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The Role of *Coccinella undecimpunctata* L. in Suppressing the Population Level of *Schizaphis graminum* (ROND) and Increase the Yield in Wheat Plantation at Dakahlia Governorate, Egypt

Introduction

Aphid species are reported as pests on wheat plant in different parts of the worlds (KOLBE, 1969; SANDERSON and MALHOLLAND, 1969; GILL, 1971; DEAN, 1974; WETZEL, 1975; WATT, 1979 and WETZEL et al. 1981). Some of these species are more dominant and confined in particular countries (GREENE, 1966; RAUTAPAA, 1966; HARPER, 1973; GEORGE, 1974; KOLBE and LINKE 1974 and FREIER and WETZEL, 1976). Previous studies in Egypt showed that *Schizaphis graminum* (ROND) as most dominant on wheat plantations representing separately 50 percent of all aphid species inhabiting this plants in the field (ALI, et al. 1982, and GHANIM and EL-ADL, 1983). Several active predators were found associating with cereal aphids of which *Coccinella undecimpunctata* L. was the most dominant. The present study deals with the role played by this predator as a biological control agent against *Schizaphis graminum* (ROND) population under, local field conditions. In addition, the indirect role of this predator in increasing the wheat yield has been investigated.

Materials and Methods

Studies have been carried out in the Experimental Research Station, Faculty of Agriculture, Mansoura University for two successive wheat seasons (1985, 1986). Giza 155 wheat seeds were sowed in the 20th of November in the two years of study. Forty special iron cages ($50 \times 50 \times 200$ cm) covered with Muslin textile and prepared with 1 m long Zipper (to facilitate examination introduction and counting aphid and the predator individuals) have been used in the studies. In each season cages were set up in the field during the first week of February. At that time the wheat plants usually reach the Feeks stage No. 6 (First node of stem visible). Five treatments of eight cages each were designed, as follows:

Treatment I without aphid or predator (Control); II with *Schizaphis graminum* only; III with aphids and one couple (adult male & female) of the predator, IV with aphids and 4 individuals of first instar larva of the predator, and lastly V with aphids and one first instar larva of the predator. The plants under each cage have been sprayed with Malathion 57%, directly after setting up the cages to kill any insects may be found on the plants. Two weeks after spraying an artificial infestastion to the caged plants from a maintained culture of *S. graminum* with a ratio of 3–5 aphid individuals/plant was made. Introducing of aphid individuals were carried out on a fine camel brush. Aphids under the cages were left undisturbed to reproduce until the Feekes stage No. 12 (Quarter of heading process completed, in the beginning of second week of March), subsequently number of aphids was estimated and kept at a ratio of 100 aphid individuals/cages in 1985 and 80 individuals/cage in 1986. Simultaneous introduction of the predator was carried out; e.g. adults (male and female) immediately after copulation, and first instar larvae 24 hours

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after hatching. The average number of aphids per wheat plant was estimated through examination of ten infested, plants chosen at random under each cage. This procedure case carried out every four days during a period extended, from 9 – 10 March till 22 – 27 April in the two years of study. Thus, twelve readings have been reported for 1985 and thirteen for 1986. The aphid index was calculated for each cage on the basis of the average number of aphids on one shoot and the time over which the aphids were present. The method of calculating the aphid index of each cage was after RAUTAPAA (1966) and FREIER (1975). At the end of the wheat season all the ears per each cage were collected, counted, put in a plastic sac and transfered to laboratory, for estimating the average number of grains per ear, the average weight of ear and the average weight of 1000 grains in each cage. A statistical analysis had been done for determination of the obtained results.

Results and Discussions

The effect of predator *C. undecimpunctata* on the abundance of *S. graminum*:

Figures 1 & 2 show the population fluctuations of the aphid *S. graminum* on caged plants in the absence or presence of the predator *C. undecimpunctata* during the two years of investigation (1985 and 1986). Treatment II refers to the population dynamics of the aphid under investigation in the absence of *C. undecimpunctata*. The general average numbers of aphid individuals per plant recorded in this treatment at the time of first count (Quarter of heading process completed, in March 9, 1985, and March 10, 1986) reached 3.73 in 1985 and 3.40 in 1986. The maximum average of aphid individuals (122.8 and 91.60/plant)

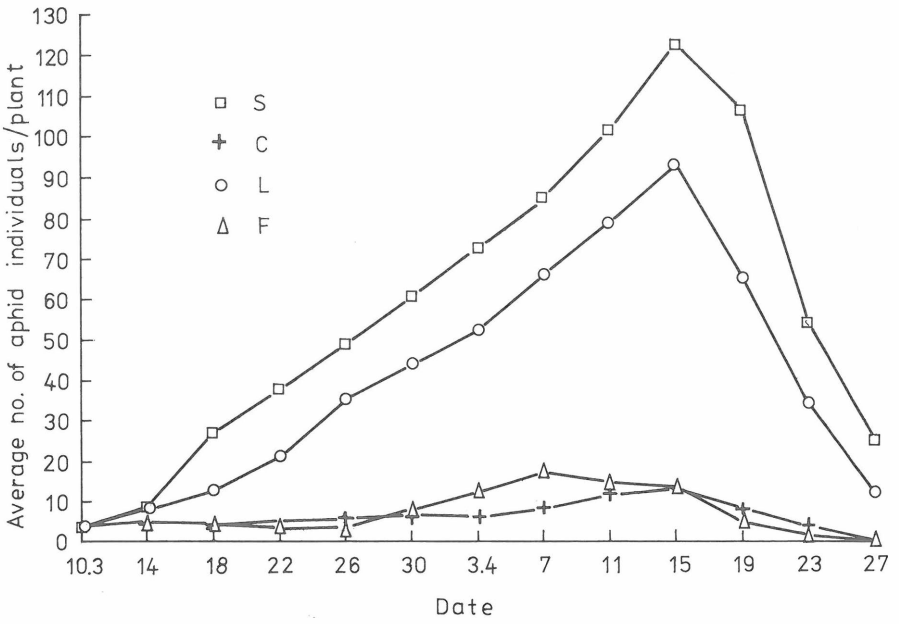

Fig. 1: The population fluctuation of the aphid (*Schizaphis graminum*) under the cages with or without different stages and numbers of the predator (*Coccinella undecimpunctata*) during wheat season 1985. – S – *Schizaphid graminum* only. C – One couple predator adult. L – One larva. F – Four larvae

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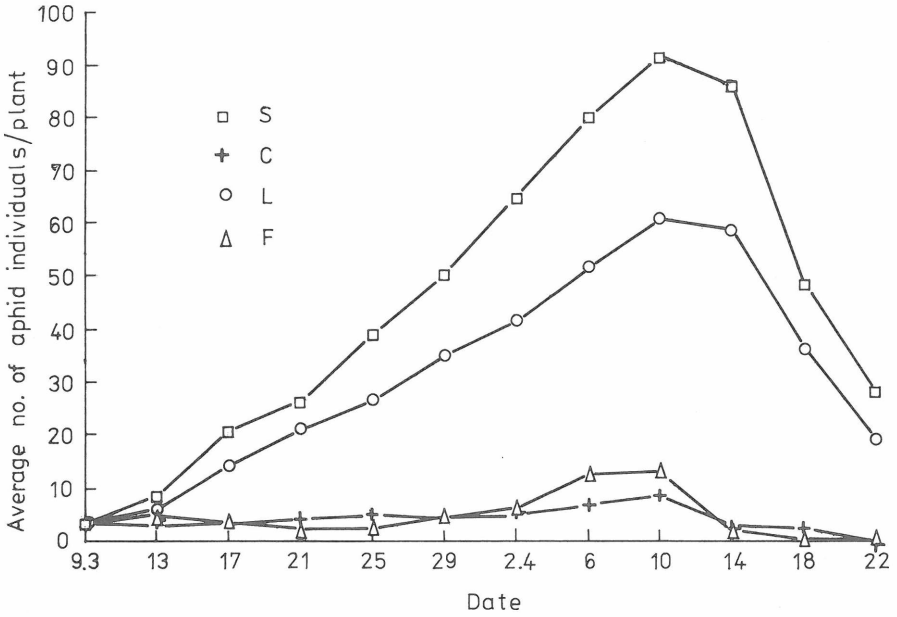

Fig. 2: The population fluctuation of the aphid (*Schizaphis graminum*) under the cages with or without different stages and numbers of the predator (*Coccinella undecimpunctata*) during wheat season 1985. — S — *Schizaphid graminum* only. C — One couple predator adult. L — One larva. F — Four larvae

existed at the milky stage of wheat (on April, 15, 1985, and April, 10, 1986 respectively. Thus, the aphid population increased sharply from first count to reach the peak one month later at the milky stage of the plant, and consequently the increasing rate reached 32.92 times in 1985 and 26.94 times in 1986. The aphid population „curve" began to drop steadily towards the beginning of ripining stage of wheat and sharply with the full ripining stage. In treatment III, (one couple of the predator present), the general average number of aphid individuals per plant reached, at period of heading wheat stage 3.8 in 1985 and 3.6 in 1986, thus indicating suppression in aphid population under the effect of the introduced predator especially at the milky stage of the plant. At this stage the average number of aphids decreased to 13.25 and 8.6 individuals per plant in 1985 and 1986 respectively. Consequently, the increasing rate of the aphid appeared very low, e.g. 3.5 and 2.4 times in the respective two years of investigation. In treatment IV (4 first instar larvae of the predator present), the general average number of aphid individuals reported for the heading wheat stage per plant were 3.83 and 3.75 in 1985 and 1986 respectively. The result of this treatment revealed confirmed the benefit effect of the predator in suppressing the aphid population during the most important period of the plant growth (from Quarter of heading process completed stage to milky ripe stage). At the Milky ripe stage of the plant this average was 17.4 per plant in 1985 and 13.18 per plant in 1986. Thus, the increasing rate of aphids in this case was reached 3.5 times and 4.5 times in the two years, respectively. In treatment V (one first instar larva of the predator present) the average number of aphids per plant at the heading stage (Quarter of heading process completed) were 4.04 in 1985 and 3.7 in 1986. Comparing with last treatment, it appeared that lower number of larval predation in

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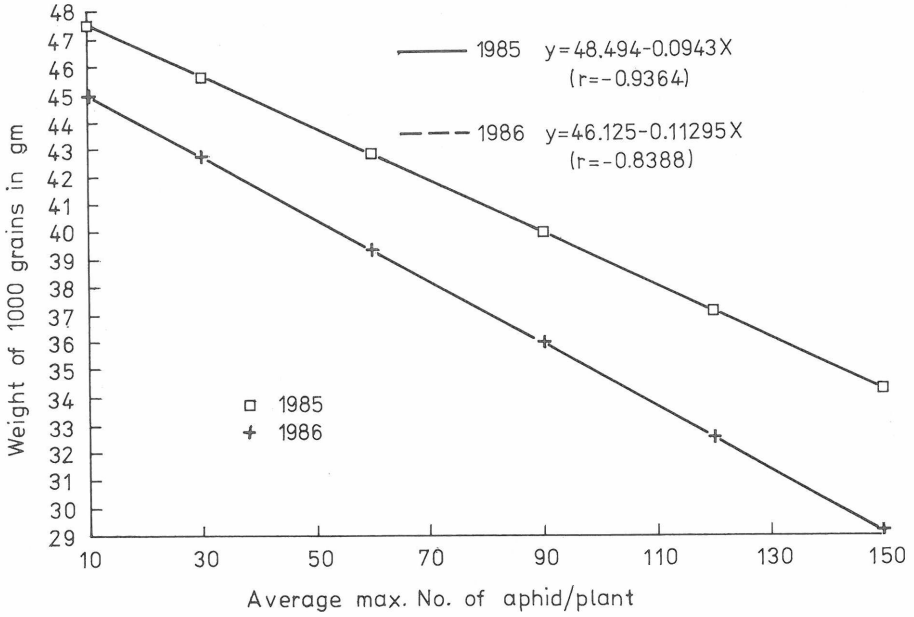

Fig. 3: The correlation between 1000 grain weight in gram and average maximum numbers of aphid in all treatments for the two years of study

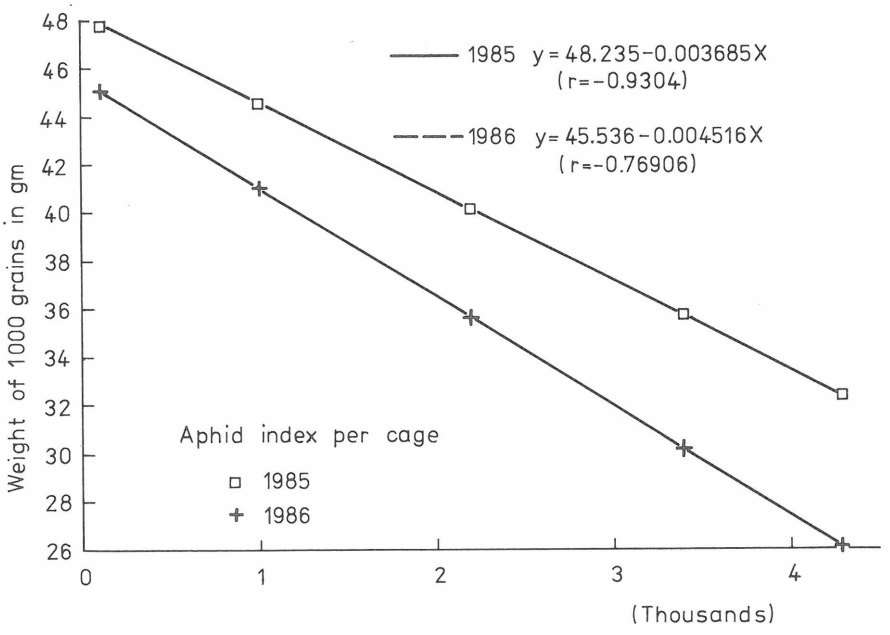

Fig. 4: The correlation between 1000 grain weight in gram and Aphid index per cage in all treatments in the two years of study

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Treatment V resulted in decreasing suppression of the aphid population. In this case the numbers of aphid individuals per plant, at the milky stage increased to 93.16 in 1985 and 60.84 in 1986. The aphid population curve, in this treatment, increased steadily from the beginning of infestation (Quarter of heading process completed) to show an obvious peak at the (milky stage). The increasing rates of the aphid reported for the two years of investigation increased in this treatment to 23.06 times and 16.44 times.

The aphid index and the crop per ear; respective correlation values with the maximum number of aphids were ($r = -0.97$ for 1985 and -0.89 for1986) and with the aphid index ($r = -0.96$ for 1985 and -0.88 for 1986). These results came in the same line as that of JONES, 1972 and RAUTAPAA, 1976. The numerical relation among the maximum number of aphids, the aphid index and the weight of crop per ear in all treatments is presented in Figs. 5 & 6 along with the regression equations which explain this relation.

The aphid index represents the sum of the aphids living on one shoot on each day of the experiment. The aphid index per cage reached in these experiment have been estimated by the using of RAUTAPAA (1966) and FREIER formula (1975), and are given in Table (1). It appears that in 1985 and 1986 the average numbers of aphid index reported for treatment II were 3091.56 and 2133.08, while these reported for treatment III were 328.15 and 183.81, respectively. These data shed light on the effective role of the adult predator, in suppressing the aphid population in the field; i.e. its couple destroyed 89.71% and 91.38% in 1985 and 1986 of the aphid population respectively. On basis of these results it can be stated that the aphid under investigation can be kept in the field under the economic injury level when a predator-prey ratio maintained constantly at a ratio of 1 predator: 40–50 aphids. This findings agree with that of FREIER and WETZEL, 1980; and WETZEL et al. 1981. In treatment

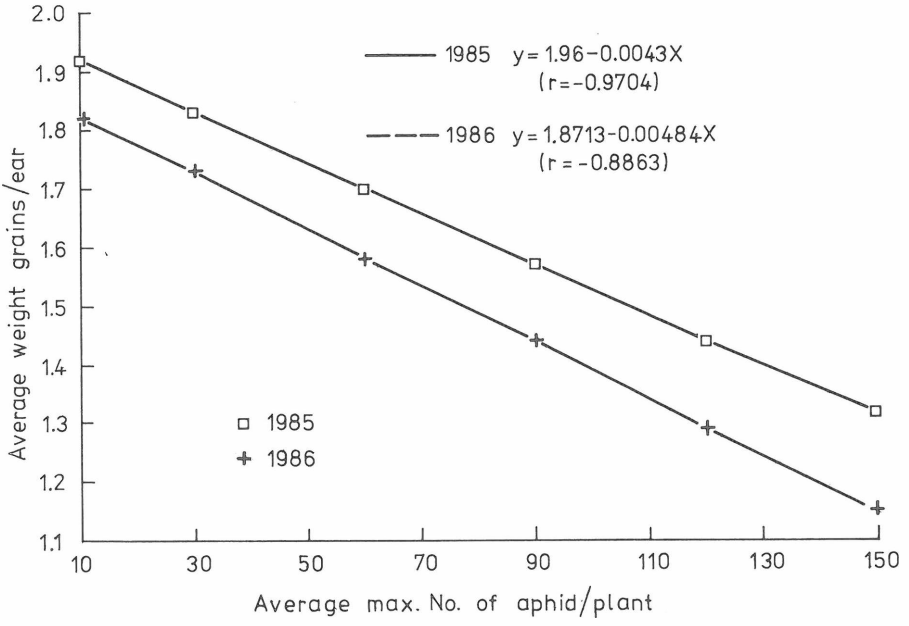

Fig. 5: The correlation between average weight or grains per ear in gram and average maximum number of aphid in all treatments for the two years of study

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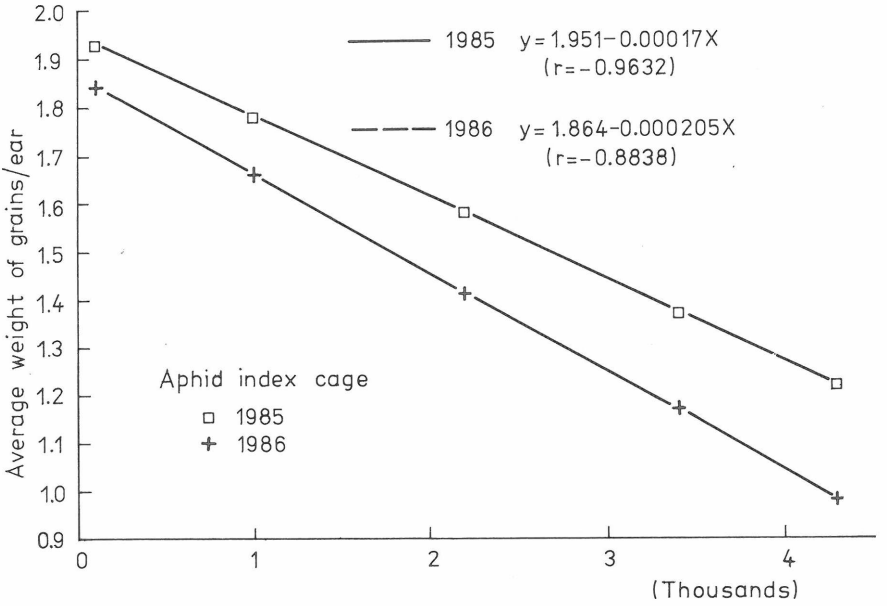

Fig. 6: The correlation between average weight or grains per ear in gram and aphid index per cage in all treatments for the two years of study

IV the average numbers of aphids index were 365.13 in 1985 and 218.28 in 1986. These results also assure the effective role of the predator larvae at the rate mentioned in this treatment in suppressing the cereal aphid in the field. A ratio of 1 predator larva: 20–25 aphids caused a reduction in the aphid index per cage to 88.19 in 1985 and 89.77 in 1986 respectively. In treatment V when only one first instar larva of the predator was present, the aphid index per cage increased to 2077.60 in 1985 and 1455.75 in 1986. Thus, the low predator prey ratio (one predator larva: 80–100 aphids) caused only 32.80% and 31.75% reductions in the aphid population in 1985 and 1986, respectively.

Table 1:
Average of aphid index per cage in the different treatments of the two years of study at Mansoura district, Egypt.

Seasons	Treatment II	Treatment III	Treatment IV	Treatment V
1985	3091.56 ± 50.94	318.15 ± 21.20	365.13 ± 16.09	2077.6 ± 41.36
1986	2133.08 ± 40.88	183.81 ± 9.64	218.28 ± 5.65	1455.75 ± 18.74

2 – Effect of introducing different stages and numbers of the predator on wheat yield:
The wheat yield was estimated in the present study, by weighting the grains per ear and the weight of 1000 grain. The obtained data reported for this a spect in the two years of study are given in Tables (2 and 3). The control treatment I showed an average weight of 1.96 gram of grains per ear in 1985 and 1.87 gram in 1986, and the average weight of 1000 grain reached 48.42 and 46.36 gram in the two years 1985 and 1986 respectively. In

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treatment II the respective weight of grains per ear decreased to 1.41 and 1.43 gram. The aphid caused loss in the crop reached to 28.06% in 1985 and 23.53 in 1986 in comparing with the control. Consequentely, the weights of 1000 grain were 36.19 gram in 1985 and 36.17 gram in 1986, and the loss percentages were 25.30% and 22.00% as reported for 1985 and 1986 respectively. In treatment III the weight of grains per ear increased to 1.9 gram in 1985 and 1.83 gram in 1986; showing losses in the crop by 3.06% in 1985 and 2.14% in 1986; compared with the control. Averages reported for 1000 grain were 47.52 gram in 1985 and 44.75 gram in 1986; indicating the losses of 1.86% and 3.47% in the two respectively years. These results assure the highly effective role of the predator in the adult stage in controlling the cereal aphid and indirectly limiting the loss in yield. In treatment IV, the average weight of ear were 1.88 and 1.81 gram in 1985 and 1986, and the respective percentages of loss reached 4.08% and 3.21%. Consequently, the weights of 1000 grain were 46.55 and 44.31 gram and the loss percentages were 3.86% and 4.42% as reported for 1985 and 1986, respectively. These results again showed an effect of the predator similar to that indicated in Treatment III. In Treatment V, the weight of grains per ear in averaged 1.59 gram in 1985 and 1.57 gram in 1986; indicating that the respective losses in the crop by 18.88% and 17.04%, respectively. Under this condition the weight of 1000 grain averaged of 40.44 gram in 1985 and 39.11 gram in 1986; showing less percentages of 16.48% and 14.64% respectively. These results indicate clearly that one predator in the first instar larva at high population level of aphid (one predator larva: 80 – 100 aphids) was not sufficient to control the pest in the field, though increasing the crop by 9% compared with Treatment II.

Table 2:
Average weight of 1000 grain in gram per cage in the different treatments for the two years of study

Seasons	Treatment I	Treatment II	Treatment III	Treatment IV	Treatment V
1985	48.42 ± 0.27	36.19 ± 0.29	47.52 ± 0.26	46.55 ± 0.21	40.44 ± 0.19
1986	46.36 ± 0.48	36.17 ± 0.54	44.75 ± 0.30	44.31 ± 0.33	39.11 ± 0.46

Table 3:
Average weight of grains per ear in gram in the different treatments for the two years of study

Seasons	Treatment I	Treatment II	Treatment III	Treatment IV	Treatment V
1985	1.96 ± 0.02	1.41 ± 0.01	1.90 ± 0.005	1.88 ± 0.006	1.59 ± 0.007
1986	1.87 ± 0.03	1.43 ± 0.01	1.83 ± 0.004	1.81 ± 0.006	1.57 ± 0.007

Statistical analysis of the data presenting the maximum numbers of aphid per plant and the weight of 1000 grain in the five treatments showed a highly significant negative correlation between these two aspects ($r = -0.94$ in 1985 and -0.84 in 1986): A similar trend of correlation was also indicated between the aphid index and the weight of 1000 grain ($r = -0.93$ in 1985 and -0.80 in 1986). The numerical relation between the existance of a given number of aphid and the weight of 1000 grain in the five different treatment are presented along with the regression equations which illustrate this relation in Figs. 3 & 4.

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A highly significant negative correlation has been noticed between both of the maximum number of aphids; the obtained results assured the important role of this predator in the wheat fields in suppressing aphid population to be under the economic injury level if the predator prey ratio was = < one adult predator: 40 – 50 aphids or one predator larva: 20 – 25 aphids.

Abstract

Field studies under special metal cages were carried out in wheat fields for the two successive years 1985 and 1986 to evaluate the efficiency of *Coccinella undecimpunctata* L. in controlling *Schizaphis graminum* (ROND) and its indirect effect on wheat yield. The study was excuted in the wheat fields of the Experimental Research Station, Faculty of Agriculture, Mansoura University. The obtained results showed the efficacy of *C. undecimpunctata* L. in regulating the population level of *S. graminum* (ROND) with a degree depends on the existance ratio between the populations of the two species. The injury in the wheat crop caused by *S. graminum* (ROND) compared with the control reached 28.06% in 1985 and 23.53% in 1986, while the aphid increasing rates were 32.92 times in 1985 and 26.94 times in 1986 comparing with the aphid numbers found at the beginning of the artificial infestation. The presence of one predator larva: 80 – 100 aphid individuals resulted in an economic injury in wheat crop that reached 18.88% in 1985 and 17.04% in 1986. At this ratio 32.80%, and 31.75% reductions in the aphid numbers were recorded in 1985 and 1986 respectively. While the presence of one predator adult: 40 – 50 aphids or one predator first instar larva: 20 – 25 aphid individuals induced no economic damage in the crop, as the crop loss weas 3.06% in 1985 and 2.14% in 1986 with the first ratio (one predator adult: 40 – 50 aphids) and 4.08% in 1985 and 3.21% in 1986 with the second ratio (one predator larva: 20 – 25 aphids). The first ratio caused reduction in the aphid index reached 89.71% in 1985 and 91.38% in 1986, while the second ratio induced 88.19% in 1985 and 89.77% in 1986.

Zusammenfassung

Felduntersuchungen wurden auf Weizenfeldern mit speziellen Metallkäfigen in den beiden Jahren 1985 und 1986 unternommen, um die Wirksamkeit von *Coccinella undecimpunctata* L. bei der Bekämpfung von *Schizaphis graminum* (ROND) und ihren indirekten Einfluß auf den Weizenertrag festzustellen. Die Untersuchungen wurden auf den Weizenfeldern der Experimentalforschungsstation der Landwirtschaftlichen Fakultät der Universität Mansoura durchgeführt. Die Ergebnisse zeigten, daß die Wirksamkeit von *C. undecimpunctata* L. bei der Regulierung des Populationsniveaus von *S. graminum* (ROND) bis zu einem gewissen Grade vom Zahlenverhältnis der Populationen der beiden Arten abhängt. Die Schädigung der Weizenernte durch *S. graminum* (ROND) erreichte im Vergleich zur Kontrolle 28,06% im Jahre 1985 und 23,53% im Jahre 1986, wobei die Zuwachsraten der Aphiden 32,92 im Jahre 1985 und 26,94 im Jahre 1986 betrugen im Vergleich zu den Zahlen der Aphiden zu Beginn des künstlichen Befalls. Beim Verhältnis von einer Raublarve zu 80 – 100 Aphiden betrug die Ökonomische Schädigung der Weizenernte 18,88% im Jahre 1985 und 17,04% im Jahre 1986. Bei diesem Verhältnis waren Reduzierungen der Zahl der Aphiden um 32,80% bzw. 31,75% for 1985 bzw. 1986 zu verzeichnen. Beim Verhältnis von einem adulten Raubinsekt zu 40 – 50 Aphiden oder einer Raublarve im ersten Stadium zu 20 – 25 Aphiden trat keine ökonomische Schädigung ein, denn der Ernteverlust betrug 1985 nur 3,06% und 1986 nur 2,14% beim ersten Verhältnis (ein adultes Raubinsekt zu 40 – 50 Aphiden) und 1985 nur 4,08% und 1986 nur 3,21% beim zweiten Verhältnis (eine Raublarve zu 20 – 25 Aphiden). Beim ersten Verhältnis wurde eine Senkung des Aphidenindex um 89,71% im Jahre 1985 und 91,38% im Jahre 1986 erzielt, beim zweiten eine Senkung von 88,19% im Jahre 1985 und 89,77% im Jahre 1986.

Резюме

Название работы: Роль *Coccinella undecimpunctata* L. при подавлении популяции *Schizaphis graminum* (ROND) и повышении урожая пшеницы в губернии дакахлия, Египет

В 1985 и 1986 гг. на посевах пшеницы проводили полевые опыты со специальными металлическими клетками для изучения эффективности *Coccinella undecimpunctata* L. при борьбе с *Schizaphis graminum* (ROND) и ее прямого влияния на урожайность пшеницы. Опыты проводили на посевах

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пшеницы экспериментальной научно-исследовательской станции сельскохозяйственного факультета Мансурского Университета. Полученные результаты показали, что эффективность *C. undecimpunctata* L. при регулировании численности популяции *S. graminum* (Rond) до некоторой степени зависит от численности популяций обоих видов. По сравнению с контролем вызванные *S. graminum* (Rond) потери урожая пшеницы достигли 28,06% в 1985 г. и 23,53% в 1986 г., причем численность тлей повысилась в 1985 г. в 32,92 и в 1986 г. в 26,94 раза по сравнению с численностью тлей к началу искусственного поражения. При отношении I хищного личинка к 80—100 тлям экономический ущерб урожая пшеницы составил 18,88% в 1985 г. и 17,04% в 1986 г. При таком отношении численность тлей снизилась на 32,80% в 1985 г. и 31,75% в 1986 г. соответственно. При отношении I взрослого хищного насекомого к 40—50 тлям или I хищного личинка первого возраста к 20—25 тлям экономического ущерба не было, потери урожая составили всего лишь 3,06% в 1985 г. и 2,14% в 1986 г. в случае I взрослого хищного насекомого к 40—50 тлям (первое упомянутое отношение) или только 4,08 в 1985 г. и 3,21% в случае I хищного лиинка к 20—25 тлям (второе отношение). При первом отношении индекс тлей снизился на 89,71% в 1985 г. и 91,38% в 1986 г., а при втором отношении снижение составило 88,19% в 1985 г. и 89,77% в 1986 г.

References

Ali, A. M.; Rizk, M. M. & Hussein, M. M.: Zum Auftreten von Getreideblattläusen und ihren Prädatoren im Gebiet von New Valley (A.R. Ägypten). — Kongreß- u. Tagungsberichte der MLU. — Halle-Wittenberg, T. I. — 1982. — S. 164.

Dean, G. J.: Effects of parasites and predators on the cereal aphids *Metopolophum dirhodum* (Wlk.) and *Macrosiphum avenae* (Fabr.) (Hem. Aphididae). — In: Bull. ent. Res. — London **63** (1974). — S. 411—422.

Freier, B.: Untersuchungen zum Massenwechsel und zur Schadwirkung von Getreideblattläusen. — 1975. — 202 S. — Halle-Wittenberg, Univ., Diss.

Freier, B. & Wetzel, Th.: Untersuchungen zum Einfluß von Getreideblattläusen auf die Ertragsbildung bei Winterweizen. — In: Beitr. Ent. — Berlin **26** (1976). — S. 187—196.

— Der Verlauf der Progradation der Getreidelaus *Macrosiphum avenae* (Fabr.) im Winterweizen und die Möglichkeit der kurzfristigen Befallsvorhersage. — In: Beitr. Ent. — Berlin **30** (1980). — S. 137—143.

George, K. S.: Damage assessment aspects of cereal aphid attack in autumn- and spring-sown cereals. — In: Ann. appl. Biol. — London **77** (1984). — S. 67—74.

Gill, C. C.: Prevalence of aphids and barley yellow dwarf virus on barley in Manitoba in 1970. — In: Pl. dis. rep. — Washington **55** (1971). — S. 797—801.

Ghanim, A. A. & El-Adl, M. A.: Aphids infesting wheat and the effect of their predators in suppressing its population in the field, at Mansoura district. Egypt. — In: J. Agric. Sci. — Mansoura Univ. **8** (1983) 4. — S. 958—968.

Greene, G. L.: Field population of three grain aphid species in Western Oregon. — In: J. econ. Ent. — College Park **59** (1966). — S. 1201—1206.

Harper, A. M.: English grain aphid: Effect of yield of wheat in Alberta. — In: J. econ. Ent. — College Park **66** (1973). — S. 1326.

Jones, M. G.: Cereal aphids, their parasites and predators caught in cages over oat and winter wheat crops. — In: Ann. Appl. Biol. — London **72** (1972). — S. 13—25.

Kolbe, W.: Studies on the occurrence of different aphid species as the cause of cereal yield and quality losses. — In: Pflanzenschutznachr. Bayer. — Leverkusen **22** (1969). — S. 171—204.

Kolbe, W. & Linke, W.: Studies of cereal aphids; their occurrence, effect on yield in relation to density levels and their control. — In: Ann. appl. Biol. — London **77** (1974). — S. 85—87.

Rautapaa, J.: The effect of the English grain aphid *Macrosophum avenae* (F.) (Hom., Aphididae) on the yield and quality of wheat. — In: Ann. Agric. Fenn. — Helsinki **5** (1966). — S. 334—341.

— Populations dynamics of cereal aphids and methods of predicting population trends. — In: Ann. Agric. Fenn. — Helsinki **15** (1976). — S. 272—293.

Sanderson, F. R. & Mulholland, R. J.: Effect of the grain aphid on yield and quality of wheat. — Proc. 22 N.Z. Weed Pest Control Conf., 1969. — S. 227—235.

Watt, A. D.: The effect of cereal growth stages on the reproductive activity of *Sitobion avenae* and *Metopolophium dirhodum*. — In: Ann. appl. Biol. — London **91** (1979). — S. 147—157.

DOI: 10.21248/contrib.entomol.41.1.277-286

WETZEL, TH.: Dynamics of population and distribution of major winter wheat pests the basis for directed control against them. — Proc. VIII Int. Congr. Plant protect. — Moscow, Sect. 11, 1975. — S. 440—452.

WETZEL, TH.; GHANIM, A. A. & FREIER, B.: Zur Bedeutung von Prädatoren und Parasiten für die Überwachung und Bekämpfung von Blattläusen in Getreidebeständen. — In: Nachr.-Bl. Pflanzenschutz DDR. — Berlin **35** (1981) 12. — S. 239—244.

WETZEL, TH. & SPAAR, D.: Zum integrierten Pflanzenschutz gegen Schadinsekten des Getreides. — Kongreß- u. Tagungsberichte der MLU. — Halle-Wittenberg, T.I. — 1985. — S. 14—24.

Besprechungen

KOIWAYA, S.: **Studies of Chinese Butterflies.** Band I. Tokyo: Selbstverlag, 1989. — 239 S.: 729 Fig., davon 311 farbig.

Es gibt gegenwärtig eine Vielzahl von Büchern über die Tagfalter der verschiedensten Gebiete und zoogeographischen Regionen. Trotzdem ist vorliegender Band I einer neuen Serie es wert, besonders hervorgehoben zu werden, da er sich mit den Tagfaltern eines Gebietes befaßt, über das in neuerer Zeit keinerlei zusammenfassende Darstellung existiert. In China berühren sich die Paläarktis und die Orientalis, und für jede Insektengruppe ist aus diesem Grunde die genauere Kenntnis des rezenten Vorkommens ihrer Vertreter in diesem Gebiet außerordentlich wichtig. Hauptbeitrag der vorliegenden Untersuchung ist die Bearbeitung der Ausbeute einer 1980 durchgeführten Sammelexpedition nach China, ergänzt durdh zusätzliche Angaben früherer Sammelreisen. Die nachgewiesenen Arten werden mit ihren Funden sowie ergänzenden diagnostischen Angaben aufgeführt. Zahlreiche schwarzweiße und farbige Fotos der Falter, aber auch hervorragende Farbfotos der Raupen, Puppen und Eier unterstützen den Text. Verbreitungskarten runden den Text ab. In einem gesonderten Kapitel werden eine neue Gattung sowie neun neue Arten beschrieben. Ein weiterer Abschnitt befaßt sich mit den Entwicklungsstadien einiger Nymphalidae. — Für den 2. Band sind schon weitere Einzelbearbeitungen geplant. Dem Autor und Herausgeber kann man nur zu diesem gelungenen Start gratulieren und man kann sich mit Recht auf die Fortsetzungen freuen. — Die Publikation ist beim Autor (3-22-8, Shinotakaido, Suginami-ku, Takyo, 168 Japan) zu beziehen. R. GAEDIKE

REINHARDT, R. & HARZ, K.: **Wandernde Schwärmerarten.** — 1. Aufl. — Wittenberg Lutherstadt: ZIEMSEN 1989. — 112 S., 4 Farbfotos, 63 Fig. Die neue BREHMbücherei; 596). — Preis 11,20 DM.

Seit 1957 die Nr. 191 der Neuen BREHM-Bücherei von HARZ & WITTSTADT den „Wanderfaltern" gewidmet wurde, sind umfangreiche neue Erkenntnisse, besonders auch über ökologische und züchterische Fragestellungen gewonnen worden. Im Mittelpunkt der vorliegenden Bearbeitung stehen die 4 Wanderschwärmerarten Totenkopfschwärmer (*Acherontia atropos*). Windenschwärmer (*Agrius convolvuli*), Oleanderschwärmer (*Daphnis nerii*) und Linienschwärmer (*Hyles livornica*). Nach einführenden Bemerkungen zur Systematik der Sphingidae und zur enzymatischen Stellung der genannten Arten werden diese monographisch abgehandelt. Sehr ausführlich werden die einzelnen Entwicklungsstadien sowie Fragen der Lebensweise (u. a. Generationsfolge, Verhalten der Falter) erörtert. — Ein allgemeiner Teil mit den Themenkomplexen: Das Wandern der Schmetterlinge; Ökologische Grundlagen der Emanzipation; Rezessionsformen bei Lepidopteren sowie ein Kapitel über die Zucht on Sphingiden, ein ausführliches Literaturverzeichnis sowie ein Register runden dieses lesenswerte Bändchen ab. Ohne den positiven Eindruck schmälern zu wollen, sei auf zwei kleine Ungereimtheiten hingewiesen: In der Einleitung wird der Windenschwärmer als *Herse convolvuli, im Hauptteil als Agrius convolvuli* bezeichnet und in der Verbreitungskarte für den Oleanderschwärmer wird das Gebiet der Schwarzmeerküste im Bereich der Georgischen SSR nicht mit erfaßt, obwohl dort die Art als Falter und Raupe immer zahlreich zu finden war (Gebiet von z. B. Suchumi; gesichert von 1950—1955, eigene Beobachtungen). R. GAEDIKE

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