Evaluation of some biopesticides as one of the integrated pest management items of the pink stem borer sesamia cretica (LED.)

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SUMMARYThe presented study involved evaluation of two B.thuringiensis products and two nematode species and theirmixtures as main items for the integrated control management ofthe pink stern borer Sesamia cretica (led.). Biocides were appliedin maize fields and their effects were estimated on the numbers ofS. cretica egg-masses & total eggs and larvae in addition to dead heart cases and also the weight of resultant dry cars yield. Also, the influence of different treatments on population of predaceous insect species was estimated. Bioassay tests were also, conducted in laboratory to find out the toxicity effect of the assayed materials on S. cretica 1st, 31.d & 5h1 larval instars. Histopathological effect on integument and mid-gut of treated S. cretica late 4th instar larvae and the assessment of total protein and calcium in haemolymph were studied. The obtained results may besummarized as follows:I. Laboratory studies:Laboratory studies were carried out to determine the LT50's and LC50's of the two bacterial products, Dipel 2X and Xentari (with and without molasses ,10% and K2CO3 1% or Steinernema carpocapsae or S. riobravae at LC50's) on Sesamia cretica ls I,3"dand 5th larval instars. Laboratory treatments were by feeding the larvae on treated tender pieces of maize stems for 3 days for 1 st instar and 2 days for 3rd and 5th instars, and after that on untreated maize stems. The percentages of accumulated corrected mortality were recorded until larval mortality or pupation. Mortalities were recorded after 3, 6, 10, 14, 18 days for 1" instar, 2, 6, 9, 12 days for 3rd instar and after 2, 6, 9 days for the 5th instar. The LT50's were calculated at 1% concentration, the results were as follows:1-1st instarThe shortest period for killing 50% of the treated larvae was 1.62 days as a result for S. carpocapsae treatments followed by the mixture Dipel + S. carpocapsae, and Dipel II ; 3.34 and 3.37 days, respectively. The lowest LC50 was that of the mixture Xenatri + S. riobravae LC50 causing the highest efficacy; 0.036% and for the entomopathogenic nematode S. carpocapsae at 258.95J / ml.2- 3rd instarThe shortest LT50 was 1.5 day as a result of S. carpocapsae treatment followed by Dipel II (1.6) day and the mixture Dipel + S. carpocapsae LC50 being 2.5 day. The lowest concentration forLC50 was Xenatri + S. carpocapsae with 0.013%, for the nematodes it was for S. carpocapsae 292.37 J / ml.3- 5th instar:The shortest LT50 was 1.6 day as a result of S. carpocapsae treatment. The lowest LC50 was that of Dipel + S. riobravae with 0.027% followed by Dipel + K2CO3 (0.052%) and for the nematodes it was for S. carpocapsae 260.06 J / ml.II. Evaluation of field applications of B. thuringiensisproductsin maize field on S. cretica infestations:ILL On egg-masses & number of eggs:All the bacterial preparations used either alone or with additives caused significant reductions in egg-masses, 5 days after the 1st spray, than control which contained 8.5 & 9 egg-masses / 30 plants in 2003 & 2004 respectively. Using the mean of the two year results, data indicated that. Xenatri at low concentration [I] and Dipel 2X at high concentration [II] were the highest in efficacy among the different treatments used as they gave 1.3 egg-masses / 30 plants, 5 days after lst spray. Also, the biopesticidescaused significant reductions in numbers of S. cretica eggs' than control which was 100, 108 eggs / 30 plants in 2003 & 2004, respectively. It was found that Xenatri [I] was the most effective treatment which had drastic effect on the number of eggs being12.7 eggs / 30 plants followed by Dipel at higher concentration [II] and Xenatri [I] + molasses; 13.4 & 14.7 eggs / 30

plants, respectively.11.2. Effect on S. cretica larvae:All the used treatments caused significant reductions in the larval counts of S. cretica found in the maize stems than that was found in the untreated plants after 5 days from the first spray, 24 hours and 5 days from 2”d spray and 24 hours from the 3”I spray). The control plants received as mean numbers for the two years 50, 30.4, 40 & 27.1 larvae / 20 plants, respectively. Treatment D [I] + molasses was the most effective treatment in all the pervious samples causing reductions percentages; 75, 59.2, 66.5 & 61.3, respectively, than control.11.3. Effect on number of dead-hearted cases:Treatment D [I] + molasses caused the lowest percentage in dead hearted plants during 2003 & 2004 seasons, being 8.8% dead hearts achieving 85.5% reduction than control which recorded61.8% in dead hearted cases, followed by Dipel [11] causing 78.3% reduction than control. The lowest treatment in efficacy was the chemical pesticide Diazinox and Xentari [I] causing 59.5 & 60.8% reductions than control, respectively.11.4. Effect on the resultant yield:At the end of the two seasons, dry ears were weighed foreach treatment and calculated yield was estimated as Ardab / feddan. An increase was found in the yield as a result of using different treatments than the control which achieved 8.7 Ardab /feddan as a mean of two seasons.The highest increase 17.1 Ardab / feddan with percentage increasethan control was recorded in D [I] + molasses treatment, while the lightest yield obtained was •3.3 Ardab / feddan for the chemical treatment Diazinox.III. Latent effectIII.!. On the pupal weight:The weight of untreated pupa of S. cretica was 0.212 gm asan average for the two years. While, the weight of pupae was affected by either of the tested treatments in which it reached 0.119 gm I pupa for Dipel + K2CO3 showing 43.56% reduction than control.IV. Evaluation for bacterial products,entomopathogenicnematodes and their mixtures on S. cretica infestations tomaize plants:IV.I. Effect on egg-masses & number of .eggs:All the Bacillus thuringiensis preparations used, either alone or with additives, caused significant reductions in egg-masses, 5 days after the 1st spray, than control which contained 7.3 egg-masses / 30 plants in 2004. The results indicated that S. carpocapsae .1000 J / ml and the mixture Dipel at low concentration [I] + S. carpocapsae 2000 J / ml showed highest efficacy, resulting average rate of one egg-mass / 30 plants after 5 days of 1Stspray with percentage reduction 86.3% than control. Also, the biopesticides caused significant reductions in numbers of S, eggs than control . which harboured 80.5 eggs. / 30 plants. It was found that S. carpocapsae was the most effective treatment showing drastic effect on the number of eggs, being 9 eggs / 30 plants. While the least effective treatment was the chemical insecticide Diazinox leading to 32.8 eggs / 30 plants indicating 54.8% reduction than control.IV.2. Effect on S. cretica larvae:All the used treatments caused significant reductions in the larval counts of S. cretica found in the maize stems than that was found in the untreated plants after 5 days from the 1 s’ spray, 24 hours and 5 days from the 2”d spray and 24 hours from the 3rd spray). The best treatment which caused the highest percentage reduction 92.3% than control (3.5 larvae / 20 plants) was D [1] + S. carpocapsae 2000 J / ml. For the treatment samples, as 5 days from 1st spray, 5 days from 2” spray and 24 hours from 3r spray, treatment D [I] + S. carpocapsae 2000 J / ml was the most effective leading to plants infested at rates 11, 4, 3.5 larvae / 20 plants causing percentage reductions 84.7, 88.6 & 92.3% thancontrol, respectively.1V.3. Effect on number of dead-hearted plants:Treatment D [1] + S. carpocapsae 2000 caused the lowest percentage in dead hearted cases being 5% dead hearts achieving 87.5% reduction than control which recorded 40% percentage in dead hearted cases, followed by Xenatri [1] + S. carpocapsae 2000 J / ml causing 81.5% reduction than control. The lowest treatment in efficacy was S. riobravae 1000 and Xentari [1] + S. carpocapsae 1000 causing 29 & 39.5% reductions than control,respectively.IV.4. Effect on the resultant yield:Different rates of increase were found in the dry ears yield as a result of using different treatments than control achieved 12.6 Ardab / feddan. The highest increase (22.9 Ardab / feddan, with percentage increase 81.7% than control was recorded in D [I] + S. carpocapsae 2000 and Xenatri [I] + S. carpocapsae 2000 treatments. That was followed by Dipel at high concerntration with 21.9 Ardab / feddan with percentage increase 73.2% than control. The lightest yield obtained was 16.9 Ardab / feddan for the mixture X [I] + S. riobravae 1000 treatment.V. Latent effectV.1. On the pupal weight:The mean weight of untreated pupa of S. cretica was 0.201 gm. While, the weight of pupae was affected by either of the tested treatments in which it reached 0.11 gm / pupa for Dipel + S. carpocapsae 2000 showing 45.3% reduction than control. TheThe highest peak of count from the

weekly samples was recorded on the untreated plants and Xentari [I] + molasses treatments in which it reached 61 larvae / 50 plants for both of them on June 22m1(28 °C & 66% R.H.). The total number of C. carnae that which were collected during the 13 samples all over the whole season was 350 larvae / season for the untreated plants followed by 290 larvae / season for Xenatri + molasses treatment followed by Dipel + molasses with 270 larvae / season. 3- Coccinella undecimpunctata:The highest peak (31 adults / 50 plants) was recorded on the untreated plants on June, 8th (27.5 °C & 63% R.H.). While highest total population during the season was 109 adults was recorded from Xentari + molasses treatment followed by 106 for Dipel [1] + molasses.4-Cydonia vicina isis:The highest peak (33 adults / 50 plants) was recorded from treatment (X [I] + molasses). The total highest number of adults in all 13 samples was 109 on plants treated with Xentari + molasses.5-Cydonia vicina nilotica:The highest peak was recorded in 8th June on treated plants with D [I] + S. carpocapsae 2000 (31 adults / 50 plants). The highest total seasonal count for this predator was 91 adults / season resulted from Dipel [I] + S. carpocapsae 2000 treatment, followed by 83 adults / season for Xentari [I] + molasses treatment.6-Scymnus spp.:The highest peak was recorded also on untreated plants in 22nd June with 63 adults / 50 plants. Also, the highest total seasonal number of Scymnus spp. was recorded on untreated plants being 347 adults / season, followed by 210 adults counted on plants that received Dipel [1] treatment.7-Paederus alfierii:The highest peak was recorded on both of the untreated plants and those treated with Dipel [I] being 83 adults / 50 plants in 2961 June (28.6 °C & 65% R.H.). During the 13 samples, the untreated plants harboured the highest number of population predator abundance with 515 adults / season. The same totalAll treatments were effective on total protein in S. ere’ tica haemolymph as the lowest total protein was indicator to the highest efficacy among the different treatments which was remarked on D [1] + S. carpocapsae LC50 (231.51 t.tg / ml) followed by Dipel [1] + S. riobravac LC50 (239.33 lig / ml),respectively.seasonal count (515 adults) was also recorded from treatment by Dipel [I].VII.Histopathological effects of biopesticides on S. creticatreated as 4th lan;al instars:It was found that all treatments were effective and caused a lot of histopathological symptoms in mid-gut of treated larvae as disorganization in epthelial cells, absence of cell boundaries, nucleus and peritrophoic membrane, destruction in the muscle layers, detachment of the basement membrane and appearance of vacuoles when treated by bacterial pesticides Xenatri and Dipel 2X also, among those treated by the mixtures Dipel 2X + S. carpocapsae 2000, Dipel 2X + S. riobravae and Xenatri + S. carpocapsae 2000.VIII.Assessment of total protein in haemolymph of S. cretica: