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PERSISTENCE OF CERTAIN PETROLEUM FRACTIONS ON DIFFERENT SURFACES AGAINST THE COWPEA BEETLE, *CALLOSOBRUCHUS MACULATUS* F.

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Abstract

Four petroleum fractions extracts from solar, lubrication oil, kerosene and paraffin oil were treated on certain glass, polyethylene and cotton fabric (Dammur) to evaluate their efficiency and persistence against adults of *Callosobruchus maculatus* F. for different periods extending up to six months. Results revealed that the persistence of fractions on different surfaces had differed according to the type of surface used. Solar fraction was the most persistent followed by kerosene, lubrication oil then paraffin oil. Glass surface was the most ideal to retain toxicity followed by polyethylene and cotton fabric (dammur).

INTRODUCTION

In some instances, one important quality of protective packaging is resistance to penetration by stored-product insects. This is especially true for seed packages, because seeds usually have a high unit value and are stored for long periods of time. Seed packages may be attacked by insects of external origin during storage or by insects inadvertently packaged along with the food or seeds.

Bag treatment with chemicals for protection of stored grain against insect attack has some advantages over other methods of control. This method proved effective under certain conditions in protecting stored products from insect infestation

beside avoiding contamination of foodstuffs. In Egypt, however, very little work has been carried out on this subject and no long term storage of grains or the comparative effectiveness of insecticides applied are avilable.

The aim of the present work is to evaluate the efficiency of four petroleum fractions extracted from solar, lubrication oil, kerosene and paraffin oil against the cowpea beetle, *C.maculatus* after their application on different surfaces such as glass, polyethylene and cotton fabric (dammur). Petroleum fractions proved o be safer, cheap and available than other imported pesticides. Moreover, they showed good insecticidal efficiency against many insects, and against the rice weevil, S. oryzae in protecting stored cowpea from infestation with the cowpea beetle C. *maculatus* F. (Mahgoub and EL-Sisi 1990).

MATERIALS AND METHODS

Four petroleum fractions were prepared from solar, lubrication oil, kerosene and paraffin oil according to A.S.T.M. method No. 483 (Anon, 1968). These fractions were used to evaluate their efficiency against the adults of *C. maculatus*.

Three concentrations at the rates 0.009, 0.004 and 0.006 mg/cm2 were prepared from each fraction in acetone. Circular discs of polyethylene and cotton fabric (dammur) 9 cm in diameter were dipped in each of the tested fractions on one surface only (internal surface of petri-dish 9 cm in diameter). Discs were dried by an electric fan, then polyethylene and dammur discs were transferred to 9 cm diam. Petri-dishes. Twenty five newly emerged 1-2 days old adult beetles were confined to petri-dishes which were covered with muslin and secured in place by rubber band. Petri-dishes with insects were kept in an incubator at 27°C and 65±5% R.H. Mortalities were counted after 24h.

To evaluate the persistence efficiency of the used fractions against the tested insects, 25 newly emerged beetles were introduced periodically to each Petri-dish at 2,3,5,10,20,30,40,50 days and up to 170 days after initial treatments. In all cases, three replicates were made for each treatment and the untreated check. Percentages kill were calculated and gross persistency values were worked out according to the formula used by Power amd Yadar (1980) as follows :

$$\text{Gross persistency} = \frac{\text{Sum of (\% mortality x period days)}}{\text{Number of observations}}$$

RESULTS AND DISCUSSION

As seen in Table 1 the persistence of petroleum fractions on the different surfaces was considerably influenced as observed from the levels of mortality shown by the adults of C.maculatus.

Despite the dosage, solar-fraction was more persistent on glass followed by kerosene, lubrication oil then paraffin oil. The more persistence of solar fraction could be related to its high toxicity to C.maculatus. These results are in agreement with Mahgoub and El-Sisi (1991) who found that solar was highly persistent as it gave 100% mortality up to 17 weeks after treatment against S.oryzae adults. In the untreated check, mo mortality was observed through the whole period of the experiment.

As seen in Table 1, the order of persistence was solar > kerosene> lubrication oil> paraffin oil on the different surfaces. Amog these surfaces, glass retained the highest persistency followed by polyethylene and cotton fabric (dammur). These results indicated that petroleum fractions are more persistent on non porous surfaces. Similar results had already been shown against *C.chinensis* using glass metallic surfaces and plywood (Cogburn 1972, Gojmerae and Slominski (1973), Weaving (1974) and Parkin (1966) had pointed out that the porosity of surface was responsible for less persistency.

The values of gross persistency of the different fractions on the different surfaces are tabulated in Table 1. In most cases, solar was most persistent followed by kerosene, lubrication and paraffin oil.

Gross persistency indicated that glass surface was the most ideal to retain toxicity followed by polyethylene and dammur. These results agree with Power and Yadav (1980) who sprayed some surfaces such as glass, aluminum, plywood, paint-

ed plywood, polyethylene, jute bags, cement and mud by some insecticides against adult of *C.chinensis* (Linn.).

The rates of persistence on glass ranged between 50-100, 90-180 days at the dosages 0.0009, 0.004 and 0.006 mg/cm2, respectively. With polyethylene surface, the rates of persistence ranged between 50-90, 80-120 and 80-150 days with the same doses.

In case of cotton fabric (dammur), the rates ranged between 30-60, 50-100 and 50-110 days with the concentrations 0.0009, 0.004 and 0.006 mg/Cm2 , respctively. Mahgoub and El-Sisi (1991) studied the persistence of treated jute bags with the same tested fractions against the rice weevil S.oryzae L. They found that jute bags treated with petroleum fractions gave 100% mortality through the exposure period (6 days) and up to one month after treatment.

It can be concluded that fair protection of stored cowpea seed up to 170 days could be achieved through surface treatment of glass with 0.006 mg of solar per cm2.

In all cases, higher doses were much effective under the same storage conditions.

Table 1 . Persistence of petroleum fractions on different surfaces against C.maculatus F., as indicated by percent mortality.

	Days after application																						Gross Persistency
	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	
Dosage 0.009 mg/cm^2																									
Glass:																									3242.67
Solar	100	100	100	100	100	100	100	100	100	100	100	100	100	100	90	66	30								1196.50
Lubrication oil	100	100	100	100	100	100	100	100	100	100	70	33.3	0	-	-	-	-								2373.29
Kerosene	100	100	100	100	100	100	100	100	100	100	100	100	80	66.6	50.3	36	0								1031.64
Paraffin oil	100	100	100	100	100	100	100	70	100	60	25	3.3	0	-	-	-									
Polyethylene:																									
Solar	100	100	100	100	100	100	100	100	100	100	100	100	93.3	60	21.3	0	0								2154.00
Lubrication oil	100	100	100	100	100	100	100	70	100	60	22	3.3	0	-	-	-	-								734.50
Kerosene	100	100	100	100	100	100	100	100	100	100	100	100	90	66.6	33.3	2.8	0								2105.57
Paraffin oil	100	100	100	100	100	60	28	100	70	35	20	0	-	-	-	-									900.00
Dammur:																									
Solar	100	100	100	100	100	100	100	100	100	100	65	30	3.3	0	-										1063.45
Lubrication oil	100	100	100	100	100	100	100	100	100	36	2.8	0	-	-	-										565.78
Kerosene	100	100	100	100	100	100	100	100	100	100	100	40	3.3	0	-										1190.73
Paraffin oil	100	100	100	100	100	100	100	100	0	-	-	-	-	-											380.00
Dosage 0.004 mg/cm^2																									
Glass:																									0
Solar	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	90	78.6	52	30	0				4568.00
Lubrication oil	100	100	100	100	100	100	100	100	100	100	100	100	80	66.6	33.3	0	-	-	-	-	-				2601.79
Kerosene	100	100	100	100	100	100	100	100	100	100	100	100	100	98	86	66.6	40	3.3	0	-	-				3325.6
Paraffin oil	100	100	100	100	100	100	100	100	100	100	100	60	40	2.8	0	-	-	-	-	-	-				1778.77
Polyethylene:																									
Solar	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	80	53.3	0	-	-	-	-			3335.33
Lubrication oil	100	100	100	100	100	100	100	100	100	100	100	100	100	90	73.3	33.3	0	-	-	-	-	-			2690.07
Kerosene	100	100	100	100	100	100	100	100	100	100	100	100	100	95	80	70.3	30	20	2.8	0	-	-			2789.00
Paraffin oil	100	100	100	100	100	100	100	100	100	100	60	44	100	20.6	0	-	-	-	-	-	-	-			2152.23
Dammur:																									
Solar	100	100	100	100	100	100	100	100	100	100	100	100	100	48.6	30	20.8	2.8	0	-						2030.27
Lubrication oil	100	100	100	100	100	100	100	100	100	100	60	33.3	3.3	0	-	-	-	-	-						1069.36
Kerosene	100	100	100	100	100	100	100	100	100	100	56.6	30	2.8	0	-	-	-	-	-						1039.27
Paraffin oil	100	100	100	100	100	100	100	100	50	38	20	0	-	-	-	-	-	-	-						852.00

Table 1 . (Cont.)

	Days after application																							Gross Persistency	
	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	
	Dosage 0.009 mg/cm^2																								
Glass:																									
Solar	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	93.3	70	33.3	3.3	0	5997.83
Lubrication oil	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	87.8	60	30	2.8	0	-	-	-	-	-	3658.00
Kerosene	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	90.6	81.6	55	30		0	-	5283.09
Paraffin oil	100	100	100	100	100	100	100	100	100	100	100	100	100	60	28.6	0	-	-	-	-	-	-	2.8	-	-	2633.86
Polyethylene:																									
Solar	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	90	78.6	45	20	0	-	5795.00
Lubrication oil	100	100	100	100	100	100	100	100	100	100	60	100	100	88.7	66.7	38	20	2.8	0	-	-	-	-	-	-	2633.86
Kerosene	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	95	88.6	66	30	6.4	0	-	-	-	4566.10
Paraffin oil	100	100	100	100	100	100	100	100	100	100	100	60	33.6	2.8	0	-	-	-	-	-	-	-	-	-	-	1755.08
Dammur:																									
Solar	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	63.3	20	0	-							3439.38
Lubrication oil	100	100	100	100	100	100	100	100	100	100	100	60	40	36	28.6	0	-	-	-							1817.14
Kerosene	100	100	100	100	100	100	100	100	100	100	100	100	100	100	50	28	0	-	-							2630.00
Paraffin oil	100	100	100	100	100	100	100	100	60	20.8	0	-	0	-	-	-	-	-	-							1094.00

REFERENCES

1 . Anonymous. 1968. Am. Soc. Testing Materials, Philadelphia, A.S.T.M. Standard Methods, Part 18 methods 445 and 483.

2 . Cogburn, R.R. 1972. Natural surfaces in Gulf Port Warehouse influence on toxicity and malathion and Gardona to confused flour beetle. J. Econ. Entomol., 65 (6) : 1706-1709.

3 . Gojmerae, W.L. and J.W. Slominski. 1973. Paint the surfaces before using insecticides. Ag. Chem., 28 (4) : 6.

4 . Mahgoub, S.M. and A. EL-Sisi. 1990. Evaluation the insecticidal efficiency of some Egyptian petroleum oil fractions against the rice weevil. Egypt. J. Agric. Res. (in press).

5 . Mahgoub and A. El-Sisi. 1991. Control of *Sitophilus oryzae* in wheat grains using some Egyptian petroleum oil fractions. Egypt. J. Agric. Res. (in press).

6 . Parkin, E.A. 1966. The relative toxicity and persistence of insecticides applied as wettable powder against stored product beetles.Ann.Appl. Biol.,57(1):1-14.

7. Power, C.S. and T.D. Yadav 1980. Persistence of organophosphorus insecticides on different surfaces. Indian J. Ent., 42 (4) : 728-736.

مدى استمرارية المنتجات البترولية على أسطح المواد المختلفة ضد حشرة خنفساء اللوبيا

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٢ – معهد بحوث وقاية النبات - مركز البحوث الزراعية – الدقى .

تم اختبار التأثير المتبقى لأربعة منتجات بترولية هى السولار ، زيت التشحيم ، الكيروسين ، زيت البرافين ، وذلك لفترات مختلفة على بعض الاسطح المختلفة مثل الدمور ، البولى إيثيلين ، الزجاج ضد الحشرة الكاملة لخنفساء اللوبيا.

وقد أثبتت الدراسة الآتى :

١- اختلف تأثير المنتجات البترولية المستخدمة على حشرة خنفساء اللوبيا تبعا لاختلاف التركيز المستعمل (٠,٠٠٠٩ ، ٠,٠٠٠٤ ، ٠,٠٠٠٦ ملجم / سم٢) واختلاف السطح المعامل (دمور ، بولى ايثيلين ، زجاج).

٢- أعطى السولار بصفة عامة أعلى تأثير من حيث استمرار بقائه على السطح المعامل لمدة ١٨٠ يوما يليه الكيروسين (١٧٠ يوما) ثم زيت التشحيم (١٣٠) وأخيرا زيت البارافين (٩٠ يوما).

٣- أعطى سطح الزجاج أعلى بقاء ، يليه فى ذلك البولى ايثيلين ثم الدمور.