Egypt. J. Agric. Res., 71 (2), 1993.

JOINT ACTION OF TWO LOCAL MINERAL OILS WITH SOME ORGANOPHOSPHOROUS INSECTICIDES AGAINST ADULTS OF THE WHEAT APHID *RHOPALOSIPHUM PADI.*

WAFAA M. H. EL-DEEB

Centeral Agricultural Pesticides Laboratory , Agricultural Research Centre, Ministry of Agriculture , Dokki, Egypt.

(Manuscript received 2 march 1991)

Abstract

Two mineral oils and five organophosphorous insecticides were tested individually againt adults of the wheat aphid *Rhopalosiphum padi.*The results showed that primiphos-ethyl, primiphos - methyl and the mineral star oil were more toxic than monocrotophos, dimethoate, malathion and the mineral oil Shokrona super.

The joint action of insecticide /mineral oil combinations revealed different levels of synergism except for primiphos-methyl/Shokrona super where antagonism was observe. The most effective combination was primiphos - methyl/Star oil with a factor of sinergism 4.54, while the least was dimethoate / Star oil .

INTRODUCTION

In recent years aphids appeared as a major pest on several crops in Egypt especially on wheat and cotton. Particular interest should be therefore devoted to combat aphids with more efective means of control.

The growing concern with problems associated with insecticide use such as misapplication, deleterious side effects on plant, unbalance of natural enemies, toxicity to mammals and the high cost of pesticide control, necessitate the search for other means of control such as the use of mineral oils alone , or in mixtrues with insecticides. This will result into lower doses used and an environment that is less

cotaminated with insecticides.

The use of mineral oils alone or combined with insecticides to control sucking insects was previously studied by Moustafa and El - Attal (1984) .

The present investigation aimed at studying the relative toxicity of certain local mineral oils, organoposphorous insecticides and their binary mixtrues against the wheat aphid *Rhopalosiphun padi* (L.).

MATERIALS AND METHODS

Samples of wheat leaves infested with *R.padi* were collected from Dakahlia Governorate in April 1989. Two mineral oils used were formulated at the Central Agricultural Pesticides Laboratory under the names Star oil and Shokrona super.

Five organophosphorous insecticides were used, these were pirimiphos ethyl (50% WP), pirimiphos methyl (50 % EC), monocrotophos (40 % EC), dimethoate (40% EC) and malathion (40 % EC).

Insecticides and mineral oils were tested individually at several concentrations against *R.padi* adults . Four replicates of ten adults each were used for each concentration. The toxicological tests were carried out by using the slide-dip technique .

By means of a fine brush, adults were affixed to double faced scotch tape and stuck tightly to the slides on the dorsal part. The slides were then dipped in the prepared insecticide water solutions for ten seconds.The same technique was also used for the control using tap water only. Natural mortality was corrected according to Abbot's formula (1952) . Mortality was recorded two hours after treatments, and all insects responded to touching with the fine brush were considered alive.

Mortality data were subjected to statistical analysis by the method of Finney (1952), and the LC_{50} values for insecticides and oils were determined . The toxicity factor for insecticides was determined according to Sun (1950) as follows:

$$\text{Toxicity foctor} = \frac{LC_{50} \text{ of the most effective insecticide}}{LC_{50} \text{ of the less effective insecticide}} \times 100$$

The joint action of insecticide/oil mixtures was tested by mixing a non lethal concentration of the mineral oils (125 PPm) with the recommended concentration of the insecticides. Series of dilutions were then made to obtain complete mortality regression lines.

The degree of synergism was determined by estimating the factor of synergism (F.S.) according to Chadwich (1961) based on LC_{50} values.

$$\text{Factor of synergism (F. S.)} = \frac{LC_{50} \text{ of the insecticide alone}}{LC_{50} \text{ of the insecticide in the synergized form}} \times 100$$

The F. S. of one indicates no synergism, a value less than one means antagonism, and a value greater than one indicates synergism.

RESULTS AND DISCUSSION

Results shown in Table 1 indicate the toxicity factor of insecticides and mineral oils after two hours from treatment on the adult stage of *R.padi.* Pirimiphos - ethyl is the most toxic insecticide with an LC_{50} value of 110 ppm. The related compound pirimiphos methyl came next with 96.5 toxicity factor. Comparatively, the toxicity factors of monocrotophos, dimethoate and malathion were lower (22.3, 19.1 and 12.9, respectively).

Table 1. Relative toxicity of certain insecticides against the adult stage of *R.padi.*

Compound	LC_{50} ppm	Slope	R.T. *
Primiphos - methyl	110	2.78	100
Primiphos - ethyl	114	2.24	96.5
Star oil	282	2.51	39.0
Monocrotophos	493	3.32	22.3
Dimethoate	576	2.56	19.1
Malathion	857	2.26	12.8
Shekrona super	1949	1.56	56.0

* R. T. = relative toxicity

Table 2. Joint action of insecticide / oil combination on the adutl stage of *R. padi* infesting wheat (1989 season)

Insecticide	Insecticide alone		Insecticide / Star oil			Insecticide/ shokrona super		
	LC_{50}	slope	LC_{50}	slope	F. S.	LC_{50}	slope	F. S.
Pirimiphos - methyl	114	2.24	25.1	1.39	4.54	306.0	2.31	0.37
Monocrotophos	493	3.32	199.5	3.29	2.47	142.4	2.99	3.46
Malathion	857	2.26	435.3	2.43	2.00	252.0	3.39	3.40
Primiphos - ethyl	110	2.78	65.6	3.08	1.68	44.3	3.70	2.48
Dimethoate	576	1.65	562.3	1.65	1.02	266.7	3.07	2.16

$$F.S. = \frac{LC_{50} \text{ of the insecticide alone}}{LC_{50} \text{ of the insecticide in the synergized form}}$$

Star oil is more toxic than Shakrona super as shown by the toxicity factors 22.3 and 5.6, respectively. It is clear that pirimiphos -ethyl , primiphos - methyl and Star oil were more potent against adults of *R.padi* compared with monocrotopos, dimethoate, malathion and the mineral oil Shokrona super .

Reduction in potency of organophosphates against *T.padi* was demonstrated by El - Hariry (1988) . Furthermore Sawicki *et al.*, (1978) showed that the green peach aphid *M.presicae* (Sulz.) acquired resistance to organophosphorous and carbamate insecticides world wide.

As demonstrated in Table 2 except for pirimiphos methyl which was antagonized by Shokrona super oil, different levels of synergism were achieved by insecticides combined with Shokrona super or Star oil. The highest F.S. obtained was that for pirimiphos methyl / star oil combination, followed by monocrotophos / Shokrona super, then malathion / Shokrona super. Moderate factors of synergism were also indicated with the mixture pirimiphos methyl/Shokrona super, monocrotophos /star oil, dimethoate / Shokrona super then malathion/ star oil. On the other hand, the combinations pirimiphos -ethyl / star oil and dimethoate / star oil produced slight levels of potentiation.

Similar results were obtained by Mostafa and El - Attal (1985) who reported that mineral oils if are properly selected and prepared, could be used separately at the rate of 7.5 L/ ha for the control of thrips , but oil insecticide combinations were superior to oil or insecticides if applied alone.

REFERENCES

1. Abbott, W.S., 1925. A method of computing the effectiveness of an insecticide. J. Econ. Entomol., 18, 265 - 267.
2. Chadwich, P. R., 1961. A comparison of safroxan and piperonyl butoxide as pyrethrum synergists. Pyrethrum Post, 6:30 - 37.
3. El-Hariry, M. Abdel-Hamied 1988. Toxicological studies on certain aphid species infesting gramineous crops "Graminaceae" Ph. D Thesis , Fac. Agric., Ain Shams Univ. Egypt.
4. FINNEY, D. J., 1952. Probit analysis. 2nd Ed. (Cambridge Univ. Press, London: 318 pp).

5. Moustafa, K. Omayma AND Z. M. El-Attal 1984. Enhancement of the efficiency of some insecticides against thrips and cotton leaf worm by mineral oils. J. Agric., Sc., Camb., 105: 63-6.

6. Sawicki, R. M., A. D. RICE, A. L. Devonshire, G. D. Moores, S. M. Petzinge, and A. Cameron, 1978. The detection and distribution of organophosphorus and carbamate insecticides resistance in *M. Persicae* (Sulzer) in Britain. Pestic. Sci. 9:189

7. Sun, Y.P., 1950. Toxicity index -an improved method of comparing the relative toxicity of insecticides. J. Econ. Entomol. 43 : 45- 53

تأثير خلط بعض الزيوت المعدنية المحلية مع المبيدات الفوسفورية علي الحشرات الكاملة لمن القمح

وفاء الديب

المعمل المركزي للمبيدات – مركز البحوث الزراعية – الدقي

نظراً للمشاكل الناتجة عن الأستخدام المكثف لمبيدات الآفات الذى أدى الي حدوث خلل في التوازن الطبيعي بين الآفات واعدائها الحيوية، وكان من نتيجتها ظهور أفات جديدة لم يكن لها تأثير ضار ملحوظ من قبل، كان من الضروري البحث عن أفضل الوسائل للمكافحة مع المحافظة علي الأعداء الحيوية.

ولقد اجري هذا البحث كمحاولة لاستخدام بعض الزيوت المعدنية المحليه بمفردها أو بخلطها مع بعض المبيدات الفوسفورية لمكافحة من القمح *R. padi* وذلك بغرض تقليل الجرعات المستخدمة من المبيدات.

ولقد أوضحت النتائج ان البريموفوس ايثيل والبريموفوس ميثيل والزيوت ستار اويل كانت أكثر المواد سمية عن كل من مونوكوروتوفس والملاثيون والزيت المعدني شكرونا سوبر .

ولقد أدي خلط المبيدات مع الزيوت الي زيادة كفاءة المبيدات بمعدلات مختلفة فيما عدا البريموفوس ميثيل / شكرونا سوبر الذي أعطي تأثيراً مضاداً.

وكان أكثر المخاليط كفاءة هو البريموفوس / ستار اويل بينما كان أقلها كفاءة دايميثويت / ستار أويل .