

THE EFFECT OF WATER EXTRACT OF SOME PLANTS, GROWTH REGULATOR (DIMILLIN) AND METABOLIC PRODUCTS OF RHIZOPUS SP ON GRYLLODES AIGILLATUS

Esraa fadel wathah and Rasha Muzahim Hatem

Biology Dept. College of Science, University of Al-Qadisiyah, Iraq. Email: esraa.wathah@qu.edu.iq,
Rasha.Albokhlate@qu.edu.iq

Article received 1.10.2018, Revised 29.1.2018, Received 8.2.2018

ABSTRACT

This research aimed to investigate the activity of the *Ricinus Communis*, *Dodonia sp.* and *Syzygium Aromaticum* extract plants, growth regulator (Dimillin) and fungal suspension of *Rhizopus sp.* on both Nymph and adult stages of *Grylloides sigillatus* insect. The excellence of *Rhizopus sp.* fungal suspension had been noticed in nymph stage destruction, in which it reached 96.82% in 100% concentration after 6 days from the treatment, while the effect of Dimillin reached 90.22% in the same concentration. As for the extract plants the *R. communis* followed by *Dodona sp.* and *Syzygium S. S. aromaticum* were more effective in spraying than in feeding, in which they reached 87.22%, 75.12% and 69.13% successively through spraying, while they reached 64.2%, 53.4% and 48.1% successively respectively through feeding. In adult stages the mortality proportion of the fungus reached 81.14% in 100% concentration. The growth regulator hadn't any mortality proportion in adults, in nymphs the *R. communis* plant is the most effective through spraying in which it reached 72.4% in 40% concentration after 6 days from the treatment.

Key words: Dimillin, *Rhizopus sp.*, *Grylloides sigillatus*, water extracts

INTRODUCTION

The *Grylloides sigillatus* insect relates to *Grylloides* family and orthoptera order. It is one of the familiar insect for many people as it exists in houses and gardens. The sounds of its male causes noise inside houses. It eats so many kinds of plants in the field such as wheat, barley, sugarcane, tobacco, rice and others storage material (Alazawy et al. 2010).

Field cricket is considered as one of the insects that causes big economic losses in agricultural field in Diyala in which it destroyed large spaces from the field that are planted with corn, sesame and sunflower in which they reached (25-100) member in every single square meter in the corn field and less than that in sesame and sunflower fields on July/1998. The adults and nymphs of this insect cause damage because they eat the fragile seeds and the new once (Aljubouri, 2009). The use of chemical pesticides in getting rid of the agricultural lesions leads to increase the plant productions in big amount, but it also causes a lot of problems like poisoning cases and environmental pollution. The undesirable effects of chemical pesticides require to search for other techniques and alternative methods to reduce the spread of pollution, re environmental balance and formulate new environmental concepts (Al-Malah, and Abdul, 2009). It is also used for insect growth regulators

the fact that these substances are non-toxic to other organisms and have negative effects on insects and their reproduction (Clarke and Jewess, 1990) and the fungi are one of the biological factors for the resistance of pests, where he was infected by insects for the first time in 1726, where he found some butterflies by *Cordyceps* (Deacon, 1983).

MATERIALS AND METHODS

Collection of plants and preparation of plants water extract: *Ricinus communis* plant had been taken from a house in Al-Dewaniyah city, while *Dodonia sp.* and the *Syzygium aromaticum* plants had been taken from arboretum. The leaves of these plants had been collected, Dried in the shadow and grind. The water extract had been prepared according to the method of Riouse (1987) by taking 25 gram from plant powder and mixed with 100 ml from distilled water, the mixture was mixed for 60 minutes by magnetic motor and left for one day in 4°C for steeping. The mixture had been filtered through variable layers from gauze, and then again it had been filtered by using filtering paper whatman No.1 by Buchner funnel. Unloading pump had been used to get rid from not smashed parts, and then the extract had been taken and dried through cooling under low pressure.

Breeding the insect: The insects had been collected from house gardens in Al-Dewaniyah city of

both (Nymph and Adult) stages, bred in Glass basins which their dimensions 23 x 14 x 20cm and fed with Flour bran and yellow corn grits. Small plastic pots of 3 x 1.5cm dimensions had been filled with water and put inside breeding basins. Under these pots a sterile soil of 6-7cm height had been put for putting eggs by adults and covered tightly. This cover has small holes for air, yet the insects can't go outside. After that these insects had been bred laboratory in 30°C and 45% humidity.

The effect of the plant extract on nymph and adult stages of field cricket insect: The concentrations 10, 20 and 30µg/ml had been prepared for each extract from the mentioned extracts separately. Glass bottles of (8x14) cm dimensions had been used to test the activity of plant extract through spray. Filtering paper had been put under these bottles, while inside them 10 new hatching nymphs. These nymphs had been sprayed by extracts then covered by tapestry cloth which is tied by rubber band with three replicates per concentration. In the comparison treatment, the distilled water had been used only. To test the activity of early mentioned extract through feeding, 1gm from corn grits and 1 ml from each concentration of the extract had been put in the mentioned breeding bottles after putting 10 nymphs. The same tips had been repeated with changing the nymphs by adults to test the effect of the extract on adult stages (Khalif and Aelan, 2011). The mortality proportion of both nymphs and adults had been calculated after 2,4,6 days from the treatment.

Preparing the secondary products of *Rhizopus sp* and Dimillin: The isolated fungi was obtained from Assist. lect. *Wala'a Yass Lahmood*/ Biology Dept. College of Science, Al-Qadisiyah University. The fungal suspension was prepared according to Huxham, and Lackie (1988) way, from which 25, 50, 75 and 100% concentrations had been prepared. And the same concentrations for the pesticide had been prepared.

The effect of Metabolic products of the fungal *Rhizophis sp* and the Dimillin Pesticide on *Gryllo-dessigillatus*. The same above bottles had been used in the same way that had been used for the effect of the plant extracts on the nymphs and adults of the insect through spraying. The doom proportion had been calculated after 2,4 and 6 days from the treatment.

Statistical analysis: The experiments had been designed according to the pattern factorial experiments with completely randomized design (CRD) and the mortality proportion had been corrected according to the equation Abbott Formula (Abbott, 1925).

$$\text{The corrected mortality} = \frac{\text{mortality proportion in treatment} - \text{mortality proportion in control}}{100 - \text{mortality proportion in control}} \times 100$$

It had been chosen the lowest significant difference (LSD) under prospect level 0.05. To identify significant differences, the corrected mortality proportion had been turned to angle value to get it in to statistical analysis (Alrawi, 2000).

RESULTS AND DISCUSSION

The results showed that the difference in insect mortality due to the difference of the plant species and the concentrations of the extract. This is related to the difference between the active ingredients that are existed in the plants which causes the mortality proportion for the insects (Al-Ibada, 2011). The nymphs were more affected than adults which means that the insects' age play an important role in resistance to the extract. The insect mortality proportion through spraying was higher than feeding may be because spraying process leads to waste the extract either through cuticle or through respiratory vents then to bronchi and peritoneal membrane which cover the surfaces of reproductive system, the Malpighian tubules and digestive system. The effect started by the Inhibition of oxidative cortex in mitochondria (Taniguchi, *et al.*, 1997) or by mixing the poison material with the fatty substances in the insect's body (Pederson, 1976). The highest mortality proportion in nymphs for the water extract through spraying for *R. communis* was 87.22% in 40 µg/ml concentration after 6 days from the treatment while through feeding was 64.2% followed by *Dodonia sp.* and *S. aromaticum* in 75.12%, 69.13% proportion through spraying respectively, while through feeding it was 53.4% and 48.1%. In adults for the castor plant it was most effective in which it reached 72.4% through spraying and 51% through feeding in 40µg/ml concentration after 6 days from the treatment.

In *Dodona sp.* and *S. aromaticum* plants it reached 62.2%, 52.4% through spraying and 51.2%, 38.2% through feeding respectively in the same concentration and same period of the treatment. This improve the findings of Al-Mansour, *et al.*, (2006) who revealed that the water extract of castor plant through spraying was more effective than the extract through feeding on Termite workers *Microcerotermes Diversus* in which it reached 16.94% in 100% concentration through feeding, while through spraying it reached 100% mortality proportion. Mahdi, and Radi (1984) referred to the activity of the cold, hot water extract of *Dodonia viscosa* plant on adult and nymph stages of *Mizus persicae* Jabbar *et al.* (2006) studied the effect of vegetable oils and

one them castor oil which had the ability to decrease the eggs of *Callosobruchus Maculates* insect. The spread oil of the clove plant can decrease the fertility of *Callosobruchus maculates* (Abdul Azeez2001). (ALKazaz (2010) indicated that *D. Viscoa* extract had a role in decreasing hatching eggs proportion of *Callosobruchus Maculates* insect and also decrease female productivity for the same insect which were treated by the extract. The oil of *Syzygium Aromaticum* cause mortality for *Aphis nerii* insect in 100% proportion in (1.5) concentration after 7 days from the treatment (Kareem *et al.*, 2012).

Table 1: The effect of the water extract of the *R. Commnnis* plant on nymph stage for the *Gryllodes sigillatus*

Concent rations (µg/ml)	Mortality proportion for the nymphs by spraying after			Mortality proportion for the nymphs by feeding after		
	2 d	4 d	6 d	2 d	4 d	6 d
10	22.00	32.1	40	2.2	10.26	18.2
20	35.00	45.3	50.12	13.2	24.21	29.2
30	49.00	52.2	59.16	28	30.26	38.14
40	52.13	61.13	69.13	31.1	40.1	48.1
Control	0	0	0	0	0	0

L.S.D=4.33

Table 2: Effect of the water extract of *Dodonia sp.* plant on nymph stage for *G. aigillatus*

Concent- rations (µg/ml)	Mortality proportion for the adults by spraying after			Mortality proportion for the adults by feeding after		
	2 d	4 d	6 d	2 d	4 d	6 d
10	10.22	15.2	20.0	6.00	4.14	10.72
20	21.13	30.2	35.12	10.33	20.4	24.12
30	30.13	37.2	44.2	20.14	26.4	33.2
40	45.2	46.2	52.4	35.2	35.4	38.2
Control	0	0	0	0	0	0

LSD=6.33

Table 3: Effect of the water extract of *S. aromaticum* plant on nymph stage for *Gryllodes sigillatus*.

Concent rations (µg/ml)	Mortality proportion for the adults by spraying after			Mortality proportion for the adults by feeding after		
	2 d	4 d	6 d	2 d	4 d	6 d
10	25.19	30	35.2	14	20	25
20	45.13	54.1	58.21	23.2	32.4	36.2
30	50.12	60.16	65.14	29.2	41.22	44.4
40	60.22	66.2	72.4	38.2	45	51
Control	0	0	0	0	0	0

LSD=3.37

Table4. Effect of the water extract of *Ricius communis* plant on adult stage for the *Gryllodes aigillatus*.

Concent rations (µg/ml)	Mortality proportion for the adults by spraying after			Mortality proportion for the adults by feeding after		
	2 D.	4 D.	6 D.	2 D.	4 D.	6 D.
10	15.2	20	30	5.51	10	20
20	25.12	45	47.13	15.12	35	36.2
30	36.2	52.2	55.14	25.4	31	44.2
40	47.12	59.2	62.2	36.4	38.2	51.2
Control	0	0	0	0	0	0

LSD=2.89

Table 5: Effect of the water extract of the *Dodonia sp.* plant on adult stage for *Gryllodes sigillatus* insect

Concent rations (µg/ml)	Mortality proportion for the nymphs by spraying after			Mortality proportion for the nymphs by feeding after		
	2 d	4 d	6 d	2 d	4 d	6 d
10	40.19	43.12	50.00	10.2	26.14	28.00
20	52.00	69.22	72.21	30.2	47.22	50.22
30	67.16	75.16	80.16	45.16	52.2	58.11
40	74.12	81.2	87.22	50.12	58.2	64.2
Control	0	0		0	0	0

LSD=4.89

Table 6: The effect of the water extract of the *Syzygium Aromaticum* plant on adult stage for the *Gryllodes sigillatus*

Concent rations (µg/ml)	Mortality proportion for the nymphs by spraying after			Mortality proportion for the nymphs by feeding after		
	2 d	4 d	6 d	2 d	4 d	6 d
10	26.11	32.22	44.16	4.5	10.2	20.15
20	40.17	55.34	62.18	18.15	33.32	40.15
30	50.27	66.22	70.12	25.22	43.22	48.8
40	62.22	74.16	75.12	40.2	32.14	53.4
Control	0	0	0	0	0	0

LSD=5.34

The results in the tables 7and 8 showed that *Rhizopus sp.* and growth regulator (Dimillin) in nymph stage reached the highest effect in 100% concentration to 96.82% and 90.2% respectively. The fungi were affective because they were able to breakthrough cuticle layer cause laziness, Idle and motionless and eventually death (Bekheit, and Abo el-Abbas, 2002). Dimillin effectiveness related to the growth regulator which inhibit chitin synthesis and led to waste a lot of the regulator which effect its evolution then death (Hall and Dohse, 1980). In adult stage *Rhizopus sp.* Effectiveness was noticed while Dimillin growth regulator hadn't any effect and this is because the growth regulators are low toxicity on adults and their effect are only on growth and evolution (Miura and Takashi, 2009). On this part Thomas (1972) referred that *Aedes Aegypti* adults which were treated by Teflubenzuron mortality in 10% propor-

tion after 24 hours from the treatment while Martins (2008) found that Dimillin hadn't any mortality proportion in fly home adults *Musca domestica* after 7 days from the treatment. Miura and Takashi (2009) declared that pupa of *Anopheles* sp mortality in 96% after treating it by Dimillin in 0.0025gm/L proportion. Kewka *et al.* (2009) found that *Rhizopus* sp. fungus cause mortality for *Ommatissus binotatus* nymphs in 49.6% after 72 hours from the treatment. The *Trichoderma* sp. fungus caused mortality for *G. sigillatus* nymph 100% proportion and 83.34% for adults (Al-Emery *et al.*, 2008). Van *et al.*, (1969) found that adult mortality proportion for the cricket insect and *Supella Longipalpa* reached 86.66% in treating it by the fungal suspension *Trichoderma harzianum*.

Table7: Effect of the the fungal suspension of *Rhizopus* sp. on nymph and adult stages for the *Grylodes sigillatus*.

Concentrations (%)	Mortality proportion					
	Nymph			Adult		
	2d	4d	6d	2d	4d	6d
25	49.12	52.12	59.16	34.12	39.22	44.18
50	61.22	78.14	81.22	54.78	63.23	67.14
75	76.16	84.12	89.87	59.16	70.20	74.28
100	83.18	90.22	96.82	69.18	75.12	81.14
Control	0	0	0	0	0	0

LSD=2.33

Table 8: Effect of the growth regulator (Dimillin) on nymph and adult stages of *Grylodes sigillatus* insect

Concentrations %	Mortality proportion					
	Nymph			Adult		
	2d	4d	6d	2d	4d	6d
25	43.14	45.22	53.12	0	0	0
50	55.18	72.30	75.42	0	0	0
75	70.32	78.32	83.46	0	0	0
100	75.16	83.18	90.22	0	0	0
Control	0	0	0	0	0	0

LSD=1.75

Conclusions

- 1-Plant extracts of *R. Communis*, *Dodonia* sp and *Syzygium aromaticum* have an obvious effect on different stages of life *Grylodes sigillatus*.
- 2-The effect of plant extracts by spraying was the most effective in comparison with feeding
- 3- The non - adult stages of the insects were more affected than the adult stages of the insect.
- 4-The *Rhizopus* sp and growth regulator (Dimillin) had insecticidal effect.

REFERENCES

- Abbott, W.S., A method of computing the effectiveness of an insecticide. J. Econ. Entomol. 18: 65-6 (1925).
- Abdul Azeez, Shadea Alsaed, The continuity of some vegetable oils effectiveness on southern Lupine beetle *Callosobruchus maculatus* during storage. The United Arab Universities for study and Agricultural Research Magazine 9(132): 432-444 (2001).
- Al-Azawy, A. F. and Qado, I. Q. and H.S. Al-haidery, The Insects (1990).
- Al-Emery, Majeed Shnawa Safeeh Albahily, Hayat Mohammed Reza Mahdi, Binyan Muna Abdulwahed, The effect of some fungi and plant extract in getting rid of Dubas Bug *Ommatissus Binotatus* var. (Tropiduchidae: Homoptera) Lybicus De Berg (2008).
- Al-ibada, A.J., The vital effect of water extracts of some decoration plants in cimex (Tingidae: hemipteran) (Mul. And Rey) *Monosteria uncostata*. Diyala agricultural science magazine (2011).
- Al-Jubouri, Ibraheem Jadoa, Field cricket. Agricultural collage, Baghdad Univveristy (2000).
- Alkazaz, Zainab Kareem Jawad, The efficiency of Ethyl Alcohol Extract of *Myrtus communis* L. Leaves and *Dodonaea* (2010)
- ALKazaz, Zainab Kareem Jawad, The Efficiency of Ethyl Alcohol Extracts of *Myrtus communis* L. Leaves and *Dodonaea viscosa* (L.) Leaves and Seeds in Control of Some Biological Aspects of Pea Weevil: *Callosobruchus maculatus* (Fab.) (Coleoptera Bruchidae) (2010)
- Al-Malah, N.M. and J.K. Abdul, The role of some secondary ingrideance in the sensitivity of some kinds of pear for the infection of Tingidae: Hemiptera insect. *Stephanitis pyri* (F.) Al-Rafidaen Agricultural Magazine 37(4): 179-188 (2009).
- Al-Mansour, N.A., K.H. Ali Al-Hadlik and S.J. Saleh Thamer, The effect of water extracts of some plant in the workers of Termite *Microcerotermes Diversus Silvestri* (1920) (Termitidae): Isoptera Al-Basra science magazine b24(1)40-56 (2006).
- Alrawi, khashe wakhalf Allah, Introduction to Statistics Second Edition. Book for printing and publishing, University of Mosul (2000).
- Bekheit, H.K.M. and F. Abo El-Abbas, Pathogenicity of entomogenous Fungi (Hyphomycetes) to larvae of the cotton leaf worm *Spodoptera littoralis* (Lepidoptera:Noctuidae). Arab Univ. J. Agric. Sci. Ain Shams Univ. Cairo 10(1): 146-405 (2002).

- Clarke, B.S. and A. Jewess, The inhibition of chitin synthesis *Spodoptera littoralis* larvae by *flufenxuron*, *Teflubenzuron* and *diiflubenzuron*. Pestic. Csi. 8: 377-388 (1990)
- Deacon, J.W., Microbial control of pests. Use of fungi. In Microbial control of plant pests and diseases. (VNB) U.K.N. Pp. 31-41 (1983)
- Hall, R.D. and M.C. Dohse, Laboratory and field tests of CGA. 72662 for control of the housefly and face fly in poultry, povine or swim manure. J. Econ. Entomol. 73(4): 564-569 (1980).
- Huxham, I.M. and A.M. Lackie, Behavior invitro of separated fractions of heamocytes of the locust *Schistocerca gregaria*. Cell Tissue Res. 251: 677-684 (1988)
- Jabbar, A. M. AL-Aradhi and M.T. Thaaer, Effect Study of Water and Alkaloid crude extracts from leave *Dodonaea viscosa* Linn (Sapinadaceae) on some biological aspects of *Mizus persicae* (Homoptara: aphidae)
- Kareem, Tariq Abdul Sadda, Elsara, Emad Adnan Mahdi, Mahmood and Nabeel Abdul Latif, The vital activity of Five aromatic vegetable oils against *Aphis Nerii* (Aphidae: Homoptera). Diyala Agricultural Science Magazine 4(2): 177-186 (2012).
- Kewka, E. J., B.J. Mwaagonde, E. Kimaro, S. Msangi, C.P. Msangi and A.M. Mohande, Aresting boxfor outodoor sampling of adult *Anopheles arabiensis* in rice irrigation schemes of lower moshi, northern Tanzania. Malaria Journal 8(1): 82 (2009).
- Khalif, J. M. and Aelan, Biological resistance of nymph and adult of field cricket *Gryllodes aigillatus* (Gryllidae: orthoptera) by using *Trichoderma harzianum* fungi Laboratory. Al-Kufa Magazine for agricultural sciences 3(1): 73-81 (2011).
- Mahdi, M.T. and F.H. Radi, The effect of using some vegetable oils in resisting southern Lupine beetle *Callosobruchus maculateus* (Fab.) (Coleoptera: Bruchidae) agricultural and water resources magazine, volume (3)(2) p.110-114 (1984).
- Martins A., T.A. Belinato, J.B. Lima and Vulle, Chitin synthesis inhebitor effect on *Aedes aegypti* popu- lations susceptible and resistant to organo phosphate tempose pest. Mange. Sci. 64: 676-680 (2008).
- Miura, T. and R.M. Takashi, Effect of the insect growth inhibitor Sir8514 on hatching of southern house mosquito eggs. G. Econ. Entonol.72: 692-694 (2009).
- Pederson, M.W., D.K. Barner, E.L. Sorensen, G.D. Griffinm, M.W. Nielson, L.J. Emming, R.R. Hill, F. L. Frosheiser, R.M. Sonoda, C.H. Hanson, T.E. Devine, M.J. Anderson, B.P. Goplen and E.E. Howarth, Effects of low and high saponin selection in Alfalfa on Agronomic and pest resistance Traits and interrelationship of these Traits. Crop. Sci.15: 254-256 (1976).
- Riose, D.I., M.C. Recio and A. Villar, Antimicrobial activity of selected plant Employed in the Spanish Mediterranean area. J. Ethnopharmacol. 21: 139-152 (1987).
- Taniguchi, M., M. Yamaguchi, I. Kubo and T. Kubota, Inhibitor effect of Isoden Diterpenoides on Grothan Mitochondrial oxidative phosphorylation in Lepidopterous Insects. Agric. Biol. 43: 71-74 (1997).
- Thomas, P.L., Control of insect pest of stored using a juvenile hormone analogue. J. Econ. Entomol. 66(1): 277-278 (1972).
- Van- Emden, H.F., V.F. Esasitop, R.D. Hughes and M.J. Way, The ecology of *Muzus persicae*. Ann. Rev. of Entomol. 14:197-270 (1969)