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Title of Thesis: Seasonal Abundance and Certain Biological Aspects of Cereal Aphids on Barley in Egypt (Giza region)
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Abstract

The survey results revealed the occurrence of seven different cereal aphid species (Homoptera, Aphididae) on barley plants grown at Giza region. These species were *Rhopalosiphum maidis* (Fitch), *Rhopalosiphum padi* (Linnaeus), *Metopolophium dirhodum* (Walker), *Diuraphis noxia* (Mordvilko), *Sitobion avenae* (Fabricius), *Schizaphis graminum* (Rondani) and *Schizaphis cyperi* (Van der Goot). All the seven aphid species In addition to, *Schizaphis minuta* (Van der Goot) and *Saltusaphis scirpus* Theobald occurred on nine cereal weed plants associated with barley fields.

The associated cereal weed and wild host plants were, Bearded rye grass, *Lolium temulentum* L., *Bromus catharticus* Vahl, Spring wild oat, *Avena fatua* L., Nut grass, purple nut sedge, *Cyperus rotundus* (L.), Tunis grass, *Sorghum virgatum* (Hack.) Stapf., Bermuda grass, *Cynodon dactylon* (L.) Pers., Deccan grass, *Echinochloa colonum* (L.) Link, Lesser canary grass, *Phalaris minor* Retz. and Crab grass, *Digitaria sanguinalis* (L.) Scop.

The cereal aphid species, *R. maidis* and *R. padi* were recorded on seven different cereal weed species. While, *S. cyperi* was recorded on six cereal weed species. Both of *M. dirhodum* and *S. avenae* were recorded on four different cereal weed plants. While both of *S. graminum* and *D. noxia* were recorded on three and two cereal weed plants, respectively. *S. minuta* and *S. scirpus* were recorded on only one cereal weed species, *i. e., C. rotundus*.

S. cyperi was recorded on six cereal weed plant species, *R. maidis* was recorded on seven different cereal weed plant species, *R. padi* was recorded on seven different cereal weed plant species. Four cereal weed plant species harboured *S. avenae*, *M. dirhodum* occurred on four cereal weed plant species, *D. noxia* was recorded on two cereal weed plant species, *S. graminum* was recorded on three cereal weed plant species, *S. scirpus* and *S. minuta* were recorded on only one cereal weed species, *i. e., C. rotundus*.

The survey study of the associated Aphidophagous predatory species revealed the occurrence of seven predator species belonging to three insect orders (Coleoptera, Neuroptera and Diptera) and four families (Coccinelidae, Staphelinidae, Chrysopidae and Syrphidae). These insect predator species were, *Coccinella undecimpunctata* L. and *Scymnus interruptus* L. (Fam.: Coccinelidae)*Paederus alfierii* (Koch.) (Fam.: Staphelinidae) *Chrysoperla carnea* Steph. Chrysopidae *Syrphus corollae* Fab., *Syritta spinigera* Loew and *Sphaerophoria flavicauda* Zetterstedt (Fam.: Syrphidae)

Survey of the parasitoid species belonging order Hymenoptera indicated seven primary parasitoid species belonging to two families and two hyperparasitoid species to two families. These recorded parasitoid species were: Primary parasitoids, Fam.: Aphidiidae *Aphidius matricariae* Haliday, *Aphidius colemani* Viereck, *Aphidius* spp., *Diaeretiella rapae* McIntosh, *Ephedrus persicae* Froggatt and *Praon necans* Mackauer. Fam.: Aphelinidae, *Aphelinus* sp. The recorded Hyperparasitoids were from Fam. Cynipidae, *Alloxysta* spp. and Fam. Pteromalidae (*Asaphes* and *Pachyneuron*).

R. maidis and *M. dirhodum* naturally infected with four different entomopathogenic fungal species. Two of them belong to Order: Entomophthorales and other two species belong to Order: Moniliales. These fungi species were from Fam.: Entomophthoraceae, *Panadora neoaphidis* (Remaudiere and Hennebert) Humber, Fam.: Ancylistaceae, *Conidiobolus thromboides* Drechsler. Fam.: Moniliaceae, *Verticillium lecanii* (Zimmermann) Viegas (species complex), Fam.: Clavicipitaceae, *Paecilomyces farinosus* (Holm ex S. F. Gray) Brown & Smith.

There are also other three Hyphomycetes (saprophytic fungi) fungal species belong to Fam.: Euratiaceae, *i.e., Penicillium* spp., *Aspergillus* spp. and *Alternaria* spp.

Different types of unidentified conidiophores and spores were noticed associated with the *R. maidis* and *M. dirhodum.*

R. maidis was the most abundant cereal aphid species occurred on barley plants over the two seasons. Other cereal aphid species were observed in few numbers over the two seasons

The obtained results indicated that *M. dirhodum* was more abundant late in the season during the delayed period of the stem extension growth stage, which lasted until the heading stage of barley development.

It is apparent in both seasons that the trend of population value of *R. maidis* was almost similar in all three sowing dates, however decreased slightly in the delayed sowing dates.

The nymphal instar form was the common recorded form of aphid on barley followed by the apterous form then the alate form. Also, the stem extension growth stage of barley harboured the highest population of *R. maidis* in comparison with the tillering and heading stage at the first, second and third sowing date over the two successive seasons.

The impact of aphids population on barley plants was higher at the first season than the second one for the three sowing dates, respectively. Also, it seemed that the second sowing date harboured the highest impact of aphids on barley than the first or the third sowing date.

The relative abundance of *R. maidis* on the two common barley varieties grown at Giza region (Giza 123 and Giza 124) throughout the two successive seasons 2001/2002 and 2002/2003.

Statistical analysis indicated that there were no significant differences between the two tested barley varieties (Giza 123 and Giza 124) in relation to *R. maidis* infestation.

There were significant response between aphid infestation level and nitrogen fertilization rates for both seasons. The relation was polynomial for the second degree.

Statistical analysis indicated that their were significant relation between the maximum temperature and the aphid population at the second and the third sowing date in both two studied seasons. Also, their were a significant relation between the minimum temperature and the population at the second sowing date for both two seasons. While there were no significant relationship between the relative humidity and the aphid population for both two studied seasons.

The highest fecundity rate for *R. maidis* (47.18 progeny/female) was recorded at 20 ^{o}C.
The longest duration of life span (25.9±7.4 d) was recorded for *R. maidis* at 20^{o}C. At 25^{o}C, *M. dirhodum* had the longest life span duration (19.1±2.8 d) followed by *R. padi* (15.65±2.47 d) and *D. noxia* (15.4±2.1d) came third in that order.

The highest value of R_o for *R. maidis* was 37.75 at 20^{o}C, At 25 ^{o}C, the recorded values of R_o for *M. dirhodum*, *R. padi* and *D. noxia* were 17.76, 16.4 and 3.04, respectively.

The highest value of r_m (0.32) was recorded at 25 ^{o}C then decreased to (0.28) at 20 ^{o}C and to (0.25) at 29 ^{o}C. The lowest (r_m) value (0.06) was recorded at 15 ^{o}C. As shown in Table (31), *R. maidis* recorded the highest value of r_m (0.32) followed by *R. padi* (0.23) then *M. dirhodum* (0.21). The lowest (r_m) value (0.09) was recorded for *D. noxia*.

Developmental rates of the different biological parameters (nymphal instars, life-cycle and generation time) of *R. maidis* reared on barley seedlings were influenced by the constant temperature at which they were exposed. Developmental time for these parameters were shorter and developmental rates were faster as temperature increased. Results obtained by regression equations indicated that there was a high response between temperature increase and developmental rate of different studied parameters.

Out of these equations, the (t_0) value and the (k) value were estimated. The (t_0) values for the nymphal instars (first, second, third and fourth) were (9.16, 7.41, 9.45 and 5.50), respectively. The t_0 value was estimated also, for the life-cycle and generation time of *R. maidis* as 6.84 d and 8.38 ^{o}C d, respectively. The thermal requirements (k) for each nymphal instar, life-cycle and generation time were 15.167, 20.47, 17.05, 25.53, 87.31 and 88.11 degree-days, respectively.

The obtained data of seasonal abundance of aphids were used to develop a prototype program to forecast aphids abundance on barley at different planting dates in relation to plant growth stages. This prototype is a first step towards developing an expert system for prediction of aphids on barley.

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