Journal of Positive Psychology & Wellbeing http://journalppw.com
2022, Vol. 6, No. 1, 766 – 774 ISSN 2587-0130

Effect of Biological Insecticides on Three Harmful Sugarcane Pests

Sabbour M.M[1], Nayera.Y.Solieman[2]

[1]*Department of Pests and Plant Protection, National research center 33rd El-Bohouth St. - Dokki, Giza, Egypt*
[2]*Agriculture Economic Dept. Agriculture Division. National research center 33rd El-Bohouth St. - Dokki, Giza, Egypt*
**Corresponding author, e-mail: sabbourm@yahoo.com*

ABSTRACT

Sugar cane crop developed in an enormous region in Egypt. It is a significant yield since ,it produce sugar. The harvest swarmed with numerous hurtful creepy crawlies which causing a ruinous to the yield. Chitosan and nano chitosan assessed on their bothers which swarm the harvest. Results showed that, the yield expanded in the space treated with nano chitosan followed by region treated with chitosan. LC50 of chitosan and nano chitosan recorded that, Chilo agamemnon 110 and 87 ppm. The LC50 of Sesamia cretica recorded 134 and 100 ppm for chitosan and nao chitosan , separately. LC50 of Saccharicoccus sacchari give 100 ppm for chitosan medicines and 77ppm for nano chitosan medicines. In the field tests, the heaviness of sugarcane were huge expanded 1.3 crease and 1.5 overlap after treated with chitosan and nano chitosan during season 2018. During season 2019 the sugarcane weight huge expanded to 1.5 and 1.7 overlay treated with the relating microbes. End the nano-chitosan promisingly affect sugarcane bothers.

Keywords: Sugarcane bio agents, *Chilo agamemnon*, *Sesamia cretica*, chitosan, nano, Biological Insecticides

INTRODCTION

Sugar cane (*Saccharum officinarum*) a significant financial harvest in Egypt, it produces sugar in the upper Egypt. Sugar stick is a monetary significant yield created sugar. Sugar can edit plagues with numerous nuisances which obliterate the developed harvest and diminished the yield Annual Report of Sugar Crops Council (2012). Bassyouny (1993). Among the genuine vermin, Chilo agamemnon, Sesamia cretica, and Saccharicoccus sacchari. C. agamemnon contamination: the butterflies lay eggs on the lower surface of the leaf cutting edges as cuts with 1520 eggs beginning from April, which bring forth following 4-7 days. This causes contaminations with parasites and microorganisms after disease, which makes the sticks simple to break at the site of disease, absence of yield, and low degree of sucrose, and may cause demise of the developing peak while tainting youthful plants El-Bagoury, 1978. S. cretica contamination by butterflies show up in the long stretch of April to June and lay their eggs on the weeds, and subsequent to incubating the hatchlings move to the youthful reed plants and dive in the developing zenith (shrike) and cause their passing, decaying, and the dryness of the apical leaves (demise of the heart), just as the lower buds, so they develop new sticks. This scourge is considered to have minimal financial harm. The pink sugarcane mealybug scale bug S. sacchari (Cockerell) (Homoptera: Pseudococcidae) is the most perilous irritation that hurts the reed crop since it influences the leaves and replicates as microscopic organisms, where the female lays eggs at a pace of 150-250 eggs and the creepy crawly delivers 3-4 ages for every season with its various stages that cover the lower surface of the leaves, and when the contamination is serious, it covers the upper surface also, which prompts the presence of A honeydew coming about because of this current bug's retention of the cytosol of the leaves, and with the presence of residue and the development of dark form parasites, the leaves

© 2021 JPPW. All rights reserved

win and consequently lose their capacity Serag, (1997). - Means of transmission of the scale creepy crawly pervasion: wind, transport of tainted plants, dress of laborers working in the field, water system water, creatures and mice that feed on contaminated sticks and their exchange to other sound fields and bugs, for example, the job of dates The sugar bothers constrained by bug sprays which prompts the pollutions in the conditions.

Chitosan structures are a wiry materials removed from the shell of marine creatures as crabs, lobster and shrimp which achieve to hinder the fat retention of and the cholesterol, When they applied on entry point, chitosan assists blood with coagulating. This work intends to assess the chitosan and nano chitosan on sugar stick bugs.

MATERIALS AND METHODS

Raising of irritations. Sugar can gathered from the Nag Hammadi fields, moved to National examination Center Laboratory. Then, at that point, the sugar can stalks cut into little areas 10 cm, then, at that point, moved to a glass pox 40X50 Cm. Lab societies of the pink sugar stick mealybug Saccharicoccus sacchari, Chilo agamemnon and Sesamia cretica, raised on a cut segments of sugar stick tail. All examinations made at temperature of 26±2ºC and 80±5 Relative dampness inside National Research Center Laboratory. These bugs utilized for research center examinations.

Planning of Nano-Chitosan. Chitosan buy from Aldrich organization and ready for Experiments. Nano-chitosan plan as indicated by Anusha and Albin (2016).

Nano exemplification. Chitosan The Nano exemplification of chitosan arranged by Li-Ming Zhao et al (2011).

Adequacy of Chitosan Against the Target. Six focuses were ready from Chitosan and Nano chitosan and assessed on the objective bugs at convergences of : 6 ppm, 5ppm, 4ppm, 3ppm, 2ppm, 1ppm. The % mortality happen were determined by Abbott's recipe, while the LC50 esteems were assessed all through probit investigation (Abbott, 1925). The test was completed under research center conditions at 26±2°C and 60-70% RH.

Preliminaries in the Field. The preliminaries made in the field did at Aswan, in upper Egypt during the seasons 2018 and 2019 to concentrate on the gauge of the chitosan and their nano on sugar stick designated bothers. Sugar stick was developed at the fifteenth of September during the two sugar stick seasons in a space of 1.5 feddan. Chitosan were applied as single medicines in randomize plots. Normal agrarian practices were performed and no compound control was utilized during the review time frame. Ten plots were splashed with just water as untreated. Tests from every treatment were gathered week by week and moved to the research facility for examination. Rates of contamination were determined. Yield information in treated and untreated plots of sugar stick after the reap time during (2018 and 2019), addressed by kgs weight in the equivalent got by Sabbour and Shadia (2018) and Sabbour and Hussein (2018).

RESULTS

Table 1 show that LC50s of chitosan and nano chitosan on C. agamemnon which recorded 110 and 87 ppm. Table 2 show that LC50s of S. cretica which recorded 134 and 100 ppm for chitosan and nano chitosan , separately. Table 3 show the LC50 of S. sacchari which give 100 ppm for chitosan medicines and 77ppm for nano chitosan medicines. (Table3).

Table 4 show that the heaviness of sugarcane were critical expanded 1.3 overlap and 1.5 crease after treated with chitosan and nano chitosan during season 2018. During season 2019 the sugarcane weight huge expanded to 1.5 and 1.7 crease treated with the relating microorganisms (Table 4).

Table 1: chitosan and Nano chitosan effect on *Chilo agamemnon* under laboratory conditions

Treatments	LC_{50} *ppm*	*S*	*V*	95% C*onfidence limits*
Chitosan	110	0.1	1.2	80-133

© 2021 JPPW. All rights reserved

Nano chitosan	87	1.1	1.1	70-149

Table 2 chitosan and Nano chitosan effect on *Sesamia cretica* under laboratory conditions

Treatments	LC_{50} *ppm*	*S*	*V*	95% C*onfidence limits*
Chitosan	134	0.1	1.1	98-153
Nano chitosan	100	1.1	1.1	90-139

Table 3: chitosan and Nano chitosan effect on *Saccharicoccus sacchari* under laboratory conditions

Treatments	LC_{50} *ppm*	*S*	*V*	95% C*onfidence limits*
Chitosan	100	0.1	1.4	81-143
Nano chitosan	77	1.1	1.1	65-129

Table 4: yield weight after treatment applied by the chitosan Nano chitosan

Materials tested	Season 2018 Weight .Ton. of sugar cane (Ton/F) feddan)	Season 2019 Weight. Ton. of sugar cane (Ton/ F)
Chitosan	34.45±60.61	35.89±46.79
Nano chitosan	38.60±**88**.16	39.99±69.38
Control	24.70±**3**5.13	23.4**6**±87.79
F test	24.9	25.9
LSD 5%	22.4	22.9

Economic return from the sugarcane crops treating using both chitosan and nano-chitosan.

Table No. (5) show that the sugarcane crop treatment using both chitosan and nano-chitosan resulted in an increase in the productivity per Feddan by about 46.05% and 62.92%, and the costs of production per Feddan by about 7.09% and 8.18%, respectively, compared to the control, which amounted to about 24.08 Ton / Feddan, 18348 pounds / Feddan. It was also found that the sugarcane crop treating using both chitosan and nano-chitosan resulted in a decrease in the cost of producing a ton of sugarcane by about 26.68%, 33.67% in compared to control, which reached about 761.960 pounds / ton. The net return per ton as a result of the transaction achieved about 161,342 pounds / ton, and about 214,607 pounds / ton, in compared to a loss per ton in control of (61.960) pounds / ton . In other words there is a loss in the amount of sugar per feddan of about 26,688 kg, and about 36.36 kg, which results in increasing the production of sugar cane in the case of generalizing the treatment of the area planted with sugar cane at the level of the Republic, which is reached about 327,412 thousand feddans , also about 27,503 thousand tons of sugar, and about 30,777 thousand tons of sugar. This contributes to reducing the amount and value of Egyptian imports of sugar crop with the same amount of increase in sugar production from sugar cane. The study recommends generalizing the treatment of the total cultivated

© 2021 JPPW. All rights reserved

area of sugarcane crop across the country using by using the nano-chitosan . Accordingly, the production of a ton of sugarcane needs about 227.5 m^3, and about 203.9 m^3 of Irrigation water for each of them, respectively, in compared to 332.2 m3 per control. The sugarcane crop treatment using both chitosan and nonchitosan contributes to an increase in the production of sugar produced from the feddan by about 84,408 kg, and about 94,152 kg in compared to the amount of sugar produced from the control, which is reached about 57,792 kg. The net yield of the feddan reached about 5674.4 pounds, and about 8397.6 pounds, respectively, in compared to a achieved loss in the control reached about (1010.4) pounds, while the invested pound return reached about 1.289 pounds, and about 1.423 pounds, respectively, in compared to realized a loss in the control which reached about (0.945) Pounds.

Table (5) Economic return from the sugarcane crops treating using both chitosan and nano-chitosan

Statement	control	Chitosan	Nano-chitosan
Feddan productivity / ton	24.08	35.17	39.23
% Increase in production	-	46.05	62.92
Total feddan costs	18348	19648	19848
The price of supplying per ton	720	720	720
Total feddan revenue	17337.6	25322.4	28245.6
Net yield per feddan	(1010.4)	5674.4	8397.6
Return of the pound invested	(0.945)	1.289	1.423
Cost per ton	761.960	558.658	505.393
Yield per ton	720	720	720
Net yield per ton	(61.960)	161.342	214.607

Source: Calculated and compiled from Table No. (4), Ministry of Agriculture and Land Reclamation - Annual Statistical Bulletin 2018-2019.

DISSCUSSIONS

Consequences of this review concur with results artists by Sabbour and Nayera in year of 2014, they pointed that the growths utilized against bug which swarm the sugar beets cause a higher mortality in every conditions of the investigations in field ,the diseases rates altogether diminished after the organisms applications and research facility analyses of the parasites causing a critical lack in the sugar beets bothers numbers. Many creators have similar outcomes, Sabbour and Hussein (2016), Sabbour and Singer (2016), Sabbour and Abd El Rahman (2007),stated that decline Cassida vittata diminished in its numbers after the medicines of growths application and the terpense applications diminished the sugar beet creepy crawlies. Sabbour and Abed-Elhakeim (2018), Hasssen et al (2012), Goodwin et al,(2007), noticed that, the eggs of C. vaitta not incubated after chitosan medicines, contortions happen between hatchlings, pupae and grown-ups, additionally the sugar beet organic product weight expanded. Sahab et al (2015) study dependent on the controlling the aphid through nano-chitosan applications and decrease their numbers by this applications. In light of the

© 2021 JPPW. All rights reserved

aftereffects of the current review, showed that, Sabbour (2015a) pointed that uses of Imidacloprid and nano-Imidacloprid diminished olive natural product fly, Mediterranean organic product fly numbers in the field. Our outcomes concur with Sabbour (2015b) who found that the quantities of the potato tuber moth, diminished by the uses of , nano materials. Comparative discoveries were additionally accomplished by Sabbour (2013) against three olive bugs constrained by bacterial arrangements of spinosad. These outcomes are in consistence with those acquired by Sabbour (2015a) for olive trees treated with Imidacloprid and nano-Imidacloprid and invaded by C. capitata and P. oleae. Likewise, treatment of potato plants, invaded by P. operculella, with nano-organisms I. fumosorosea and M. flavoviride expanded the yield (Sabbour, 2015b). in this manner results concur with Sabbour nd Singer (2015 a,b, c) , Matter and Sabbour (2013), Sabbour and Shadia (2015) Sabbour et al (20120, Sahabet al (20 2014,& 2015),Similar outcomes were acquired by Sabbour (2013) for spinosad-treated olive trees that were invaded by B. oleae, C. capitata and P. oleae. Sabbour 2017, observed that the olive weight expanded after bioinscticid applications. Sabbour and Nayera 2017, detailed that nano-biopesticides application increment the efficiency of the olive organic products under field conditions. Additionally Sabbour and Shadia (2020), Sabbour , (2016 a,b), Sabbour and Nayera (2016), control Tuta absoluta by nano chitosan and results showed a decrease in the invasion numbers. Sabbour (2016) utilize the nano chitosan against schistocerca. The equivalent acquired by Magda Sabbour (2020), Sabbour et al, (2020) Sabbour and Nayera (2020, a&b) and, Magda Sabbour and Shoura b (2020) . The net yield of the feddan came to around 5674.4 pounds, and around 8397.6 pounds, individually, in contrasted with an accomplished deficit in the control came to around (1010.4) pounds, while the contributed pound return came to around 1.289 pounds, and around 1.423 pounds, separately, in contrasted with understood a shortfall in the control which came to around (0.945) Pounds (Nayera et al, 2020), Hashem et al (2019), Sabbour and Nayera (2019, a,b) . The sugarcane crop treating utilizing both chitosan and nonochitosan adds to expanding the proficiency of the water system water part of the harvest, as a feddan needs around 8,000 m3 of water system water (Nayera and Rania 2016). The equivalent acquired by Sabbour and El-Sayed (2018 a,b), Sabbour and Nayera (2018), Sabbour and Shadia (2016& 2017), Nayera et al (2016 a, b,c). the bio-bug sprays control numerous agribusiness bothers, Sabbour (2016), Sabbour and Nayera (2016) Sabbour and Shadia (2016).

COONCLUSION

Sugar cane crop is a significant harvest in Egypt which pervaded with numerous bugs which causing a dangerous to the yield. Chitosan and nano chitosan assessed on there bothers which tracked down that. the yield expanded in the space treated with nano chitosan followed by region treated with chitosan.

REFERENCES

[1] Abbott, W. S., 1925. A method of computing the effectiveness of an insecticide. *J. Econ. Ent., 18: 265-267.* (15)

[2] Annual Report of Sugar Crops Council 2012. Sugar Crops Council, Ministry of Agriculture and Land Reclamation, Giza, Egypt.

[3] Anusha, J. R. and Albin T. Fleming.2016. Synthesis and Characterization of Chitosan Nanoaggregates from Gladius of Uroteuthis duvauceli. International Journal of Biomaterials. Volume 2016, Article ID 5379424, 9 pages. http://dx.doi.org/10.1155/2016/5379424

[4] Bassyouny, A.M 1993. Studies on preferability and injury level of some main insects to certain sugar beet varieties in *Egypt . J. Appl*. Sci. 8: 213-219.

[5] El-Bagoury, M. E. 1978. Ecological and biological studies on mites of family Tydeidae. Ph.D. Thesis, Fac. Agric., Cairo Univ., 111pp

[6] Goodwin, B., T. Babb, S. Kaffka, and L. Godfrey 2007. Biorational management of beet armyworms in sugar beets in the Central Valley, Larry

© 2021 JPPW. All rights reserved

Godfrey and Tom Babb. http//sugar beet. Ucdavis.edu.2007.

[7] Hashem M.Y , Sabbour M.M., Ahmed S.S., Abd Elrhman A. Montaser A.S.and Mohamed. K.M. (2019). Efficacy of silica nanoparticles on cotton leaf worm larvae, *Spodoptera littoralis* (Boised.) (Lepidoptera: Noctuidae**).** Journal of Plant Research. Vol. 19 No.2 .

[8] Hassan Abdel-Latif A. Mohamed, M.M. Sabbour, M. Ragaei and Rasha Samy. 2012. Characterisation of *Bacillus thuringiensis* mutant highly producing melanin pigment and active against potato tuber moth. Archives of Phytopathology and Plant Protection. Vol. 45, No. 5, March 2012, 547–560.

[9] Li-Ming Zhao, Lu-E Shi, Zhi-Liang Zhang, Jian-Min Chen, Dong-Dong Shi2, Jie Yang and Zhen-Xing Tang. (2011). PREPARATION AND APPLICATION OF CHITOSAN

[10] Magda Mahmoud Sabbour and El-Sayed Hassan Shaurub .2020. Efficacy of imidacloprid and *Beauveria brongniartii* on green peach aphid, *Myzus persicae*, and its predator, *Coccinella undecimpunctata* in tomato. JBiopest 13(2):167-176.

[11] Magda Mahmoud Sabbour (2020). Insecticidal effect of three essential oils and Beauvericin nano gel on *Sitophilus oryzae* and *Sitophilus granarius* (Coleoptera :Curculionidae. JBiopest 13(2):127-134.

[12] NANOPARTICLES AND NANOFIBERS Brazilian Journal of Chemical Engineering Vol. 28, No. 03, pp. 353 - 362, July - September, 2011.

[13] Matter, M.M. and M.M. Sabbour. 2013. "Differential efficacies of *Nomuraea rileyi* and *Isaria fumosorosea* on some serious pests and their efficient predator prevailing in tomato fields in Egypt. J. of. Plant Pro. Res.. Vol. 53, No. 2 . 103-109. (2013)

[14] Nayera Y.Solieman , Rania M.Barghash (2016a) . The Economic Efficiency 0f Water Irrigation Usage and Restructuring Cultivation of Agricultural Crops. *International Journal of ChemTech Research* Vol.9, No.10 pp 62-71.

[15] Nayera.Y.Solieman, SabbourM.M. Hashem seham,A.A. 2016b. Role of agriculture residues and its economics importance in decreasing fodder gab in Egypt. International Journal of ChemTech Research. Vol.9, No.10 pp 20-30

[16] Nayera.Y.Solieman, Eman AbdAllah AbdAllah, SabbourM.M.. 2016c. An Analytical Study of Some Political and Economic Factors Affecting Egyptian chitosanes Exports. International Journal of ChemTech Research. Vol.9, No.10 pp 10-18:2455-9555 .

[17] Nayera Y. Solieman, Rania M. Barghash, Hamdy A. Sawalhy (2020). Situation of Water Use Efficiency in Egyptian Agriculture during. *Egyptian Journal of Agronomy* Vol. 42, No.1, pp. 93-103.the Period 2012-2016.Ministry of Agriculture and Land Reclamation - Annual Statistical Bulletin 2018-2019.

[18] Sabbour, M.M.; Shadia El-Sayed Abd-El-Aziz, Marwa Adel Sherief. (2012). Efficacy of three entomopathogenic fungi alone or in combination with diatomaceous earth modifications for the control of three pyralid moths in stored grain. J of. Plant Pro. Res.. Vol. 52, No. 3 :359-363.

[19] Sabbour, M.M. 2015a. Nano-Imidaclorprid Against Three Olive PestsUnder Laboratory and Field Conditions Open Science *Journal of Bioscience and Bioengineering* 2 (5): 45-49.

[20] Sabbour M. M. 2015b. The Toxicity Effect of Nano Fungi *Isaria fumosorosea* and *Metarhizium flavoviride* Against the Potato Tuber Moth, *Phthorimaea operculella* (Zeller). *American Journal of Biology and Life Sciences*. 3 (5):155-160.

[21] Sabbour M.M and S.M. Singer.2015a. Imidaclorprid efficacy against grasshopper *Hetiracris littoralis* (Orthoptera: Acrididae). International Journal of

© 2021 JPPW. All rights reserved

Scientific & Engineering Research, Volume 6, Issue 9, September-2015. 1701-1708.

[22] Sabbour M.M and S.M. Singer. 2015 b. Control of Locust *Schistocerca gregaria* (Orthoptera: Acrididae) by Using Imidaclorprid. International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064.

[23] Sabbour M.M and S.M. Singer. 2015 c. Efficacy of Nano *Isaria fumosorosea* and *Metarhizium flavoviride* against Corn Pests under Laboratory and Field Conditions in Egypt. International Journal of Science and Research (IJSR). ISSN (Online): 2319-7064.

[24] Sabbour, M.M and Nayera, Y. Soliman, 2015. Usage of nanotechnology of the fungi *Nomuraea rileyi* against the potato tuber moth *Phthorimaea operculella* (Zeller) under laboratory field and store conditions. International Journal of Information Research and Review. Vol. 2, Issue, 09, pp.1131-1136, September, 2015.

[25] Sabbour, M.M. and Shadia El-Sayed Abd-El-Aziz. 2015. Efficacy of some nano-diatomaceous earths against red flour beetle *Tribolium castaneum* and confused flour beetle, *Tribolium confusum* (Coleoptera: Tenebrionidae) under laboratory and store conditions. Bull. Env.Pharmacol. Life Sci., Vol 4 [7] June 2015: 54-59.

[26] Sabbour M.M. 2016. Observations of the effect of Chitosan and its nano compositions against the locust *Schistocerca gregaria* (Orthoptera: Acrididae). *International Journal of ChemTech Research.*Vol.9, No.06 pp 270-276.

[27] Sabbour, M. M and Abdel-Rahman, A. 2007. Evaluations of some terpenes and entomopathogenic fungi on three sugar beet insect pests. *J. Boil. Pest. Cont*. 17:22-29.

[28] Sabbour, M.M and Nayera, Y. Soliman, 2014. Determinations of the entomopathogenic fungus *Beauveria brongniartii* on three sugar beet pests. *European Journal of Academic Essays* 2(10): 23-28, 2014.

[29] Sabbour, M.M. and Shadia El-Sayed Abd-El-Aziz. 2016. Efficacy of three essential oils and their nano-particles against *Sitophilus granarius* under laboratory and store conditions. J. ent. Res., 40 (3) : 229-234 (2016)

[30] Sabbour M. M.2016a. Differential efficacies of *Metarhizium anisopliae* and Destruxin on some tomato serious pests and their predators. American Advances Journal of Biological Sciences 2(7) (2016) 150–158.

[31] Sabbour M.M. 2016b. Observations of the effect of Chitosan and its nano compositions against the locust *Schistocerca gregaria* (Orthoptera: Acrididae). International Journal of ChemTech Research.Vol.9, No.06 pp 270-276.

[32] Sabbour Magda and Hussein M. M. 2016. Determinations of the effect of using silica gel and nano-silica gel against *Tuta absoluta* (Lepidoptera: Gelechiidae) in tomato fields. Journal of Chemical and Pharmaceutical Research, 2016, 8(4):506-512.

[33] Sabbour M. M. and S. M. Singer. 2016. Incidence effect by nano spinosad of the invasive tomato leafminer, *Tuta absoluta* Meyrick, (Lepidoptera: Gelechiidae) under laboratory and field condition . Journal of Chemical and Pharmaceutical Research, 2016, 8(2):829-833

[34] Sabbour M.M. Nayera. Y. Solieman. 2016.Two Egyptian *Bacillus thuringiensis* isolates from soil and their potentialactivity against *Tuta absoluta* infestation under laboratory and field condition. Der Pharmacia Lettre, 2016, 8 (9):11-17.

[35] Sabbour M.M. and Nayera. Y. Solieman, 2016. The efficacy effect of using chitosan and nano-chitosan against *Tuta absoluta* (Lepidoptera: Gelechiidae) Journal of Chemical and Pharmaceutical Research, 2016, 8(3):548-554.

© 2021 JPPW. All rights reserved

[36] Sabbour, M.M. and Shadia El-Sayed Abd-El-Aziz. 2016. Roll of three essential oils and their Nano against *Ephestia cautella* Lepidoptera Pyralidae under laboratory and store conditions. international Journal of PharmTechResearch: 0974-4304 ,

[37] Sabbour, M.M. and Shadia El-Sayed Abd El-Aziz.2017. Screening effect of three *natural* oils and their Nano against *Ephestia Kǜehniella* (Lepidoptera-Pyralidae)Under Laboratory And Store Conditions . Bioscience Res. , 2017 14(2): 408-416.

[38] Sabbour, M.M. and El-Sayed Hassan Shaurub. 2018. Evaluations of *Metarhizium anisopliae* and two Destruxin against cotton leaf worm *Spodoptera littoralis* (Lepidoptera: Noctuidae) under laboratory and field conditions Bioscience Research 15(2): 1028-1033.

[39] Sabbour M.M and Nayera Y. Solieman ·2018. The effect of Beauvericin comparing with nano Beauvericin against *Palpita unionalis* (Lepidoptera: Pyralidae). Bioscience Research, 2018 15(3):2151-2158.

[40] Sabbour, M.M. and El-Sayed Hassan Shaurub. 2018. Toxicity effect of Imidacloprid and nano-Imidacloprid particles in controlling *Bactrocera oleae*(Rossi) (Diptera: Tephritidae) under laboratory and field conditions. Bioscience Research 01815(3):2494-2501.

[41] Sabbour,M.M. and Shadia El-Sayed Abd El-Aziz,2018. The combined effect of *Metarhizium anisopliae* and some natural oils against *Ephestia kuehniella* and *Ephestia cutella* (Lepidoptera: Pyralidae) under laboratory and store conditions. Bioscience Research 2018 15(4): 3480-3489.

[42] Sabbour,M.M. and Hussein M.M. 2018. The chemically effect of Titanium oxide TIO2 nanoparticles against *Bactrocera oleae* (Rossi) (Diptera: Tephritidae) under laboratory and field conditions . Bioscience reserch, 15(4):4292-4297.

[43] Sabbour M.M and Nayera Y. Solieman. 2019 a. Insecticidal activity of the toxin diketopiperazines comparing with its nano composition on Ceratitis capitata under laboratory and field conditions . Plant Archives Vol. 19, Supplement 2, 2019 pp. 365-369.

[44] Sabbour M.M and Nayera Y. Solieman. 2019 b. Control of beet fly (*Pegomyia hyoscyami)* ((Diptera : Anthomyidae) using chitosan and nano chitosan. International Journal of Plant Research. Plant Archives Vol. 19, Supplement 2, 2019 pp. 462-465

[45] Sabbour, M.M. and Nayera Y. Solieman. 2020a. Control of potato tuber moth Phthorimaea *operculella* (Lepidoptera: Gelechidae) by imidacloprid. . Plant Archives Volume 20 No. 2, 2020 pp. 7528-7532.

[46] Sabbour, M.M. and Nayera Y. Solieman. 2020b Toxicity of imidacloprid on cabbage white butterfly *Piers rapae*. Plant Archives, Volume 20 No. 2, 2020 pp. 4675-4479.

[47] Sabbour, M. M. and Shadia E. Abd El-Aziz.(2020). Plant essential oils for the management of two serious s stored pests in Egypt. J. ent. Res., 44 (3) : 377-384.

[48] Sabbour, M.M., Solieman, N.Y. and Abdel-Raheem, M.A. 2020. Influence of *Metarhizium anisopliae*-based Destruxin-A-760 and Destruxin-A-724 on the sugar beet fly, *Pegomya mixta* Vill. (Diptera: Anthomyiidae). *Journal of Biopesticides,* **13**(1):21-27.

[49] Sahab ,A.F; Sabbour , M.M.,Attallah,A.G. and Abou-Serreh, Nivin. 2014. Genetic analysis of the entomopathogenic fungus *Beauveria bassiana* to the corn borers tested by UV as physical mutagen. *International Journal of ChemTech Research Vol.6, No.5, pp 2319-7064*

[50] Sahab, A. F.; Waly, A.I., Sabbour, M. M. and Lubna S. Nawar 2015. Synthesis, antifungal and insecticidal potential of Chitosan (CS)-g-poly (acrylic acid) (PAA) nanoparticles against some seed borne fungi and

© 2021 JPPW. All rights reserved

insects of soybean. *International Journal of ChemTech Research* Vol.8, No.2, pp 589-598.

[51] Serag, S.A. (1997): Studies on biological control of some piercing and sucking insects. M.Sc. Thesis, Fac. Agric., Al-Azhar Univ., Egypt, 136pp.

© 2021 JPPW. All rights reserved