Studies on some corn borers parasitoids

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SUMMARYLaboratory studies were conducted to find out the efficacy of Delfin (ahioinsecticide derived [Tom Bacillus thuringiensi« var. kurstaki) onthe first instar larvae of Sesamia cretlca and the second instar larvae ofOstrinia nubilalls, and also the inspect. ofConsuJt (an1.G.R.) on thefirst instal latvae of S. cretlca. Laboratory studies were also oriented toConomorium sp., which was first recorded in Egypt as pupalendoparasitoid on S. eretica. On the other hand, field included surveyof paJasitoids on immature stage of S. cretica and O. nubilalis and thepercentages of parasitism on pests infesting summer and 1 iliplantations in addition to assaying different control methods against thetwo mentioned pests. The obtained results may be summarized asfollows:Laboratory studies:1-1- Effect of bioinsecticide (Delfin) on Ostrinia nubllalls andSesamia cretica.The efficacy of Delfin (a commercial product of Bacillusthuringiensis) on the 2nd instar larvae of O. nubilalis and 15t instarlai ae of S. eretiea were studied. After 48 hours [rom treatment, theLC50 values were 10 104 S.U. on O. nubilalls and 5.2 x 104 S.U. on S.cretlca. A negative relationship was determined bet een the appliedconcentration of Del fin and LTso' value i.e. the LT5G was shortened bJthe increase of Delfin concentration in both of O. nubllalis and •.'.cretica. In addition these values were shorter in case of I~1instar larvaeof S. cretica than those of the 2nd instar larvae of o. nubilalis at thesame concentration of Delfin.SUlllmarv- IM,-1-2- ElTect or I.G.R. (Consult) on S. creticaThe lsf instar larvae S. cretica were fed on fresh succulent rolledleaves of maize plants dipped in different concentrations of Consult.The Leso value was 72 p.p.m., 24 hours after treatment. The LT50 wasshortened by increase in Consult concentration.1-3- Morphological studies on Conomorium sp,This study included the first record of Conomorium sp. on S. creticapupae. This parasitoid was identified by Dr. Hannes Baur, staffmember Natural History Museum (Bern, Switzerland).1-3-a-The different immature stages of Conomorium sp, (egg, 4 larvalinstars, prepupa and pupa) were briefly described.Egg of hymenopterous type, on deposition it measures 0.7-mm. longand 0.28 mm. at its widest part. The size of egg increased asdevelopment proceeds to reach 1.31-mm in length and 0.437 mm inwidth, just before hatching. The larva could be easily discerned throughthe transparent chorion. The larva molts three times during itsdevelopment, i.e. it develops through four larval instars.The 151 instar larva is 1.4 mm long and 0.525 mm wide, the body 13segmented. The head capsule measured 0.21O-mm length and its width0.210-mm. Each of the mandibles of 0.14 nun length and 0.070 mmwidth. The 2nd instar measures 2.625-mm in length and 0.7 mm inwidth. Head length and width measured 0.245 and 0.42 mm.Mandibles are O.175-mm long and 0.1OS-mm width. The 3rd instarmeasures 4.2-mm long and 0.875-mm wide. The head capsule is 0.21mm long and 0.315 nun wide. The mandibles are larger in size andIIHl1l:Jrvmore pigmented than in the preceding stage. Each mandible has broodrounded base and tapers to a sharp end. It measures 0.21mm in lengthand O.14mm at its base. The 4th larval instar measures 3.325mm longand 0.857 mm wide. The head capsule is 0.179 mm in length and 0.208mm at its widest part.Prepupal stage is formed inside the host pupa and measured 2.9-mmin length and 1.0 rum width. The posterior parts of prepupa lackssegmentation. Prepupa transfers to a free type pupa."which is about 3-nun long and 2.2-mm wide. At the beginning of this stage, the pupa iscreamy in colour, the compound eyes and ocelli appear red. Asdevelopment proceeds, the body darkens gradually starting with thehead and thorax, which become black. Legs appear brown with yellowin some parts.1-3-b- The average duration's of the egg, the four larval instars, theprepupa and pupa occupied 1.75 ± 0.25,2.25 ± 0.25,3.5 ± 0.09 3.75 ±0.20 4 ±O.18, 1.13 ± 0.12 and 8.5 ± 0.23 days respectively at 25°Cand 65 ± 5

% R.H. The total larval period occupied 13.5 ± 0.72 daysand the total developmental period was 24.88 ± 1.32 days.1-3-c- Emergence of parasitoid adults occurs from one or two holes ofa circular shape and 1- 1.5-null diameter. Emergencies is finishedwithin few hours.1-3-d- Sexes could be easily differentiated by the close e amination ofantenna and genitalia. The antenna is of geniculate type and consists oflong scape, a shorter pedical and a 7-segmented flagellum in bothsexes. The flagella are longer in male (1.22mm) than female (1.05mm).Male has also a pale yellow ring, on the ventral side of abdomen, whichis not present in female.Summar”- I (,X -1-3-e- .hlling occurs immediately just after emergence. Males wereable to male al any lime <luling their whole life and the mating berepealed several limes within a <lay. Females accepted to mate morethan once.1-3-f- Oviposition processes is described.f-3-g- Host range: under laboratory condition Conomorium sp. wassuccessfully reared on A. lpsilon; S. cretica and S. llttoralls but it failedcomplete parasitism on Ostrinia nubilalls; Chilo agamemnon; Eariasinsulana; Pectinophora gossypiella and Anagasta kuehnlella.1-3-h- Effects of different temperature conditions (15, 25 and 35 DC) onoviposition. period, longevity of adult female, total developmentalperiod, number of adults in progeny per female and sex ratio weredetermined. Data indicated that, 25 DC was the most favorable for theegg laying acti vity of Conomorium sp. At this temperature, the femalelived for a mean period of 27 day, The total developmental periodscr 25.9 (24-30) day’, An adult female produced (72- 375) adultswith a sex ratio of lmale: 12.95 females.1-3-1- Effect of copulation on sex-ratio, ovipositional activities rate ofoviposition and life-span in Conomorlum sp.Data indicated that copulation is 110t the factor that stimulatesoviposition. Urunated females deposit eggs as well as mated ones, butthe progeny obtained ill the former case are males. The number ofproduced adults was nearly the same in both cases. It was also foundthat mating did not affect the ovipositional activities, life-span of adultfemale and the number of eggs deposited female during its life-span.SIJ IIImmy1-3-j- Effect of rearing the parasitoid all different host species on thenumber of progeny, sex-ratio and life-cycle:In association with pupae of two host species, ..’.. cretica and A.oipsilon, and rearing the parasitoid at 30 ± 2 C & 70 ± 5 % R.H., thelife-cycle average (16.8] ± 0.] 4 and 17.44 ± 0.22) days, respectively,indicating shorter life-cycle by rearing on S. cretica. Insih’1lificaJlldifferences were found between rearing on both species ill the numbersof adults in progeny and the numbers offemale resulted. Sex-ratio wasin favor to rearing of the parasitoid 011 S. cretica (1: 7.9) opposed to 1:4.67 in case of rearing the parasitoid onA. ipsilon.1-3-k- 1 umber of generations of Conomorium sp. per year III thelaborarory:It was found that the parasitoids have 13 generation per year underlaboratory condition,1-3-1- Effect of suppiementary food on the longevity of Conomoriumadults:Longevities of adult male and female parasitoids were considerablyshort under the state of starvation and when water only was supplied. Inthe case of male feeding on bee honey with 20 ~o-d.ried ~ea tresultedthe longest. life-span. In case of females, the lange t life-span (12.7 ±0.77days) was obser ed when fed on 50 % sucro e solution.1-4- Storage of Conomorium sp. adultsIn four laboratories experiments carried out at 10 ’c, the effect oflow lemperature storage on adults of Conomorium sp. adults wasmeasured.1-4-a-EITect of torage on mortality rates among Conomoriumadults:A number of 50 females and that of 50 males were stored at 10 ’c fordifferent periods (20, 30 40, 50 60, 70, 80, 90 and 100 days). Aftersuch periods the mortalities among females were 10 26, 46, 60,62 68,74, 78 and 82%, respectively. While in case of males those were 8, 28,52, 68, 72, 78, 86 90 and 92 % respectively. These data indicated thatfemales more tolerant to cold storage than males.1-4-b- Effect of storage at 10 DC for different periods on matedfemales of Conomorium sp.:The experimented mated females lived for 36 38, 36.1 and 25.2days, respectively. The mean number of adults re ulted per femaleduring life- span after such periods of storage were 101.3, 83, 75.1 and72.2, respectively. Number of adult females resulted per female were91.6, 74.5,67.1 and 36.7 respectively, while those of males in progenywere 9.7, 8.5, 8 and 8.5,respective1y. It could be concluded that, thestoraze of the adults mated female for a maximum of 90 davs is the ~ Jfavorable one. By storage for 90 days, the longevity of adults femaleswas not affected significantly from those recorded for storage [or 30 or60 days.J-.t-c- Effect of storage for different periods on Conomorium sp,virgin females:The experimented virgin females’ len to male with freshly emergedmales before introduction to parasites. Females lived for 38.1,42.4,37.3 and 27 days. The mean number of adults resulted per femaleduring life-span after such storage periods were 102.5, 86, 80 and69.7,S1I1ll1ll<l rvrespectively. umber, of adults female

resulted per female was 94.2,78.4, 73 and 63.5 respectively. The average numbers of male amongthe progeny were 8.3, 7.9, 7.1 and 6.2 in association with theaforementioned periods of storage.1-4-d- E'ITecL of storage of males for different periods on (hefertilitv: '"Storage of males at lOCo for 25, 35 or 45 daJ s induced adverseeffects upon males. The maximum suitable period for storage adultmales of Conomorium sp. was 25 daJ s. At such period of storage,males were able to gi e after mating a progeny of males and femaleswith sex ratio of lmale: 7.3 females.II-Field studiesThe present study was carried out during maize summer and Niliplantations at vloshtohor during 1998 and 1999. Summer plantationwas sown on April zo" 1998 and April 28th. 1999. While, the liliplantation was sown on July io" of each year' The study aimed to findth r 11 . out e touowing:II-I-Survey of the parasitoids and percentages of parasitism:lI-l-l-Egg parasitoidsA-Platylelenomu.. hylas ixon (Hymenoptera: Scelionidae)This parasitoid emerged [rom S. cretica eggs collected throughoutboth summer and 1 ili plantation of the two J ears, the parasitoidshowed lWO periods of activity that coincidence with the period ofpresence of S. cretica eggs in the field. During summer plantation, thefirst period of activity extended from the second week of May to theuITImaryend or this month (2.17- 15 %) while the second period was detectedfrom Ihe til ird wee k of J une to the begi nning 0I .Iuly (3 1. 16- 4 I .66 ~~lparasitism).In the two ili plantations, the first period occurred from the Iir .t to thethird week of, August (25- 54.28 % parasitism). While, the secondperiod was from the second to the 4th week of September showinghighest rate of parasitism (88.88 - 100 %) 011 S. cretica eggs.B- Trichogramma evanescens West, (Hymenoptera:Trichogrammatidae)The percentages of parasi tism by T. evanescens were estimated in O.nubilali eggs infesting maize plants of -lili plantations of the twoyears of study. These percentages started low and increased as theeason advanced. TIle highest percentages of parasitism were (60 %on September 19th 1998 and 61.22 % on September 24th 1999.II-1-2-Larval parasitolds:A-ApanleLes sp. (Hymenoptera: Braconidae)It is a gregarious endoparasitoid on S. cretica larvae detected duringsummer plantation of the two year . In 1998, the percentages ofparasitism ranged from 1.14 % on May so" to 9.09 % on June 201.';. inthe subsequent year, those ranged from 1.11 % on . lay, 3 l st to 8 % onJune 21st.B- Bracon brevicornis Wesm, (Hymenoptera: Braconidae)1- On S. cretica larvaeThis gregarious ectoparasitoid was detected late in the summerplantation and ili seasons. In summer plantation, percentages ofparasitism ranged from 3.13 % on June 6th to 3.84 % on June 13th in1998, and from 1.8S % on June ih to 4.41 % on June 13th in 1999. InNih season, the percentages of parasitism ranged from 2.44 %) onSeptember 24th to 3.70 % on October ih 1995, and 2.56 % onSeptember, n" to 5 % on September 2ih 1999.2- On O. l1ubilalis larvaeThe parasitoid was detected in the Nih plantation parasiusmg O.nubilalis larvae. In 1998, the percentages of parasitism ranged from1.77 % October 1st to 3.33 % on September 24th. Ln 1999 liliplantation, percentages of parasitism ranged from 2.4 7 % on October,1~1to 2.54 % on October 8th.c- Meteorus rubens Nees (Hymenoptera: Braconldae)M. rubens i a gregarious endoparasitoid, which was secured fromlarvae of S. cretica infesting maize plants of the summer plantation.The percentages of parasitism ranged from 2.08 on June 6th to 3.84 %on June is" 1998 and from 1.11 % on May 31st to 3.7 % on June 13til1999D-Tachina larvarum (L.) (Diptera: Tachinldae)This dipterous parasitoid parasitised S. cretica larvae. In ili plantationof 1998, the rate of parasitism ranged from 2 % on September io" to2.44 % on September 24th. In the subsequent lili plantation 1999,percentages of parasitism ranged from 1.33 % on August 23rd to 2.22 %·th on August 16 .11-1-3-Pupal parasitoidConomorium sp. (Hymenoptera: Pteromalidae) is a parasruc wasp,nev ly recorded as endoparasitoid on the pupae of L: cretica duringsummer plantation of the t 0 years. In 1998 season summer plantationthe percentages of parasitism ranged from 10% on July 4th to 16.67 %on June zo". In 1999, the percentages of parasitism were 7.(1) % allJune 211 to ~O%on July s"11-2-I-Methotl for S. ere/lea control:A bacterial bioinsecticide (Delfin) Delfin + I %NaCI, and an insectgrowth regulator (Consult) were assayed for the efficacy in controllingS. creticu infesting maize plants culti vated in (U] area of about hal [afeddan divided into 16 equal plots. Every 4 plots received a treatmentand the remaining 4 plots were left as control. All plots weredistributed in randomized block design. According to the obtaineddata, the applied materials could be divided as follows:1- Highf efficient, including Delfin + I % NaCl hich caused66.51 and 38.84 % reductions in the numbers of perforated leavesdue to S.

cretica larval feeding opposed to 37.88 and 20.38 leavesin the control plants of the 1998 and 1999, respectively. Thistreatment reduced the mean larval counts 110 infested plants andcaused % reduction than control by 47.39 and 27.01 %in 1998 and1999, respectively.2- Intermediately efficient, in luding Delfin treatment as thispreparation caused 64.74 and 26.85 %reduction in the perforatedleaf number than control plants, respecti vely. As to % reductionthan control for the larval COWltSper / 10 infested plants, those were40.62 and 20.11 % in the two years, respectivelj .3- Least efficient, represented by the Consult treatment whichcaused 42.59 and 28.51 % reductions, respectively in the number ofleaves perforated by,S. cretica larvae than control. The reductionpercentages in larval counts 10 infested plants were 21.88 in 1998and 13.79 % in 1999.SlIlllmarv1I-2-2-ElTect of different treatments on the percentages ofparasitism:a- Egg parasitold:The natural role of parasitism by P. hylas in eggs of S. cretlca wasnot affected when maize plant.' were sprayed with Delfin or Delfin +1% NaCl. Spraying maize plants by Consult cau ed sib'Tlificantreduction in the 0 erall percentages of parasitism.b- Larval parasitoids:The collected larvae of S. cretica were found to be parasitised byApanteles sp., Bracon brevicornis and Meteorus rubens. Theobtained data indicated that the spraying of maize b", Delfin or Delfin+ 1 0-10 Tad did not affect on the occurrence of the three larvalparasitoids. On the contrary, no parasitised S. cretica larva wasdetected in the Consult treatment.II-3- Evaluation of Triclwgramma evanescens and Bacillusthurtngiensts in control management of 0. nubilalis.A biological control program was planned for controlling theEuropean com borer, O. nubilalis using Trichogramma evanescensand Bacillus thuringiensis. An area of half a feddan was elivided to16 equal plots, which received 3 treatments and control in maizeplants cultivated i11 1998 and 1999. Releases were carried out twice at7 day intervals at a release level of about 33 000 wasps for each one.One B. thuringiensis spray wa applied against host larvae thatescaped T. evanescence parasitism. Data indicated the following:1-1n 1998, infestation to maize plants by E.C.B. egg masses of beganon August 15th and reached to the peak on September 5lh.In theSUl1l1n;)I"'- 17(, -subsequent year first detection of egg masses occurred on August 191hand the peak was on September Ialt!.2- The release rate of 66,000 wasps I leddan induced rate orparasiusm In Trichogramma and Trichogrumma + B.thuringiensis plots by 69.87 and 70.69 % in 1998 and by 75.12 and73.76 %, respectively in 1999.3- 1l could be stated that the combined treatment (Trichogramma +B. lit uringlensisy is the best treatment. In such treatment, thepercentages of reduction in the mean number larvae O. nubilalls atharvest were 20 and 13.33 % in 1998 and 1999, respectively andinduced a reduction in the infestation to ears than control by 66.67and 73.33 %, respectively in the two years of study.4- One B. thuringiensis treatment is not sufficient to prevent thelarval attack to maize plants. This treatment caused 30.29 %and34.09 % reduction in the mean numbers oflarvae per 10 plants thancontrol in the two year of study. This treatment resulted 53.33 %and 46.67 %infestations to ears, thus indicated lowest reduction inthe infestation rate than control by 11.11 in 1998 and 6.67 % in1999.