bugs (Homoptera: Aphididae). J. Econ. Entomol. 83: 2147-2152.

Smith, R.G.; T.L. Archer and E.D. Bynuni Jr. (1985). Low-rate application of insecticides for greenbug (Homoptera: Aphididae) control and effect on beneficial insects on sorghum. J. Econ. Entomol, 78: 988- 991.

Toscano, N.C.; H.A. Yoshida and T.J. Henneberry (1997). Responses to Azadirachtin and Pyrethrum by two species of *Bemisia* (Homopterae: Aleyrodidae). J. Econ. Entomol., 9 (2): 583-589.