LABORATORY AND FIELD EVALUATION OF INSECTICIDES AGAINST THE OLIVE BARK BEETLE *Phloeotribus scarabaeoides* Bern. (COLEOPTERA: SCOLYTIDAE) IN FAYOUM, EGYPT.

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ABSTRACT

Under laboratory conditions depending on the exit holes, Cidial L50% was the most effective insecticide at 200 and 400 cm^3/100Lwater. Basodin 60% at 300 cm^3/ 100Lwater was the most effective. The least effective was Keiton L 50% at 200, 300 and 400cm^3/100Lwater. The highest percent reduction in number of holes was recorded for Cidial L50% treatment (42.43%) at 400 cm^3/100Lwater concentration. Also results showed that Keiton L 50% was the least effective in reducing the number of emerged beetles while both Basodin and Cidial L50% were similarly reduced the number of beetles emerged under laboratory conditions.

Application of insecticides considerably affected parasitoids emergence with Cidial L50% at 200 and 400 cm^3/100Lwater only 4.17-4.33 individuals/one cutting were found compared with 34.17 parasitoids from untreated one cutting. No parasitoids were found with the use of Basodin 60%. Therefore, Cidial L or Basodin; 400cm^3 /100L water are recomended in case of severe infestation by the scolytid *P. scarabaeoides* on olive trees.

Under field conditions, the use of Cidial L50% and Basodin 60% EC against the olive bark beetle *P. scarabaeoides* reduced the number of inside holes by 38.52 and 19.44%, respectively Cidial L50% increased efficacy was due to its repelling effect. However, Basodin 60% EC was more effective in reducing the number of beetles emerged, due to higher mortality of beetles in maternal galleries of olive branches. Statistical analysis indicated no significant difference between the two tested insecticides.

Key words: Olive trees, *Phloeotribus scarabaeoides*, Cidial L50%, Basodin 60%, Keiton L 50%, insecticides, parasitoids.

INTRODUCTION

The Scolytid bark beetle, *Phloeotribus scarabaeoides* (Bern.) attacks a number of different tree species including *Phyllirrea, Fraxinus, Ligustrum, Syringa* and olive, *Olea europaea* throughout the Mediterranean region **(Arambourg 1986)**, and was recorded in Egypt by **Taher, 1966** on olive trees at Matrouh. This pest is now widely distributed all over Egypt, and considered as a serious pest that attacks small branches, twigs and stems; causing death of small branches and weakening of the whole tree.

P. scarabaeoides are almost present all year round especially in neglected trees weakened by diseases, drought, excess watering, or infested by other pests such as *Zeuzera pyrina*. Detached branches especially those lying

on the ground also attract *P. scarabaeoides* (**Mostafa *et al.* 1992**). **In Jordan Mustafa and El-Mazraawi, 1996** showed that *P. scarabaeoides* is highly attracted to the branches located inside the tree canopy and against the tree main trunk after two weeks of branches cut.

Control methods include: a) plastic sheeting to cover stacks of pruned branches to trap new adults (**Lanari, 1980** in Italy); b) natural balance established due to the lack of chemical treatment (**Yatla, 1983** in Turkey); or c) the use of triazophos at 100g, isofenphos at 150g and azinphos-ethyl at 400g /hl, and deltamethrin at 100g/hl (**Mussche *et al.* 1987** in Tunisia). The present study aimed to evaluate some selected insecticides against the olive bark beetle *P. scarabaeoides*. For this purpose, Cidial L50%, Basodin 60% EC and Keiton L 50% were tested in the laboratory. Cidial L50 % and Basodin 60% EC were also tested under field conditions.

MATERIALS AND METHODS:

1- Laboratory experiment: three insecticides (Cidial L50%, Basodin 60%EC and Keiton L50%) with three concentrations of each; 200, 300 and 400 cm^3/100Lwater were used in addition to application of water alone as control. Olive branches infested with *P. scarabaeoides* were collected from newly infested trees during March 2005 from Ibshawai district, Fayoum governorate. Branches were cut in the laboratory to 25 cm. long x 5cm. dia. pieces that were examined to mark and record the number of inside holes. Each 6 cuttings (replicates) were sprayed with one of insecticide concentration chosen and left to dry, then kept in a jar 30cm height, tightly covered by muslin cloth and rubber bands, and kept under laboratory conditions. Six cuttings were used as control. The cuttings were examined weekly till the end of experiment to count the number of exit holes representing number of emerged adults of the pest and the associated parasitoids. Percentage of reduction was estimated for each insecticide.

2 - Field experiment: Cidial L50% and Basodin 60% EC at the concentration recommended by the Ministry of agriculture (300cm^3/100 L water) were used in Nov. 27, 2005. This experiment was done at Ibshawai district, Fayoum governorate. Eighteen cuttings, 25cm. long and 5 cm. dia., were taken from infested branches. All cuttings were initially examined to mark and count the inside holes due to infestation. Six cuttings (replicates) were used as check treatment, sprayed with water and the other twelve were sprayed with 500 cm^3 of 300cm^3/100L water concentration; 6cuttings (replicates) for each of the two materials chosen. After spraying, the cuttings were left in the farm for two months and examined weekly for new inside holes, and date of first exit holes of adults, and associated parasitoids. Cuttings were transferred to the laboratory to record the number of exit holes and parasitoids weekly for 8 weeks. These holes represented numbers of emerged adults of the pest and parasitoids. Then percentage of reduction was estimated.

Statistical analysis: Numbers of emerged beetles were computed according to the general linear models. Significant differences between treatment means were calculated by Duncan test at P0.05. using SPSSv8.0 computer program.

RESULTS AND DISCUSSION:

1 - Laboratory experiment

The effect of three selected insecticides (Cidial L50%, Basodin 60% and Keiton L 50%) with three concentrations (200,300 and 400 cm^3/100Lwater) in the laboratory on olive bark beetle *P. scarabaeoides* was shown in table 1. Data indicated that all tested insecticide treatments were insignificantly different. Depending on the exit hole reduction, Cidial L50% was the most effective at 200 and 400 cm^3/100Lwater (19.21 and 17.46 exit holes/one inside hole, respectively) followed by Basodin 60% (21.51 and 19.21exit holes/one inside hole, respectively). Basodin 60% at 300 cm^3/100 L water was the most effective. The least effective at 200,300 and 400 cm^3/100 L water was Keiton L 50% (25.37, 23.95 and 21.78 exit holes/one inside hole, respectively).

Table (1): Mean numbers of emerged *P. scarabaeoides* beetles and its parasites (per one cutting) treated with insecticides under laboratory conditions.

Concentration /100LW	Insecticide	Pre treatment inside holes	Post treatment Exit holes per		% Reduction	Parasitoids/ cutting
			Cutting	Inside hole		
200 cm^3.	Cidial L 50%	21.00	444.997	21.19	30.14	4.17
	Basodin 60% EC	20.33	437.33	21.51	29.08	0.00
	Keiton L 50%	18.00	456.67	25.37	16.35	0.00
300 cm^3	Cidial L 50%	21.50	418.996	19.49	35.74	0.17
	Basodin 60% EC	20.83	403.332	19.36	36.17	0.00
	Keiton L 50%	20.50	491.00	23.95	21.04	0.67
400 cm^3	Cidial L 50%	20.50	357.89	17.46	42.43	4.33
	Basodin 60% EC	18.67	358.67	19.21	36.67	0.00
	Keiton L 50%	20.50	446.499	21.78	28.19	0.67
Control		21.83	662.17	30.33	-	34.17

In general, the rate of reduction increased gradually with the increase of concentration for the three tested insecticides. On the other hand, the highest reduction percentage was recorded for Cidial L50% treatment (42.43%) for 400 cm^3/100Lwater concentration (table 1).

Statistical analysis indicated that 200cm^3/100L water for the tested application insecticides (Cidial L 50 %, Basodin 60% and Keiton L 50%) gave the least effect on number of emerged beetles *P. scarabaeoides*. At concentration 300cm^3/100 L water, no significant differences were found between the tested insecticides. But were significantly different from control. Also, no significant difference between Keiton L50% insecticide and control. As well as, at 400cm^3/100 L water, between the tested insecticides. A significant differences was found between this concentration and control for all insecticides but with no significant difference between Keiton L 50% insecticide and control under laboratory conditions. Keiton L 50% was the least effective insecticides in reducing the number of emerged beetles *P. scarabaeoides* while both Basodin 60% and Cidial L 50% insecticides were similar in this effect.

The most abundant parasitoids for *P. scarabaeoides* were *Cheiropachus quadrum* and *Rhaphitelus maculatus*, in addition to 2 other unidentified species founding few numbers throughout the period of experiments (March until May).

In this respect, in Egypt, **Ismail *et al.* 1988** recorded several ectoprepupal and pupal hymenopteran parasitoids of *P. scarabaeoides*: the pteromalids, *Cerocaephala corniger*, *Cheiropachus quadrum*, *Rhaphitelus maculatus*, the encyrtid *Litomadtix truncatellus (Copidosoma truncatellum)*, *Eupelmus* sp. and *Eurytoma* sp. In Spain, **Campos and Lozano 1994 and Lozano *et al.* 2000** fond that *Cheiropachus quadrum* and *Dendrosoter protuberanus* are the main parasitoids of the olive *P. scarabaeoides*.

The number of emerged parasitoids recorded was associated with high reduction caused by treatments, except for Cidial L50% at 200 and 400 cm^3/100Lwater (4.17 and 4.33 individuals/one cutting, respectively). The number of emerged parasitoids from untreated one cutting was high (34.17 individuals) compared with treated cuttings.

Table (2): Number of dead and alive *P. scarabaeoides* adults after 48hr. of treatment with a rate of 200, 300 and 400 cm^3/100L water under laboratory conditions.

Treatment	Concentration						Total	
	200		300		400			
	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive
Cidial L50%	48	0	30	2	47	4	125	6
Basodin 60% EC	40	3	55	0	64	2	159	5
Keiton L50%	40	2	59	0	60	3	159	5
control	10	2	10	2	10	2	30	6

The number of dead *P. scarabaeoides* adults in maternal galleries after 48hr. of treatment with three tested concentrations (200, 300 and 400 cm^3/100L water) are shown in table 2. These numbers were higher for Basodin and Keiton L50% (159 beetles) than Cidial L50% (125 beetles) and the least number was in the case of control treatment (30 beetles).

2 - Field experiment

Table (3): Number of new inside holes and emerged *P.scarabaeoides* beetles/one cutting under field conditions after treatment. with 300 cm^3/100L water treatment.

Treatment	Inside holes			Mean no. of emerged beetles	
	No./ cutting (prespray)	No./ cutting (2 months after treatment)	% Reduction	No. / cutting	% Reduction
Cidial L50%	14.50	19.33	38.52	581.5ab	15.74
Basodin 60% EC	13.83	24.17	19.44	477.0b	30.88
Control	13.83	30.00	-	690.1 a	-

By Handreson and Telton formula (1955).

Data presented in table (3) showed that Cidial L50%, and Basodin 60% EC under field conditions reduced the number of inside holes after two months from treatment to 38.52 and 19.44%, respectively. Cidial L50% treatment was 2 folds as efficient as that of Basodin 60% treatment. The total number of emerged beetles decreased insignificantly with treatment being only 15.74 and 30.88% for Cidial L50% and Basodin 60%, respectively.

Results reveled that the application Cidial L insecticide under field conditions was more effective in reducing the number of inside holes of *P. scarabaeoides* due to repellent effect. Whereas Basodin 60% was more effective in reducing the emergence of beetles causing higher reduction percent due to the mortality of beetles in maternal galleries of olive branches. However, statistical analysis indicated no significant difference between the two tested insecticides (Basodin and Cidial L); both there were significantly different from control.

In this respect, **Abdel Rahman, 1995** used two sprays of a mixture of either Cidial L or Basodin or 1 of Actellic, Anthio, Dimethoate or Lebaycid at the end of February and the last week of April, followed by 3 sprays of Actellic, Anthio, Dimethoate or Lebaycid at mid-June, early August and mid-September gave an effective level of control against all pests attacking olive cultivars. **Pena *et al.* 1998** mentioned that olive logs sprayed with cypermethrin alone or in combination with ethrel, no colonization occurred of *P. scarabaeoides.* **Ruano *et al.* 2008** found that pyrehroid insecticide, Deltamethrin affected the emergence of the bark beetle, with a reduction ranging from 1 -13%.

Application of insecticides affected the emergence of parasitoids. This agreed with those results obtained by **Mussche *et al.* 1987,** in Tunisia mentioned that during the control of *P. scarabaeoides* hymenoptera knocked down by the insecticide sprays. They indicated that sprays against the wood borers should be applied in September rather than October to protect these parasitoids. On versus the results disagreed with those obtained by **Campos and Pena 1997** found that the control of *P. scarabaeoides* by treating cut olive logs with Methoxychlor at 0.1%, where treatments eliminated part of the pest population and affected the fecundity of exposed females without affecting parasitoids. Also **Ruano *et al.* 2008** mentioned that the lowest dose employed corresponding to 0.00125% active ingredient of Deltamethrin reduce emergence of *P. scarabaeoides* without a significant effect on the hymenopteran parasitoids population, except for *Cheiropachus quadrum.*

In conclusion, it is recommended to use Cidial L50% or Basodin with concentration 400cm^3 /100L water in case of severe infestation by the scolytid *P. scarabaeoides*. Keiton L50% application is not recommended. Removal of infested branches after pruning as well as the use of the parasitoids as biological control agent are important factors to reduce infestation of the olive pest *P. scarabaeoides*.

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التقييم المعملي والحقلي للمبيدات لخنفساء قلف الزيتون *Phloeotribus scarabaeoides* Bern. في محافظة الفيوم

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أجريت هذه الدراسة لتقييم بعض المبيدات معملياً وحقلياً على خنفساء قلف الزيتون وقد أظهرت النتائج أنه تحت ظروف المعمل واعتماداً على ثقوب الخروج كان السيديال ل٥٠٪ أكثر المبيدات تاثيراً بتركيز ٢٠٠، و٣٠٠ سم^3/١٠٠ لتر ماء. بينما كان الباسودين٦٠ ٪ أكثر المبيدات تأثيراً عند التركيز ٣٠٠سم^3 /١٠٠لتر ماء. كان مبيد الكيتون ل ٥٠٪ أقل المبيدات تأثيراً بكل التركيزات المستخدمة. من جهة أخرى كانت أعلى نسبة خفض،لعدد الثقوب عند استخدام السيديال ل ٥٠ % بتركيز ٤٠٠ سم^3 /١٠٠ لتر ماء.أيضاً وجد أن الكيتون ل ٥٠٪ أقل المبيدات تأثيراً على خفض عدد الخنافس الخارجة ،بينما كان كل من الباسودين و السيديال متشابهان في خفض عدد الحشرات الخارجة.

وقد أثر استخدام المبيدات على خروج الطفيليات حيث سجل مع السيديال ل بتركيز ٢٠٠، و٤٠٠ سم^3 / ١٠٠ لتر ماء٤,١٧ ، ٤,٣٠فرد/قطعة بالمقارنة ب٣٤,١٧ فرد/ قطعة من القطع غير المعاملة بينما لا توجد طفيليات مع استخدام الباسودين.

أما بالنسبة للدراسة الحقلية فوجد أن استخدام السيديال ل ٥٠ و الباسودين ٦٠٪ خفض عدد ثقوب الدخول بنسبة ٣٨,٥٢، ١٩,٤٤ ٪ لكلا المبيدين على التوالي. ربما ترجع زيادة كفاءة السيديال إلى التأثير الطارد ووجد أن الباسودين أكثر تأثيراً في خفض أعداد الخنافس الخارجة وذلك يرجع إلى الموت العالي للخنافس في الأنفاق. وقد بين التحليل الإحصائي عدم وجود فروق معنوية بين المبيدين لذلك يوصى باستخدام السيديال ل ٥٠٪ أو الباسودين ٦٠٪ بتركيز٤٠٠ سم^3/١٠٠لتر ماء في حالة الإصابة الشديدة بخنافس قلف الزيتون.

الكلمات الدالة: أشجار الزيتون – خنفساء قلف الزيتون – السيديال ل٥٠٪– الباسودين ٥٠ ٪– الكيتون ل ٥٠ ٪ – المبيدات – الطفيليات.