Studies on efficiency of some new pest control measures against certain pests of common pean

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Population studies were carried out to estimate the population abundance of major pests of common bean plants i.e., Liriomyza trifolii, Aphis craccivora, Bemisia tabaci and Tetranychus urticae and also, to evaluate the efficiency of some new control methods i.e., the organophosphorus compound, Selecron 72%EC. (Profenofos), the two botanical insecticides (Achook 0.15% & Bemistop 21.1% EC.), the bioinsecticide, Biosect 32 x 106 conidia/mg (Beauveria bassiana) and the insect growth regulator, Admiral 10% EC. (Pyriproxyfen) and their mixtures against the abovementioned pests.Experiments were conducted at the Experimental Station of Faculty of Agriculture at Moshtohor, Qalyubia Governorate during the two successive seasons of 1999 and 2000 and duringsummer plantation of 2004.Besides, the effect of the sub lethal concentrations of the various treatments was investigated on some biological aspects of Liriomyza trifolii and Aphis craccivora. Further more, the efficiency of the parasitoid, D. isaea was studied for controllingLiriomyza trifolii. 1-Population fluctuation:The population abundance of Liriomyza trifolii and its larval parasitoid, Diglyphus isaea, Aphis craccivora, Tetranychus urticae and Bemisia tabaci on common bean plants was estimated during nili plantation of 1999 and 2000 and summer plantation of20041.1- Nili plantation:A- The broad bean leaf miner, Liriomyza trifolii (Burg.) Population:Results indicated that, the total L. trifolii larvae population reached its maximum on November 28th (62.5 larvae/20 leaves) during 1999; while during 2000 season, the total larvae population achieved its maximum on November 20th (24.8 larvae/20 leaves). The numbers of larvae and mines of L. trifolii were higher in 1999 season than 2000 season, however the population abundance took the same trend at both seasons indicating that, lower part of common bean plants showed higher infestation rate of Liriomyzafollowed by the middle and the upper part, which harbored the least population level.B-Aphis craccivora Koch. Population:During 1999 season, the total mean of aphid population for different plant levels reached its maximum on November 14th(1168.5 individuals/20 leaves) while, on November 13th (781.5 individuals/20 leaves) during 2000 season. However, the upper part of common bean plants had the highest population followed by middle, while the lower part had the lowest population. Also,the population of Aphis craccivora was lower during 2000 season than 1999 season.C-The whitefly, Bemisia tabaci (Genn.) Population:Data revealed that, the population of both adult and immature stages reached its maximum on November 281h, showing 1302.2 individuals/20 leaves (1999 season). While,during season 2000 the maximum level occurred on October 30th (1009.0 individuals/20 leaves).Also, it was noticed that B. tabaci adults preferred upper common bean plant level for infestation than middle and lower plant level. On contrary the higher population of immature stages was associated with lower plant level. This may be attributed to the following reasons:1) -When adults lay eggs on young leaves, these leaves will be older (middle or lower plant level) at the end of the developmental period of B. tabaci immature stages.2)-The motionless of nymphal and larval stage that prevents them from moving to young leaves.D- The population of the parasitoid, Diglyphus isaea (Walker):This study was conducted during nili season of 1999 and 2000 seasons.During 1999 season, the percentage of parasitism by D. isaea on L. trifolii reached its maximum on November 21st (21.8%) recording 32.0 ± 5.9 parasitized larvae/20 leaves and on November 13th (21.6%) during 2000 season recording 8.0 ±1.4 parasitized larvae/20 leaves.Concerning the overall mean of parasitism by D. isaea on L. trifolii values were 9.1 and

11.8%, during 1999 and 2000 season, respectively. It can be stated that, this parasitoid plays a natural role for controlling this pest.1.2- Summer plantation:A- Aphis craccivora Koch. Population:Obtained data revealed that, aphid population reached its maximum on May 10th (624.5 individuals/20 leaves), after that declined sharply and disappeared at the end of May.In addition, the middle part of common bean plants had the highest population followed by upper part, while the lower part showed the lowest population level.B-The whitefly, Bemisia tabaci (Genn.) Population:Results showed that, the total mean populations of both adult and immature stages reached its maximum on May 10th and amounted 988.4 individuals/20 leaves afterward decreased to 310.0 individuals/20 leaves on June 7th. Meanwhile, the upper part of common bean plants was the most preferred part by the adults followed by middle and lower part, which was the least preferred one; on contrary, the lower part harbored the highest immature stages populations followed by the middle and upper part, which showed the lowest one.C-The population of Tetranychus urticae Koch:Data indicated that, population of T. urticae individuals reached its maximum on May 31st (1325.0 individuals/10 inches); also, the lower part of common bean plants had the highest infestation of T. urticae followed by the middle and the upper part, which showed the lowest one during 2004 season.- The results of the summer plantation during 2004 indicated clearly that:The occurrence of the common bean pests at economic population level was plantation-dependent.Tetranychus urticae was found at economic population level during summer plantation, while its population was very low and under the economic level during nili plantation. On contrary, Liriomyza trifolii population was below the economic level during the summer plantation.2- Impact of certain chemical compounds and their mixtures against some major pests infesting common bean and their effects on the parasitoid, D. isaea:This study was carried out at the Experimental Station of Faculty of Agriculture, Moshtohor, Qalyubia Governorate during the nili plantation of 1999 and 2000 and summer plantation of 2004.. 2.1- nili plantation:2.1.1- Evaluation of certain treatments:The following materials were used:1-Selecron 72% EC. (Chemical insecticide) at 187.5 and 93.7 cm3/100L.2-Achook 0.15% EC. (Botanical insecticide) at 200 and 100 cm3/100 L.3-Bemistop 21.1% EC. (Botanical insecticide) at 500 and 250 cm3/100L.4-Biosect 32 x 106 conidia/mg. (Bioinsecticide) at 200 and 100 g/100L.5-Admiral 10% EC. (I.G.R.) at 300 and 150 cm3/100 L.Generally, results indicated that, all treatments caused suppression in the tested pests' population. Consequently, regarding the reduction in population of tested pests during the two seasons, the previous materials (high application rate) could be arranged descendingly, as follows:A-Liriomyza trifolii (Burg.):Selecron 72% EC. (81.4%) & (87.0%) > Achook 0.15% EC (70.2%) & (81.4%) > Admiral 10% EC. (75.1%) & (77.3%) > Bemistop 21.1% EC. (73.9%) & (71.8%) > Biosect 32 x 106Summary 296conidia/mg (58.0%) & (56.0%) for 1999 & 2000 season, respectively.B-Aphis craccivora Koch:Selecron 72% EC. (100.0%) & (96.7%) > Achook 0.15% EC. (97.1%) & (91.7%) > Admiral 10% EC. (95.4%) & (90.3%) > Bemistop 21.1% EC. (89.7%) & (86.0%) > Biosect 32 x 106 conidia/mg (82.2%) & (74.9%) for 1999 & 2000 season, respectivelyC-Bemisia tabaci (Genn.):Selecron 72% EC. (88.3%) & (93.7%) and (90.5%) & (91.4%) > Bemistop 21.1% EC. (78.2%) & (82.2%) and (80.7%) & (82.1%) > Achook 0.15% EC. (73.5%) & (78.7%) and (83.7%) & (82.8%) > Admiral 10% EC. (73.6%) & (76.6%) and (80.9%) & (79.0%) > Biosect 32 x 106 conidia/mg (71.4%) & (63.3%) and (70.0%) & (63.4%) for adults & immature stages during 1999 and 2000 season, respectivelyThe results showed clearly that, Selecron was the most effective compound against common bean pests, the botanical insecticides or I.G.R. and/or the bioinsecticide could be used for controlling these pests since they are more safe for environment. D-The parasitoid, Diglyphus isaea (Walker):Selecron 72% EC. (92.6%) & (100.0%) > Bemistop 21.1% EC. (55.9%) & (55.1%) > Admiral 10% EC. (36.9%) & (38.0%) > Achook 0.15% EC (35.9%) & (34.2%) > Biosect 32 x 106 conidia/mg (25.0%) & (23.9%) for 1999 & 2000 season, respectivelyResults revealed that, all tested compounds were toxic to the parasitoid. The organophosphorus insecticide highly affected the population of D. isaea, where was the highest toxic compound.While, the botanical insecticide, Bemistop was moderate toxic followed by Admiral, the botanical insecticide, Achook and the bioinsecticide, Biosect.2.1.2- Effect of various combinations:The effect of the following combinations:1-Achook 0.15% EC. + Selecron 72% EC. at 200 cm3 plus 93.7 cm3/100L.and 100 cm3plus 93.7 cm3/100L.2-Bemistop 21.1% EC. + Selecron 72% EC. at 500 cm3

plus 93.7 cm3/100L.and 250 cm3 plus 93.7 cm3/100L.3-Achook 0.15% EC. + Admiral 10% EC. at 200 cm3 plus 300 cm3/100 L.and 100 cm3 plus 300 cm3/100L.and 100 cm3 plus 150 cm3/100 L.were tested against:A- Liriomyza trifolii (Burg.):Results revealed that, addition of the insecticide, Selecron at its half-recommended rate to Achook and/or Bemistop at their high application rates induced an additive effect. While, at their low application rates induced an antagonistic effect where, the high rates of Achook and and/or Bemistop plus Selecron increased the toxicity of the combination against L. trifolii larvae than separately at two sprays during two seasons.Also, results obtained from addition of the botanical compound, Achook at its high application rate, (200 cm3) to Admiral at its recommended rate at two sprays during 1999 and 2000 seasons induced an additive effect While, an antagonistic effect was obtained from the same combination at low applicationrate of Achook and both application rates of Admiral (with some exception), i.e. the total mortality of the combination is less than the mortality of summation of each compound separately.B- Aphis craccivora Koch.:All combinations induced an additive effect on A. craccivora during the two seasons of 1999 and 2000. This means that, combinations were more toxic against A. craccivora than compounds separately.C-Bemisia tabaci (Genn.):Co-toxicity resulted from mixing aforementioned compounds induced an irregular joint action against B. tabaci, indicating a dominated antagonistic effect at two sprays during the two seasons. At the same time, results obtained from addition of the botanical compound, Achook to Admiral during the 1st and 2nd spray of 1999 and 2000 seasons showed also, an irregular joint action whereby, an additive effect with Achook at high application rate was observed during season of 1999.D-The parasitoid, Diglyphus isaea (Walker):Combinations of the botanical insecticide, Achook plus Admiral increased clearly their toxicity against larvae and pupae of D. isaea than the compounds separately. Also, addition of Selecron to the botanical compound, Achook and/or Bemistop increased obviously their toxicity than the two botanical compounds alone.Generally, the joint action resulted from various mixtures induced an additive or a potentiated effect against the beneficial tested insect, namely, the parasitoid, Diglyphus isaea.2.2- summer plantation:2.2.1- Evaluation of certain treatments:Various compounds caused suppression in the tested pests' population. Therefore, regarding the reduction in population of tested pests during 2004 season; the previous compounds could be arranged in descending order as follows:A-Aphis craccivora Koch:Selecron (Profenofos) proved to be the most effective one for controlling A. craccivora followed by two the botanical insecticides [Bemistop and Achook (Azadirachtin)], Admiral (Pyriproxyfen) and BiosectB-Bemisia tabaci (Genn.):The organophosphorus compound, Selecron (Profenofos) was also the most effective against the whitefly, B. tabaci stages followed by the two botanical compounds (Bemistop and Achook) and the I.G.R., Admiral. However, the bioinsecticide, Biosect resulted in an intermediate effect.C-Tetranychus urticae Koch:Selecron (Profenofos) proved to be the most effective for controlling T. urticae followed by the botanical insecticide, Bemistop, Biosect, Achook (Azadirachtin) and Admiral (Pyriproxyfen).2.2.2- Effect of various combinations:Results revealed that, the addition of Selecron at its half-recommended rate to Achook and/or Bemistop at two application rates had increased obviously their toxicity against Aphis craccivora, Bernisia tabaci and Tetranychus urticae than separately, and exhibited an additive effect at the two sprays. In addition, results obtained from addition of the botanicalcompound, Achook at 200 and 100 cm3/100L. to Admiral at its recommended and half-recommended rate at the two sprays during 2004 season increased its effectiveness than separately and induced an additive effect at two sprays with the two application rates.This increase was determined and termed as additive effect in which the total mortality of the combination is higher than the mortality of summation of each compound separately.-The results of the summer plantation during 2004 indicated clearly that, the effectiveness of the tested compounds alone was reduced during summer plantation; this could be attributed to high temperatures dominating during this period resulting in higher degradation of the compounds as compared with nili plantation.On the other hand, the effectiveness of the tested mixtures was increased during summer plantation. In addition, the persistence of the various treatments was reduced during summer plantation as compared with nili one, due to higher degradation of the compounds at higher temperature dominating during summer time.- Effect of various treatments on yield components:Results of nili and summer plantations stated that, Selecron, mixture of Selecron plus

Bemistop and/or Achook, Bemistop and Achook showed high efficiency against tested pests of common bean, also gave higher seed yield.Botanical and bioinsecticide could be used successfully for controlling the pests under study especially, in combinations as they gave a satisfactory reduction in pests' population, increased the yield and more safe to mammals and environment.3- Effect of certain treatments on some biological aspects of Liriomyza trifolii (Burg.):These experiments were conducted under glasshouse conditions (25 ± 3°C and 65 ± 5% R.H.) to study the effect of sub lethal concentration (LC50) of the organophosphorus compound, Selecron 72% EC., the two botanical compounds (Achook 0.15% EC. and Bemistop 21.1% EC.) and the insect growth regulator, Admiral 10% EC. on some biological aspects of L. trifolii larvaeon common bean plants.Results obtained could be summarized as follows: - Larval mortality:Mortality of L. trifolii larvae resulted from LC50 of aforementioned treatments was significantly increased for all treatments during the three successive generations comparison with the control.However, the greatest larval mortality resulted from Selecron (61.5, 63.8 & 71.1%) followed by Bemistop (59.6, 57.4 & 60.8%), Admiral (56.9, 57.4 & 57.1%) and Achook (42.9, 44.7 & 46.8%), which produced the lowest mortality. On the other hand, there were no significant differences among generations for all treatments in larval mortality.- Duration of immature stages:The total developmental period of L. trifolii immature stages was clearly affected by various compounds resulting in either lasting this period by (22.9, 30.8 and 33.9%) for Bemistop, (22.5, 28.9 and 35.2%) for Selecron and by (21.9, 29.6 and 33.4%) for Admiral than the control, or shorting this period by (17.5, 14.2 and 8.2%) for Achook during the 1st, 2nd and 3rd generation, respectively as compared with control. On the other hand, the totaldevelopment period of L. trifblii immature stages showed a negligible increase among generations, where it slight prolonged by succession of generations.- Percentage of adult emergence: ,Concerning the effect of LC50 of aforementioned compounds on the percentage of emergence of L. trifolii adults, sharp decrease was occurred in this parameter for all compounds during the three successive generations.Admiral caused the maximum decrease (20.1, 19.8 & 20.9%) in percentage of adult emergence during the three generations followed by the botanical compound, Bemistop (22.9, 21.7 & 23.8%), the insecticide, Selecron (27.4, 25.6 & 22.5%) and the botanical compound, Achook (52.0, 54.7 & 37.5%) caused the minimum values. Among generations, there were no noticeable differences in the rate of adult emergence for all treatments.- Percentage of malformation:LC50 of all treatments resulted in sharp increase in malformation rate for the three successive generations as compared with the control. Also, among generations there were no clear differences in the rate of malformation for all treatments. The organophosphorus • compound, Selecron caused the highest rate of malformation (36.3, 33.5 & 21.3%) followed by the botanical compound, Achook (25.5, 26.8 & 23.2%), Admiral (24.5, 23.7 & 25.2%) and the botanical one, Bemistop (13.1, 17.4 & 19.0%) was the lowest one affected the malformation rate.- Sex ratio:There were no clear differences in sex ratio among the three generations for all treatments; however, there was irregular variation in sex ratio by the succession of generations.It was revealed that, females were more numerous than males with all treatments. This result may indicates that, the tested compounds had more adversely effects on L. trifolii males for males are more sensitive than females.On the other hand, the botanical insecticide, Bemistop was the most compound affect the sex ratio resulting in the highest female ratio through the three generations, (73.0, 73.6 & 76.2%) than males followed by the other botanical one (Achook)(24.0, 24.6 & 20.0%), Admiral (36.6, 41.6 & 33.4%) and finally the organophosphorus compound, Selecron was the lowest one affecting sex ratio (11.6, 9.6 & 14.6% than males), which was nearly equal to, or slightly more control.- Longevity of adult:The effect of LC50 of different compounds on longevity of Liriomyza trifolii adult during three successive generations showed that, all treatments were significantly increased the pre-oviposition period as compared with the control. While, oviposition period was significantly decreased, but the post oviposition period showed variation from treatment to other, i.e. significantly increased with Selecron, but significantly decreased with Admiral and Achook.Among generations, all treatments failed to reach the level of significance in flies' longevity.Flies' longevity of L. trifolii was adversity influenced by the materials used, where Bemistop resulted in lowest longevity followed by Admiral, Achook and Selecron, i.e. Bemistop decreased female longevity by (46.7, 34.2 and 28.8% for the three generations, respectively as compared with control, while, the insecticide, Selecron reduced it

by (12.0, 21 and 20.5% for 1st,2nd and 3rd generation, respectively, as compared with controltreatment.- Fecundity:LC50 of all treatments indicated significant decrease in fecundity (represented by No. of larvae/female) as compared with the control. However, the number of larvae per female showed insignificantly differences among generations.Tested compounds could be arranged in descending order according to their adversely effects on fecundity of L. trifolii as follows: Bemistop > Selecron > Achook > Admiral. where, Bemistop decreased fecundity by (96.1, 96.1 and 96.1%), Selecron by (94.8, 95.2 and 93.9%), Achook by (92.2, 93.2 and 92.2%) and Admiral decreased fecundity by (79.7, 83.1 and 84.3%) for the three generations, respectively comparing with the control.4- Effect of certain treatments on fecundity of Aphiscraccivora Koch.:Sub lethal concentrations i.e., LC50, LC25 and LC12.5, of Selecron, Achook, Bemistop, Biosect and Admiral were tested against Aphis craccivora to show its effects on progeny number and mortality through 10 days at three period of aphid infestation after application (zero, 3 and 7 days).In conclusion, among the treatments the lowest number of offspring and aphid survival were observed at zero time infestation at LC50 and at 3 days infestation after application at LC25 with Selecron followed by Admiral, the botanical compound Bemistop and the bioinsecticide Biosect. But the botanical compound, Achook gave the same effects at 3 days infestation after application, for the three concentrations.Concerning the persistence of the studied compounds, it was found that, at 7 days infestation after application the compounds could be arranged descendingly according to persistence as follows:Selecron (-83.2, -66.2 & -30.9%), Bemistop (-73.6, -34.9 & -13.7%), Achook (-64.4, -50.2 & -22.8%), Admiral (-66.1, -22.7 & -14.4%) and Biosect (64.4, -19.1 & -16.1 decrease than control, at LC50, LC25 & LC12.5, respectively).Regarding the percentage mortality of A. craccivora resulted from treatments of LC50, LC25 and LC12.5, of different compounds, maximum mortality values were obtained at zero time infestation for all treatments at all concentrations. However, values of mortality gradually decreased by the time lapses at 3 days and 7 days infestation for all compounds and all concentrations.Regarding the period of 7 days infestation after spraying the organophosphorus compound was the most toxic and led to the greater reduction in progeny number (79.1, 60.9 & 30.5%) followed by the botanical compound, Bemistop (70.0, 33.8 & 16.0%), Achook (62.2, 49.4 & 20.0%), Admiral (59.6, 20.6 & 11.6%) and Biosect (58.1, 18.9 & 15.6% for LC50, LC25 and LC12.5), which was the lowest toxic one to A. craccivora. This investigation detected that; Selecron had an immediate and prolonged effect on A. craccivora. However, the remaining compounds Bemistop, Achook, Admiral and Biosect have considerably delayed effect as compared with Selecron.5- The efficiency of the ecto-larval parasitoid, Diglyphus isaea (Walker) against Liriomyza trifolii (Burg.):This investigation was carried out under glasshouse conditions and lasted for two Liriomyza generations. The parasitoid released after one week of artificial infestation and repeated 10 days later.Results revealed that, the percentage of parasitism reached its maximum (100%) for all parasite levels at the 7th day of second release, then decreased by the time lapses and increased once more at the termination of study at the two parasite rates (4/30 and 2/30 parasite/larvae) and amounted 91.66 and 93.33%, respectively. On the other hand, the percentage of parasitism at the rate of 1/30 (parasite/larvae) sharply declined after the 7th day to reach 23.8% by the end of 2nd Liriomyza generation.According the total mean percentage of parasitism, relatively few differences were noted among the three parasite releases (44.1, 44.9 and 46.8% for 4/30, 2/30 and 1/30 (parasite/larvae, respectively), however this value was considerable high (59.1%) at the control plants.Thus, Diglyphus isaea can be an effective agent for biological control of the leaf miner, L. trifolii at weekly releases or combined with parasite-compatible materials such as some insect growth regulators (Admiral) to be an effective agent in L. trifolii integrated pest management programs.