

Biological Control

BC 1

PRELIMINARY INFORMATION ON *PARLATORIA OLEAE* COLVEE (HOMOPTERA: DIASPIDIDAE) AND ITS NATURAL ENEMIES IN THE APPLE TREES PRCHARDS IN DAMASCUS COUNTRYSIDE. Abdulnabi Basheer, Department of Plant Protection, Faculty of Agriculture, Damascus University, Damascus, Syria..

The olive scale, *Parlatoria oleae* Colvee is an important armored scale insect pest of deciduous fruit trees, olives, and ornamentals in Central Asia the Mediterranean basin, and several regions of the United States. In Kharabo in Damascus countryside *Parlatoria oleae* develops two generations per year. It was found that *Aphytis maculicornis* Masi (Hymenoptera: Diaspididae) is the most important parasitoid of *P. oleae* of apple trees in Kharabo. Among the predators, *Chilocorus bipustulatus* L. (Coleoptera: Coccinellidae) was commonly associated with the olive scale, but with limited effect in controlling this pest.

BC 2

DETERMINATION OF EQUALIBRIUM POINT BETWEEN *HEMIBERLESIA LATANIAE* AND ITS ASSOCIATED PARASITOIDS UNDER FIELD CONDITIONS ON GUAVA TREES. Abd El- Monem Shawky Hassan¹, Kameel Abd Ellateif Hammad², Ali Abd El- Hamed Shahein² and Hassan Ahmed Nabil¹. (1) Plant Protection Research Institute, Dokki, Egypt, E-mail: scalonabil@hotmail.com; (2) Plant Protection Department, Faculty of Agriculture, Zagazig University, Sharkia Governorate, Egypt.

Studies were carried out on guava trees at Kafr Saker district, Sharkia Governorate, Egypt during three successive years 1999, 2000 and 2001 to determined the equilibrium point between *H. lataniae* and its associated parasitoids, under field conditions. Mathematic studies determined the point at which the increase of parasitoids number through their peaks leads to a decrease in number of the insect pest. Mean values of this equilibrium during the three years of studying was 0.65 parasitoid/insect.

BC 3

THE EFFECT OF FIELD APPLICATION OF NEEM AZAL®-T/S AGAINST THREE INSECT PESTS OF COTTON IN NORTH SYRIA. Mahmoud S. Lababidi, Department of Plant Protection, Faculty of Agriculture, University of Aleppo, P.O. Box 12052, Aleppo, Syria, E-mail: m-s-lababidi@popmail.com

The influence of Neem Azal®-T/S (1% Azadirachtin A) applications of 0.2, 0.3 and 0.5% water emulsions, at three different dates, on some insect pests of cotton was investigated under field conditions in north Syria during 2001 and 2002.

Neem Azal®-T/S revealed to be a potential repellent and/or feeding deterrent with toxic properties on *Thrips tabaci* Lind., *Bemisia tabaci* (Genn.) and *Aphis gossypii* Glov. The treatment of cotton seedlings with 0.5% water emulsion of Neem Azal®-T/S preparation significantly decreased the damage of the three harmful insect pests of cotton plants during the early vegetation period after sowing. Results showed that Neem Azal®-T/S was the most appropriate insecticide to be recommended for integrated pest management programs for cotton pests.

BC 4

NEEM AZAL®-T/S (1% AZADIRACHTIN A) FOR THE CONTROL OF OLIVE PSYLLID *EUPHYLLURA OLIVINA* COSTA. AND OLIVE MOTH *PRAYS OLEELLUS* F. IN NORTHWEST SYRIA. Mahmoud S. Lababidi, Department of Plant Protection, Faculty of Agriculture, University of Aleppo, P.O. Box12052, Aleppo, Syria, E-mail: m-s-lababidi@popmail.com

The efficacy of Neem Azal®-T/S (1% Azadirachtin A) was field-evaluated during 2002 in olive tree orchards. The research was carried out in Idlib, northwest of Syria. Two concentrations (0.3% and 0.5%) of Neem Azal®-T/S were used against *Euphyllura olivin* Costa (Homoptera: Psyllidae) and *Prays oleellus* (Lepidoptera: Yponomeutidae), as well as one concentration (0.15%) of Roger® (40% Dimethoate), at two date of applications. Results showed that Neem Azal®-T/S at a rate of 0.5% was highly effective on larvae of *P. oleellus* and on nymphs of *E. olivin*, and is the most appropriate insecticide to be recommended for integrated pest management of both insects. Although Dimethoate effectively control led *P. oleellus* larvae, it was harmful to its parasitoids. Using natural pesticides, such as Azadirachtin A, was beneficial in producing healthy food with no chemical residues, cost-effective, preserved the natural enemies of insect pests, and less polluting to the environment.

BC 5

FIELD INVESTIGATION ON THE EFFICACY OF NEEM AZAL®-T/S AGAINST OLIVE BUDS MOTH *MARGARONIA UNIONALIS* (HBN.) (LEPIDOPTERA: PYRALIDAE) IN OLIVE NURSERIES, ALEPPO, SYRIA. Mahmoud S. Lababidi, Department of Plant Protection, Faculty of Agriculture, University of Aleppo, P.O. Box12052, Aleppo, Syria, E-mail: m-s-lababidi@popmail.com

Recently, a new olive pest that infests olive buds and leaves was recorded and identified as olive buds moth or Jasmine moth *Margaronia* (= *Palpita*) *unionalis* (Hbn.). Within a short period of time, the pest became epidemic in olive nurseries throughout the country. Several insecticides available in the local market were employed as chemical measures for control, but most of them gave limited

effect, and they were harmful to its natural enemies. This work was carried out to compare the effect of bio-besticide Neem Azal®-T/S (1% Azadirachtin A) with the effect of some imported commercial insecticides: Nomolt® 150 SC (Teflubenzuron) and Dimethoate® 40 EC (Dimethoate) on olive buds moth. The site of the experimental trials was a governmental olive nursery in Aleppo, Syria. Five olive seedlings were selected and treated, at three dates of application during 2002, with the aforementioned insecticides three replicates/treatment, including the control. Changes of larval densities and infestation behavior, 24 hr, 5 and 9 days, 2, 3 and 4 weeks after each treatment were recorded. The results obtained were tabulated and statistically analyzed after being transferred into percentages using Abbot's formula. Neem Azal®-T/S (0.5%) showed the highest killing effect of 88% compared to 67 – 79% for Neem Azal®-T/S (0.3%), Nomolt or Dimethoate. Results showed that Neem Azal®-T/S was the most appropriate insecticide to be recommended for the integrated management of *M. unionalis*.

BC 6

THE EFFECT OF FIELD APPLICATION OF NEEM AZAL®-T/S TO CONTROL THE CITRUS MEALYBUG *PLANOCOCCUS CITRI* (RISSO.) (HOMOPTERA: PSEUDOCOCCIDAE) IN VITICULTURE. Mahmoud S. Lababidi, Department of Plant Protection, Faculty of Agriculture, University of Aleppo, P.O. Box12052, Aleppo, Syria, E-mail: m-s-lababidi@popmail.com

The citrus mealybug, *Planococcus citri* (Risso), is a serious pest of grape and citrus fruit trees in Syria. Field experiments were conducted in a grape orchard at Al-Moktariah area in the north of Homs region, Syria. The effect of various concentrations of Neem Azal®-T/S, as a natural insecticide, on the biological activity and mortality rate of immatures and adults of *P. citri* were studied at two different dates during the 2001 season. Results showed that Neem Azal®-T/S at a rate of 0.5% was highly effective on nymphs rather than adults (August in the season), the mortality rate on all insect stages of mealybug reached 86%. It was concluded that extract of *Azadirachta indica* A. Juss. is an effective component in IPM on a range of crops under Syrian conditions.

BC 7

BIOLOGICAL CONTROL OF DATE PALM PESTS IN TUNISIAN GROVES: PRESENT SITUATION AND FUTURE PERSPECTIVES. Othman Khoualdia, INRAT, Centre de Recherches Phoenicicole de Degache, 2260 Degache, Tunisia, E-mail khoualdia-othman@yahoo.fr

Although Date palm plantation is expanding in Tunisia, the commercial quality of dates didn't show a substantial improvement, because of pest damage, notably *Ectomyelois ceratoniae* Zeller, or pyrale of caroubs., In addition to the

Pods of caroub, the larva feeds on a variety of fruits such as quinces, pomegranates, oranges, figs and notably dates on which it causes considerable damage, which can reach 20 % of the national production. *Oligonychus afrasiaticus* Mc Gregor became a major problem for date palm production, because of the considerable damage it causes on dates. The present situation and the perspective of date palm pests control will be presented.

BC 8

STUDIES ON THE BIOLOGICAL CONTROL OF THE SPIDER *THERIDION EGYPTIUM* AS A BIOLOGICAL CONTROL AGENT ON COTTON LEAF WORM. Mohamed Hassan El-Erksousy, Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, E-mail.: hassandahi@yahoo.com

Biological control of agricultural pests using spider species has a good potential to overcome problems associated with the use of chemical pesticides. In this study, the life cycle of *Theridion egyptium* (Therididae) was investigated when reared on the cotton leaf worm *Spodoptera littoralis* (Boisd). The duration of the life cycle was 41.9 and 40.7 days at 26±2 C and 60-70% R.H. for females and males, respectively. The food consumption of females and males was 161.1 and 156.4 individuals, respectively, when fed on cotton leaf worm, *S. littoralis*.

BC 9

RELEASE OF *PHYTOSEIULUS MACROPILIS* (BANKS) TO CONTROL *TETRANYCHUS URTICAE* KOCH ON STRAWBERRY IN ISMAILIA GOVERNORATE - EGYPT (ACARI: PHYTOSEIIDAE & TETRANYCHIDAE). Gamal El-Deen Abdel Magied Ibrahim, Plant Protection Research Institute, 7 Nadi El-Said street, Dokki, Giza, Egypt, E-mail: gamalebrahim51@yahoo.com

The predatory mite, *Phytoseiulus macropilis* was released in a strawberry field at Serabium district (Ismailia Governorate) to control the two-spotted spider mite, *Tetranychus urticae* Koch. A single release of the predator at a rate of about 5 predator individuals/pit was applied at different early dates in the growing season (Nov. 29, Dec. 7 and Dec. 14, 1999) compared with one late release in the growing season (Feb. 14, 2000). Each of the early releases, proved to be more effective than the late release to control the two-spotted spider mites. Pest population reduction ranged between 60-90% after 3-7 weeks from the predator release. Accordingly, the pest population greatly declined during the strawberry flowering and fruiting period, which might positively affect the strawberry yield. Highest pest reductions existed when the predator individuals were released without mixing "vermiculite" or sawdust". The predator individuals moved from the release plots to the control,

intermediate non-release plots, adjacent strawberries and cucumber fields and associated weeds, especially when the two-spotted spider mite was available on these plantations. This also, might indicate the possibility of this predator to be established under the Egyptian conditions on the associated weeds and adjacent plantations.

BC 10

EFFECT OF THE RELEASES OF AMBL YSEIUS FALLACIS (GARMAN) (ACARI:PHYTOSEIIDAE) ON THE TWO-SPOTTED SPIDER MITE ON BEAN PLANTS. Ibrahim H. Helkal, Magdy M.M.H. Fawzy and Saber F.M. Moussa, Plant Protection Research Institute, Agriculture Research Center, Dokki, Egypt.

The acarine predator, *Amblyseius fallacis* (Garman), recently introduced to Egypt from USA, was released on phaseolus bean plants to control the two spotted spider mite, *Tetranychus urticae* Koch at rates of 10 and 5 individuals/2 plants (6,4 and 2 releases). The average number of the spider mites in treated plots was significantly different from that in the control plots and between each other on the sampling dates. The spider mite populations were reduced in the predator released plots, when predator release was at a rate of 10 or individuals/2 plants for five or six releases gave the best results. Releasing the predator at the rate of 5 individuals/2 plants for 2 releases were the least effective.

BC 11

LABORATORY AND FIELD STUDY ON LARVAL PARASITOID *BRACON BREVICRNI* WESM. TO CONTROL SPINNY BOLL WORM *EARIAS INSULANA* BOISED. Mohamid N. Al-Salty¹, Nazar N. Hama² and Ahmed A. Aafy². (1) Arab Organization for Agricultural Development, Arab League Countries, Baghdad, Iraq; Present address: Faculty of Agriculture, Aleppo University, Syria; (2) State Board for Agricultural Research, Ministry of Agriculture, Iraq.

Laboratory studies were conducted on rearing the parasitoid *B. brevicornis* Wesm. on larvae of the alternate host *Ephestia kueniella* Zellar, and included the following: 1) Determining the ratio of adult parasitoid to the number of alternate host 4th instar larvae. 2) Determining the optimum sex ratio for parasitoid laboratory rearing at the rate of 15 larvae of alternate host. 3) Extending of the parasitoid storage period to exceed 45 days by exposing it to cold temperature of 2 °C under laboratory conditions or under prevailing cold winter conditions. Data revealed that the optimum parasitoid/alternate host ratio was pairs of adult parasitoid to larval host which produced 38 adult parasitoids with 73 male: 27 female ratio. Moreover, neither storage at low temperature nor exposing to natural

conditions prolonged the parasitoid storage periods more than 45 days. Field release rate between 100-150 female/donum (2500 m²) have reduced the number of live larvae at different release locations in Iraq.

BC 12

ROLE OF GENUS *METAPHYCUS* MERCET (HYMENOPTERA: ENCYRTIDAE) IN BIOLOGICAL CONTROL OF SOFT SCALES IN EGYPT. Shaaban Abd-Rabou, Plant Protection Research Institute, 7 Nadi El-Seid, Dokki, Giza, Egypt.

Parasitoid species of the genus *Metaphycus* Mercet are the most effective in controlling soft scale insects in Egypt. Surveys conducted during 2000-2001 in different localities in Egypt revealed that six species of this genus were associated with 13 species of soft scale insects. *Metaphycus flavus* (Howard) was the promising species in controlling different species of soft scale followed by *M. helvolus* (Compere). The maximum parasitism rates of *M. flavus* reached 35, 37, 50 and 56% on *Ceroplastes floridensis* Comstock, *Coccus capparidis* (Green), *Coccus hesperidum* L. and *Saissetia oleae* (Oliver), respectively.

BC 13

HOST RANGE AND DISTRIBUTION OF GENUS *ANAGYRUS* (HOWARD) (HYMENOPTERA: ENCYRTIDAE) AND ITS EFFICIENCY IN BIOCONTROL OF MEALY BUGS IN EGYPT. Shaaban Abd-Rabou, Plant Protection Research Institute, 7 Nadi El-Seid, Dokki, Giza, Egypt.

Encyrtid species of the genus *Anagyrus* (Howard) (Hymenoptera: Encyrtidae) is the most successfully used in pest control. A survey conducted during 2000/2001, in different locations in Egypt, revealed this genus on 7 species of mealy bugs. These were *Antonina graminis* (Maskell), *Antonina* sp., *Nipaecoccus viridis* (Newstead), *Maconellicoccus hirsutus* (Green), *Planococcus citri* (Risso), *Pseudococcus* sp. and *Sacchaicoccus sacchari* (Cockerell). Members of this genus were distributed in 7 governorates in Egypt. *Anagyrus kamali* Moursi is the most effective species in this genus in controlling *M. hirsutus* with maximum parasitism rate of 45%, followed by *A. aegyptiacus* on *S. sacchari* with maximum parasitism rates of 32%. The other four species amounted maximum parasitism rates ranged between 5-27%.

BC 14

ROLE OF *LEPTOMASTIX DACTYLOPII* AND *CRYPTOLAEMUS MONTROUZIERI* IN REDUCING THE POPULATION OF THE CITRUS MEALYBUG, *PLANOCOCCUS CITRI* ON CITRUS TREES UNDER GREEN HOUSE CONDITIONS IN GERMANY. Ashraf A. H. Mangoud, Plant Protection Research Institute, Nadi El-Said Street, Dokki, Giza 12618, Egypt

Under green house conditions in Germany, the role of *Leptomastix dactylopii* and *Cryptolaemus montrouzieri* were studied to reduce the population of the citrus mealybug, *Planococcus citri* on citrus trees. Four tree plots were used. In the first plot (10 adults and 15 larvae/ tree) release of *C. montrouzieri* on June 1, 2001 reduced infestation. Pest reduction following the release increased gradually from 0.7 in May before the release to 7.0, 13.7, 26.3, 45.1 and 74.0% in June, July, August, September and October, respectively. Fifteen individuals of *L. dactylopii* were released in the second plot. The results indicated that the level of parasitism following one time release gradually increased from 0.64% before release in May to 5.2, 10.2, 18.8, 26.3 and 35.7%, respectively in June, July, August, September and October. In the third plot (10 adults and 15 larvae/ tree) *C. montrouzieri* was released on the first (June 2001) followed by the release of *L. dactylopii*. The reduction of infestation and parasitism levels were calculated. Following the release of *C. montrouzieri*, the reduction of *P. citri* in the plot was increased gradually from 0.59 in May to 8.2, 20.3 and 34.5%, respectively in June, July and August. In August, 15 adults/tree of *L. dactylopii* were released and the parasitism level increased gradually to reach 98.1%. The results indicated that the release of both the predator, ladybird beetle, *Cryptolaemus montrouzieri* and Encyrtid parasitoid, *Leptomastix dactylopii* gave good reduction in the population of the citrus mealybug, *Planococcus citri*. Elimination of ants was very important, because ants feeding on the honeydew secreted by the mealy bug will prevent the parasitoids and predators from playing their role as biological control agents.

BC 15

SURVEY OF THE WHITEFLY SPECIES: HOSTS AND PARASITOIDS FOR EACH SPECIES IN SYRIA. Randa Abou Tara¹, Fawzi Samara² and Wajih Kassis². (1) General Commission for Scientific Agricultural Research, P.O. Box 113, Damascus, Syria, E-mail: protlib@mail.sy; (2) Faculty of Agriculture, University of Damascus, Damascus, Syria.

A study was conducted to identify whitefly species (Aleyrodidae) in Syria, attacking more than 200 plant hosts causing high losses. Some of these hosts are important economic crops. From studying parasitoids of each species, it was found that there were 9 species specialized in parasitizing whiteflies, one is introduced,

others are indigenous in the studied area belonging to *Calles* sp., *Encarsia* sp. or *Eretmocerus* sp.

BC 16

STUDY OF THE RELATIONSHIP BETWEEN TEMPERATURES AND DEVELOPMENT PERIOD FOR THE GREENHOUSE WHITE FLY *TRIALEURODES VAPORARIORUM*, TOBACCO WHITE FLY *BEMISIA TABACI* AND THE PARASITOID *ENCARSIA FORMOSA*. Randa Abou Tara¹, Fawzi Samara² and Wajih Kassis². (1) General Commission for Scientific Agricultural Research, P.O. Box 113, Damascus, Syria, E-mail: protlib@mail.sy; (2) Faculty of Agriculture, University of Damascus, Damascus, Syria.

The relationship between temperature changes and development period was studied for the parasitoid *Encarsia formosa*, greenhouse whitefly *Trialeurodes vaporariorum* and tobacco whitefly *Bemisia tabaci*, under laboratory conditions. The results indicated that the development period for each of the parasitoid and its hosts was significantly affected by temperature changes, in addition to a strong relationship between them. The development period for the whitefly *T. vaporariorum* was 67, 23 and 19 days under a temperature of 20.29, 26.4 and 33.5 C, respectively. The development period for the parasitoid *E. formosa* intruding on *T. vaporariorum* beginning from the egg stage until adult stage was 46, 21 and 13 days under a temperature of 19.61, 24.47 and 27.2 C, respectively. Whereas, the development period of *B. tabaci* was 80, 22 and 15 days, under a temperature of 18.78, 25.9 and 35.36 C, respectively. Also the development period for the parasitoid *E. formosa* intruding on *B. tabaci* beginning from the egg stage until adult stage 49, 20 and 18 days under a temperature of 18.97, 24.5 and 34.25 C, respectively. It was found that the optimal temperature for *E. formosa* development under laboratory conditions was 27 C, where the development period for the parasitoid lasted 13 days on the host *T. vaporariorum*, which conforms with all previous studies.

BC 17

BIOLOGICAL CONTROL OF THE CITRUS MEALYBUG *PLANOCOCCUS CITRI* RISSO (HOMOPTERA: PSEUDOCOCCIDAE) WITH AN INTRODUCED PARASITE *LEPTOMASTIX DACTYLOPII* HOW (HYMENOPTERA: ENCYRTIDAE) IN TUNISIAN VINEYARDS. N. Mahfoudhi¹, M.H. Dhouibi¹, N. Chabbouh² and R. Bessai². (1) Laboratoire d'entomologie, Institut National Agronomique de Tunisie (INAT), 43 avenue Charles Nicolle, 1082 Tunis, Mahrajène, Tunisia, E-mail: nmahfoudhi@yahoo.fr; (2) Laboratoire de protection des végétaux, Institut National de la Recherche Agronomique de Tunisie (INRAT), Rue Hedi Kharray, 2049 Ariana, Tunisia.

The citrus mealybug *Planococcus citri* is one of the major pests of grapevine in Tunisia. For the control of this pest, an encyrtid parasite, *Leptomastix dactylopii* (How.) was introduced in 2001. The parasite was mass reared on *Planococcus citri* under laboratory conditions and released in vineyards where mealybug infestation on trunks was 83.6%. The release was repeated every 15 days during June, July and August corresponding to the major activity of *Planococcus citri*. After release, the parasitism rate of *Leptomastix dactylopii* was particularly high in autumn period, reaching 57.58 % in august and reaching 93.26% in October, on the third larvae instar and females of *P. citri*. In winter, there was no more mealybug specimens in the treated area.

BC 18

WHEAT CROP PROTECTION BASED ON PLANT RESISTANCE AND BIOLOGICAL CONTROL. A.H. El-Heneidy, Plant Protection Research Institute, ARC, Giza, Egypt, OR P.O. Box 915, Maadi, Cairo, Egypt, E-mail: aheneidy@link.net

Aphids are the major insect pests that attack wheat plants in Egypt. A study was carried out in different agro-ecosystems (Upper-, Middle Egypt and Delta) which represent the wheat regions in the country, aimed to maintain cereal aphids' population at the economic threshold level based on: 1) evaluation of the role of native natural enemies, mainly the parasitoids, 2) selection of resistant and/or tolerant wheat cultivars to aphids' infestation, 3) determination of economic threshold and injury levels, 4) evaluation of the efficacy of some exotic parasitoid species under laboratory, field cages and open fields, 5) evaluation of the effect of some cultural practices such as variety, planting date and fertilization rates on infestation levels, 6) monitoring immigration rates into the wheat fields using sticky traps, finally, 7) field application of all positive results to come out with recommendations that could be transferred to the farmers to achieve reduction of pest infestation rates in wheat fields by using pesticides, only when necessary.

BC 19

STUDYING OF THE EFFECT OF FUNGI *BEAUVERIA BASSIANA* ON THE BIOLOGY AND THE HISTOLOGY OF THE DIGESTIVE TRACT OF *SCHISTOCERCA GREGARIA*. Bissaad Fatima Zohra¹ and Bahia Doumandji-Mitiche². (1) National Protection Plants, P.O. Box 80, El-Harrach, Algeria, E-mail: inpv@wissal.dz; (2) National Agricultural Institute, El-Harrach, Algeria, E-mail: doumandjimitiche@yahoo.fr

The desert locust *S. gregaria* is considered as a permanent threat to all kinds of plant products due to the damage it causes, specially during invasion periods. The only strategy to control this plague is to use chemical pesticides, which is not environmentally safe. To find a safer way to control desert locust, a local clone of entomopathogenic fungus *B. bassiana*, isolated from Adrar (1600 km south Algiers) was tested. This fungus was applied to young 4 days old locusts (imagos). Different doses of this pathogen were applied D0: control, D1, D2, D3. The mortality of the insects varied from the 6th and the 9th day following the treatment. The LC50 obtained was 6.9×10^6 spores/ml. Histological sections in the digestive tract of the insects (control and treated) at LC50 were made according to the technique of MARTOJA & MARTOJA (1967). The different parts of the digestive tract showed significant differences between treated and non treated insects. Microscopic lesions in the intestine stomodeum and proctodeum (anterior and posterior) were caused by the pathogen with an alteration and dissociation occurred between intestinal epithelium and muscle. This means that insects died following food toxicity. The medium intestine (mesenteron) was resistant because of an important enzymatic activity present at this part of the digestive tract which showed down the pathogen action.

BC 20

THE EFFECT OF EGG PARASITIDS ON SUNN PEST ECONOMIC THRESHOLD. A.N.Trissi¹, M. El-Bohssini² and J. Ibrahim¹. (1) Plant Protection Department, Faculty of Agriculture, Aleppo University, Aleppo, Syria; (2) International Center for Agriculture Research in the Dry Areas (ICARDA), P.O. Box 5466, Aleppo, Syria; E-mail: M.Bohssini@cgiar.org

Sunn pest *Eurygaster integriceps*, is a major insect pest of wheat in Syria. This insect significantly reduces crop quality and yield, by feeding on leaf, stem and kernel of wheat. Trials in the field cages were carried out to assess the role of egg parasitoids in suppressing sunn pest populations. The cages (1x1x1.2 m) contained overwintered sunn pest adults at 2, 4, and 6 sunn pest adult/m² and the female parasitoid, *Trissolcus grandis* at 0, 1, 2 and 3 adult/m². Results showed that one female egg parasitoid reduced sunn pest population significantly, up to 4 adults/m² in the cages.

BC 21

BIOLOGICAL CONTROL OF SOME PATHOGENIC FUNGI BY *TRICHODERMA HARZIANUM* AND *BACILLUS MEGATERIUM*. Abdellaziz Taxanna and L. Larous, Department of Biology, University of Sétif, 19000 Algeria, E-mail: a.taxanna@mail.com

The antagonistic effect of *T. harzianum* and *B. megaterium* was tested on various pathogenic fungi (*Fusarium moniliforme*, *F. solani*, *F. graminearum*, *Alternaria alternata* and *Aspergillus flavus*) according to two different methods. In the first method, the PDA medium was inoculated with *T. harzianum* and *B. megaterium* 48h before the addition of pathogenic fungi, whereas in the second, the biocontrol agent and fungal pathogen tested were added together on the medium. Results showed 100% inhibition of some species by *T. harzianum*, whereas the inhibition of *B. megaterium* to the fungi studied was about 90-98%. The second method was less effective than the first, in which the rate of inhibition was only 60-85%.

BC 22

IN-VITRO AND IN-VIVO STUDIES ON THE USE OF *BACILLUS SUBTILIS* TO CONTROL *FUSARIUM OXYSPORUM* F.SP. *LENTIS*, THE CAUSAL ORGANISM OF LENTIL VASCULAR WILT. Said El-Hassan¹, Simon Gowen¹ and Bassam Bayaa². (1) School of Agriculture, Policy and Development, Reading University, Eralely Gate, P.O. Box 236, Reading RG6 6AT, Berkshire, UK, Email: s.el-hassan@reading.ac.uk; (2) ICARDA, P.O. Box 5466, Aleppo, Syria.

Lentil (*Lens culinaris* Medikus) is an important legume crop in Syria. Vascular wilt, caused by *Fusarium oxysporum* f.sp. *lentis*, is one of the most important diseases affecting lentil worldwide. Understanding the dynamics of the pathogen and its bio-control agent in the soil is an important factor in determining the success of biological control. The antagonistic activity of the biocontrol agent (*Bacillus subtilis*) evaluated as the percent reduction of fungal (*Fusarium oxysporum* f. sp. *lentis*) growth due to the antifungal metabolites produced by the antagonistic bacterium was studied in both *in-vitro* and *in-vivo* bioassays. Results from both assays revealed that *B. subtilis* and its filtrate had a strong inhibitory effect on spore germination and mycelial growth of *F. oxysporum* f. sp. *lentis*. In a growth room study, a population of *Bacillus subtilis* applied to 15-days-old susceptible lentil (ILL 4605) seedlings, at 5 ml (8×10^6 cfu/ml⁻¹)/plant, rapidly increased up to 10^7 (cfu/g soil) in 10 days following its application and slightly decreased to 10^6 (cfu/g soil) in 5 weeks after its application. However, in a glasshouse experiment, the population density of *B. subtilis* in the soil was greater

than 10^9 (cfu/g) after 2 weeks of drenching the bacterium suspension either alone or in the presence of the pathogen. This was accompanied by a decrease in wilt incidence of about 70% during 73 days from planting.

BC 23

IN-VITRO STUDIES ON THE POTENTIAL FOR BIOLOGICAL CONTROL OF *FUSARIUM OXYSPORUM* F. SP. *LENTIS* BY *TRICHODERMA HAMATUM*. Said El-Hassan¹, Simon Gowen¹ and Bassam Bayaa². (1) School of Agriculture, Policy and Development, Reading University, Eraley Gate, P.O. Box 236, Reading RG6 6AT, Berkshire, UK, Email: s.el-hassan@reading.ac.uk; (2) ICARDA, P.O. Box 5466, Aleppo, Syria.

Vascular wilt, caused by *Fusarium oxysporum* f.sp. *lentis*, is one of the most important diseases affecting lentil (*Lens culinaris* Medikus) worldwide. Biological control is a promising method for managing lentil vascular wilt. The proliferation and the antagonistic efficacy of *Trichoderma hamatum* in suppressing the saprophytic growth of *F. oxysporum* f.sp. *lentis* was studied in dual culture plates and in the soil. In dual cultures, *T. hamatum* inhibited the growth of *F. oxysporum* and produced abundant conidia in potato dextrose agar plate. In the glasshouse experiment, soil was drenched with *T. hamatum* (6×10^8 cfu/g soil) and its filtrate at 40 ml filtrate/kg soil (vol/wt) around seedlings of a lentil susceptible line (ILL 4605) artificially inoculated with *F. oxysporum*. Percent mortality was reduced to 31% compared to 100% in the control treatment ($p \leq 0.05$) during 73 days from planting. *T. hamatum* appears to be a strong mycoparasite and good competitor of *F. oxysporum* hyphae both *in-vitro* and in the rhizosphere of lentil plants.

BC 24

EFFECT OF SOME FUNGAL ISOLATES ON EGG HATCHING INHIBITION OF ROOT KNOT NEMATODES *MELOIDOGYNE* SPP. UNDER LABORATORY CONDITIONS. Sadek M. Ghazala, Bashier Athman Ghashira and Khalifa H. Dabaj, Plant Protection Department Faculty of Agriculture, El-Fateh University, Tripoli, Libya.

Effect of some fungal isolates *Arthrobotrys* sp., *Fusarium oxysporum*, *Paecilomyces variotii*, *Verticillium* sp. was tested as inhibitors for egg hatching of root knot nematode *Meloidogyne incognita* under laboratory conditions. Results indicated that fungal isolates of *Fusarium oxysporum*, *Paecilomyces variotiim* and *Verticillium* sp., were effective as egg-hatching inhibitors on egg-mass of root-knot nematodes *Meliodogyne incognita* compared with the control. Although, *Arthrobotrys* sp. isolate was not effective as an egg hatching inhibitor, it formed trap rings which captured second stage juveniles after hatching. The results

indicated that these fungal isolates can act as a biological control agents in agriculture soils under natural conditions.

BC 25

BIOLOGICAL CONTROL OF POWDERY MILDEW ON CUCURBITS USING *TELLETIOPSIS PALLESCENS* IN EGYPT. Shawky M. El-Desouky, Plant Pathology Research Institute, Agricultural Research Center, Giza, Egypt, E-mail: shawkidesouki@yahoo.com

Telletopsis pallescens Gokhale is a naturally occurring basidiomycetes fungus isolated from powdery mildewed squash leaves grown in open fields at Giza during the dry summer of 2001. The efficacy of *T. pallescens* was evaluated as a biocontrol agent against powdery mildew (*Sphaerotheca fuliginea*) on squash and cucumber. Control trials were conducted under a greenhouse conditions and open fields by spraying *T. pallescens* spore suspension or spraying with culture filtrate. Mildew severity and conidial density were assessed weekly starting one week from the first spray till the end of the growing period. Spore suspension or culture filtrate of *T. pallescens* provided complete control of powdery mildew on both squash and cucumber plants. Both hosts treated with a spore suspension or culture filtrate had a significant reduction ($P < 0.05$) in the severity of powdery mildew infection compared with plants treated with distilled water or those untreated. Also, the density of *S. fuliginea* conidia was significantly reduced. There were no significant differences between plants treated with spore suspension and the others treated with culture filtrates. The hyphae and conidiophores of *S. fuliginea* were shrunked, collapsed and disintegrated within 24 h after treatment. Mildew structures were absent on the surface of leaves 72 h after treatments. Biocontrol activity of *T. pallescens* appears to be as eradicant was and associated with enzymes or metabolites produced in the culture filtrate. Results demonstrated the potential of *T. pallescens* for biological control of cucurbit powdery mildew under commercial growing conditions.

BC 26

BIOLOGICAL CONTROL OF SOYBEAN DAMPING-OFF CAUSED BY *SCLEROTIUM ROLFSII* USING *PSEUDOMONAS FLUORESCENS* AND *PSEUDOMONAS PUTIDA*. Ahmed M. Hassanien¹ and Gamal A.A. Mekhemar². (1) Plant Pathology Research Institute, Agric. Research Center, Giza, Egypt, E-mail: ahmedhassanein48@yahoo.com; (2) Soils, Water and Environment Research Institute, Agric. Research Center, Giza, Egypt.

Two biocontrol agents *Pseudomonas fluorescens* and *Pseudomonas putida* were evaluated for controlling of soybean damping-off caused by *Sclerotium rolfsii* under laboratory and greenhouse conditions. The effect of both biocontrol agents

on nodulation and growth of soybean was also investigated. Data showed that *Pseudomonas fluorescens* and *Pseudomonas putida* caused significant reduction in mycelial radial growth of *Sclerotium rolfsii* on king's B medium only. The results obtained showed that *Pseudomonas fluorescens* and *Pseudomonas putida* significantly reduced pre- and post-emergence damping-off caused by *S. rolfsii* and increased plants survival individually or combined with *B. japonicum* (USDA 110 + 3407). The maximum protection of soybean plants was achieved by seed inoculation with *Pseudomonas fluorescens* combined with *B. japonicum*. Co-inoculation with *Pseudomonas fluorescens* and *B. japonicum* gave the best results in terms of number, dry weight of nodules, shoots, roots and their N-content. Generally, it was clear that the best results were obtained in case of co-inoculation with the three biocontrol agents which reduced damping-off and enhanced nodulation status and growth of soybean plants.

BC 27

FABA BEAN SEED SOAKING IN SOME BIO-AGENTS AS PROPHYLACTIC TREATMENT FOR CONTROLLING MELOIDOGYNE INCOGNITA ROOT-KNOT NEMATODE INFECTION. Wafaa M.A. El-Nagdi and M.M.A. Youssef, Plant Pathology Department, Nematology Laboratory, Research Center, Dokki, Cairo, Egypt.

Faba bean seed soaking or soil treatments with some bio-agents as abamectin, strain of *Bacillus thuringiensis*, nemaless (containing strain of *Serratia marcescens*), sincocin-AG compared to the nematicide oxamyl 24% L significantly ($P \leq 0.01$ and/or $P \leq 0.05$) reduced the population density of *Meloidogyne incognita* with an increase in the measured plant growth. On this basis, seed soaking was recommended as an economical, easy and pollution free method for managing *M. incognita* on faba bean plants.

BC 28

BIOLOGICAL CONTROL OF ROOT ROT OF WHEAT BY THE USE OF SOME ISOLATES OF TRICHODERMA LONGIBRACHIATUM. Houda Boureghda and Louiza Sidhoumi, Département de Botanique Instiut National Agronomique(INA), El Harrach, Alger, Algeria. E-mail: houdaboureghda@yahoo.fr

Root rot of wheat caused by a complex of fungi (*Fusarium graminearum*, *Fusarium culmorum*, *Fusarium avenaceum* and *Cochliobolus sativus*) is one of the most important diseases of wheat culture in Algeria, Biological control of this disease by the use of 3 isolates of *Trichoderma longibrachiatum* showed that these isolates have an antagonistic effect against *Fusarium graminearum* *in vitro* and *in vivo*. *In vitro* and when inoculated in dual cultures with the 3 isolates *T.*

longibrachiatum grew faster and reduced the growth and the conidia production of *F. graminearum*. The culture filtrates of the three isolates *T. longibrachiatum* reduced the conidia germination of *F. graminearum*. *In vivo*, the treatment of wheat seed by a spore suspension of *T. longibrachiatum* before sowing in a soil already infested with *F. graminearum* showed a net decrease of disease severity compared with the control. Differences between the efficacy of the three *T. longibrachiatum* isolates against *F. graminearum* *in vitro* and *in vivo* were noticed.

BC 29

BIOLOGICAL CONTROL OF SOIL-BORNE FUNGI IN GREENHOUSE.

M. Taweel¹, B. Alrahban² and G. Abdulrahman³. (1) Plant Protection Department, Faculty of Agriculture, Tishreen University, P.O. Box 1244, Lattakia, Syria, E-mail: mtawil@scs-net.org; (2) General Commission of Scientific Agricultural Research, P.O. Box 113, Douma, Damascus, Syria, E-mail: protlib@mail.sy; (3) General Commission of Scientific Agricultural Research, Agricultural Research Center, Lattakia, Syria.

This research was carried out to determine the effect of some biocides in controlling the soil-borne fungi *Fusarium* spp. the causal agent of wilt disease in greenhouse. Two types of biological pesticides were used, the fungus *Trichoderma harzianum* and the bacterium *Bacillus subtilis*, and they were compared with some chemical pesticides. Results has shown the efficiency of biocides to protect gerbera plants, by reducing infection rate from 11.7 to 8.1% for *Trichoderma* and from 18.0% to 4.5% for *B. subtilis*. The effect of the chemical pesticide Benomyl was weak because of infection stability through experiment stages. Also the chemical pesticide Tashgarine didn't reduce the infection but raised it after 100 days of treatment from 9.3% to 14.9%. In case of strawberry, the efficiency of biocides reached 57.7 and 70.9% for *Trichoderma* and *B. subtilis*, respectively, in comparison Tashgarine with which reached 66.6%. These results were accompanied by an increase in fruit weight of 127.4% for *Trichoderma*, 115.0% for *B. subtilis* and 76.8% for Tashgarine as compared to the control.

BC 30

STUDY OF THE EFFECT OF AMMOIDES PUSILLA (BROT.) BREIST.

ESSENTIAL OIL AGAINST PSEUDOMONAS SP. H. Laouer, M.M. Zerroug, M. Fenni and A.N. Shaker, Laboratoire de valorisation des ressources biologiques, Department of Biology, Faculty of Sciences, University ferhat Abbas, Sétif, 19000, Algeria, E-mail: hocine_laouer@yahoo.fr

The essential oil of *Ammoides pusilla* was tested by the agar diffusion test against 3 bacteria strains, *Pseudomonas aeruginosa* ATCC 27853, *P. syringae* pv *syringae* and *P. syringae* pv *mosprunorum*, and the Minimal inhibitory

Concentration (CMI) and (QMI) Minimal inhibitory Quantity were calculated against *P. aeruginosa* ATCC 9027. The results showed that the 1/2 dilution of the oil had the highest effect against the phytopathologic bacteria strains (*P. syringae* pv *syringae* and *P. syringae* pv *mosprunorum*) except *P. aeruginosa* ATCC 27853 which was less sensitive to all concentrations. The CMI was 0.12% and the QMI was 10 µl after more than 6 days of incubation. The oil effect is mainly due to its richness with thymol (44.5%).

BC 31

CULTURE MEDIA FOR MASS REARING OF THE ALTERNATE HOST MEDETERANIAN FLOUR MOTH (*EPHESTIA KUEHNIELLA* ZALLER). Nazar N. Hama¹, Mohamid N. Al-Salty², Amal N. Al-Khalidy¹ and Muna A. Zain Al-Abideen¹. (1) State-Board for Agricultural Research, Ministry of Agriculture, Baghdad, Iraq.; (2) Arab Organization for Agricultural Development/Arab league Countries; Present address: Faculty of Agriculture, Aleppo University, Syria.

A study was conducted to search for a culture medium for mass production of eggs and larvae of the alternate host Mediterranean flour moth (*Ephestia kuehniella* Zeller) which consequently will be used for mass rearing of two cotton boll worm parasitoids, namely *Trichogramma* spp. and *Bracon* spp. Three different types of "seamids" (Coarse wheat flour) (Syrian, Iraqi and Jordanian seamids) in addition to the classical medium, consisted from crushed wheat, yeast and date syrup (dibbis), were investigated. Selected biological parameters such as weights of male and female pupae, fecundity and generation durations have indicated that Syrian and Iraqi seamids were equally superior. Syrian seamid gave an average weight of 50 pupae of 0.732 g male and 0.814 g female, and fecundity was 39 eggs/female while generation duration was 41 days. Similarly, Iraqi seamid gave an average of 50 pupae to be 0.691g for males and 0.762g for females, fecundity was 41 eggs/female and generation duration was 44 days. Classical media gave an average weight for male pupae 0.532g and 0.615g for female pupae and fecundity was 22 eggs/female while generation period was 36 days. Jordanian seamid data was excluded due to microbial contamination during larval development.

BC 32

BIOLOGICAL CONTROL OF BEAN ROOT ROT. A.K. Al-Taae¹ and N.Y. Al-Murad². (1) Plant Protection Department, Agriculture College, University of Mosul, Mosul, Iraq; (2) Bio. Department, Science College, University of Mosul, Mosul, Iraq.

Integrated control measures to reduce the incidence of bean damping off were evaluated. Results showed that seed treatment with the bacterial agent, *Bacillus subtilis* gave the lowest infection incidence with the fungus *F. solani* and

the best combination of control measures of *F. solani* was seed treatment with Benlate + treatment of soil with *T. hazianum* and Al-Tahadi fungicide. The best single control component for reducing *M. phaseolina* infection was the treatment of seeds with Benlate. Second best was seed treatment with the bacterial agent *Pseudomonas fluorescens*. Most of the dual and triple treatments which contain the fungicide Benlate with other components of control showed good results and were superior to the control treatment. Soil treatment with *T. hazianum* was superior to other individual treatments in case of *R. solani*. The best combination of control components was seed treatment with Benlate and soil treatment with *T. hazianum*.

BC 33

USING SUGA BEET RESIDUES IN CONTROLLING OF DAMPING OFF AND ROOT ROT OF SUGARBEET DISEASES. Nidhal Yonis Mohammed and K. H. Taha, Department of Plant Protection, College of Agriculture and Forestry, University of Mosul, Iraq.

A study was conducted to evaluate the effect of sugar beet residues on sugar beet damping off and root rot diseases, caused by *Pythium debaryanum* and *P. ultimum*, two isolates of *Rhizoctonia solani* and *Fusarium solani*, and by using four varieties of sugar beet (Desprez, Tribble, Semirave and Ovata). The results showed that the two varieties Tribble and Desprez were less susceptible to these fungi. There was a strong evidence for an effective role of *Trichoderma harzianum* Biotype Th(20KI) as a biological agent, as disease incidence was reduced when the soil was supplanted with sugar beet residues.

BC 34

THE INFLUENCE OF THE INHERITED STERILITY ON THE BEHAVIOR OF THE CAROB MOTH *ECTOMYELOIS CERATONIAE* (LEPIDOPTERA: PYRALIDAE). J. Mediouni¹ and M.H. Dhouibi². (1) Institut National de la Recherche Agronomique de Tunisie, Rue Hédi Karray, 2049-Ariana, Tunisia, E-mail: joudamediouni@lycos.com; (2) Institut National Agronomique de Tunisie, 43 Rue Charles Nicoles, 1082 Cité Mahrajene Tunis, Tunisia.

The Carob moth *Ectomyelois ceratoniae* Zeller is the most important and destructive insect pest of dates (*Phoenix dactylifera* L.) in Tunisia. It is a polyphagous insect which causes serious injuries on several other host-plants, both in storage and in the field in the Mediterranean basin and Near East regions. It induces great economic losses each year. The successful results of sterile insects program established against many moths and the possibilities of developing sexually defined strains in Lepidoptera, encouraged us to try the inherited sterility as a biological control method against carob moth. Therefore, since 1999, a control program was conducted in Tunisia focusing on the release of either partially sterile

males or fully sterile females of carob moth, *Ectomyelois ceratoniae*, treated with gamma rays. The effect of 400 Gy gamma rays dose on males spread and females attraction was investigated. Results showed that males treated with this dose were able to fly up to 120 m from their release site. According to trap records, it seems that irradiated females were similar to non-irradiated females in attracting males suggesting that irradiation has no harmful effect on females attractivity.

BC 35

***CYDIA POMONELLA* (L.) FIELD PERFORMANCE OF GAMMA IRRADIATED AND REARED CODLING MOTH MALES.** Fater Mohamad and Mohamad Mansour, Atomic Energy Commission, P.O. Box 6091, Damascus, Syria. E-mail: atomic@aec.org.sy

Marked codling moth males, reared during immature stage on a local artificial diet, were released in a square plot (20 x 20 m) of two separate orchards. One of the orchards received sterile males exposed to 350 Gy (treatment), while the other received non-sterile (normal) males and served as the control treatment. To monitor the performance of sterile and normal males, pheromone traps were hung at certain distances (one trap/50 m) of the release site in each orchard, covering all four directions for 300 m. Traps were checked daily for up to ten days after release. Results showed that number of normal males was significantly less than sterile males at the first 50 m from the dispersion point (61.5% for normal, 76.3% for treatment), normal males, however were captured more frequently at larger distance. For instance, the percentage for normal and sterile males were 17.2, 12.4% at 100 m, 10.4, 3.8 % at 150 m and 7.2 , 2.1% at 200 m, respectively. A small percentage of normal males (2.8%) reached 250 m, whereas sterile males did not. These results indicate that sterile codling moth males exposed to a dose 350 Gy don't have the same dispersion ability as control ones. The results also showed that the number of sterile males that responded to sex pheromone were less than the normal males in the first and second day after release, However they become more frequent on the third and fourth day, decreased on the fifth and stopped completely on day six.

BC 36

IMPORTANCE OF HONEY AND WILD BEES AS POLLINATORS OF PLANTS AS PART INTEGRATED PEST MANAGEMENT FOR AGRICULTURE PRODUCTION DEVELOPMENT IN THE MITIDJA AREA, ALGERIA. Leila Bendifallah-Tazerouti¹, Salaheddine Doumandji² and Kamel Loudi³. (1) National Institute of Plant Protection, El-Harrach, 67 avenue of 1st. November, Rouiba, Algiers, Algeria, E-mail: bendif_1@yahoo.fr; (2) National Institute of Agronomy, El-Hrrach, Algiers, Algeria; (3) Sciences Mentouri University, Constantine, Algeria.

The study was conducted during the spring periods of the years 1999 and 2000 in Mitidja area (Algeria) on reared and wild honey bees to come up with an inventory of these insects and to study their role as pollinators of plants. Consequently, their impact on production, amelioration and plants protection was evaluated.