PERFORMANCE OF GROUND LOW-VOLUME SPRAYING MACHINES FOR CONTROLLING COTTON LEAFWORM LARVAE ON CLOVER PLANTS

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Abstract

Field experiment was carried out on heavy infested area with cotton leafworm larvae at Edfina district (El-Behera Governorate) for evaluation the field performance of low-volume spraying machines: Economy Micro ULVA, knapsack motor sprayer Arimistu and knapsack motor sprayer Arimistu with Micronair to spray local mineral oils: CAPL1-, CAPL-2, and Solar EC., compared with the recommended insecticide (Lannate). A satisfactory coverage was obtained on clover plants and the physical properties of mineral oils (surface tension and viscosity) under field dilution rate were determined, and compared with the spray coverage of the tested treatments.

Results obtained indicated that, reduction percentage in cotton leafworm larvae in case of mineral oils is coincided with the percentage of lost in emulsion sprayed on ground where old larvae live, while lannate treatment showed opposite results. The suitable spraying machine differes from one treatment to another i.g. Micro ULVA sprayer for CAPL-1, knapsack motor Arimistu with Micronair for CAPL-2 and knapsack motor Arimistu for Solar, EC., all local mineral oils gave higher reduction percentage than lannate without any phytotoxic effect against the cotton leafworm larvae on clover plants. On the other hand, Solar EC could be recommended as the most cheepest, available and effective mineral oil when sprayed by knapsack motor Arimistu for controlling cotton leafworm larvae on clover plants.

INTRODUCTION

Studies carried out for controlling cotton leafworm larvae *S.littoralis* on colver seedling (Abd El-Haleem *et al.*, in press) indicated that, local mineral oils achieved high efficiency for controlling larvae and pupae of this pest. Therefor, we planned this research for more studies on local mineral oils against larvae of cotton leafworm in comparison with lannate but on mature clover plants with recent spraying equipments: Economy Micro ULVA knapsack motor Arimistu and knapsack motor Arimistu with Micronair with 13, 20, 10 L/fed., respectively to find out any relation between type of spraying equipments and insecticidal efficiency. Secondly stu-

dying the effect of mineral oil type and insecticidal efficiency. Also getting clear out answer on the efficiency of local mineral oils and lannate insecticide in combating *S.littoralis* larvae.

MATERIALS AND METHODS

Field experiments were conducted on 29th November 1996 at Edfina district, El-Behera Governorate to spray a heavy infested clover area with cotton leafworm larvae by using different means of three ground spraying equipments. Technical data and spray parameters of the used sprayers are shown in Table 1. Each ground spraying equipment sprayed four products local mineral oils CAPL-1, CAPL-2, Solar EC, under rate of 3 lit/fed. Compared with lannate insecticide 90% soluble powder with 300 gm/fed., surface tension of mineral oil, spray solution under concentration used 1.5% was determined using Dunouy Tensiometer, also its viscosity was determined by using Stalgometer, Table 3.

Each treatment was 1050 m2 (70x15m) was divided into three replicates. Water sensitive paper developed by Ciba-Geigy was hanged on two levels of thirty clover plants, selected in a paralled position to the ground wire collectors (Hindy 1991) at about one meter distance between two adjacent plants in order to estimate the sprayed emulsion lost on the ground between plants. The average weather conditions during tests were as follows: air temperature 30^{o}C, relative humidity 75% and wind velocity 2.0 m/second. Measurements of size number of spots were carried out by means of a scaled moncular. All necessary corrections and calculation connected with such technique of measurements and determination of droplet were conducted according to Anonymous (1978). The spread factor of used sensitive paper was 2.2 (Ciba-Geigy, 1990). Insecticidal efficiency against larvae was determined according to El-Deeb (1977) in two randomized locations (50 x 50 cm) in each replicate, plants over the surface was cut, then total numbers of larvae was counted, counts were done before spraying and after 2,4 and 6 days of spraying. Reduction percentages were calculated by using Henderson and Tilton (1955).

Table 1. Technical data and spray parameters used to control cotton leafworm on clover plants at Edfina during 1996 season.

Equipment used / Spray parameter	Economy Micro ULVA sprayer	Knapsack motor sprayer Arimistu	Knapsack motor sprayer (Arimistu + Micronair)	Remarks
Atomization type	Rotay	Pneumatic	Pneumatic + Rotary	
No. and type of nozzle	one spinning disc	one rotary disc	one micronair	
R.P.M.	7500	6000	5500	Revoluation per min-
Flow rate L/min.	0.18	0.952	0.960	ute for one nozzle
Swath width (m.)	1.5	5.0	10	
Spray height (m.)	0.5	0.5	0.5	
Spray volume L/fed	13	20.0	10.0	
Productivity fed./h.	0.857	2.85	5.71	
Rate of performance fed/day	3.5	11.0	23.0	6 hours spray daily

Spray type target in all treatments.
Working speed 40 m/min.

RESULTS AND DISCUSSION

Results of spray deposit distribution and percentage of spray deposit on ground shown in Table 2 indicating that, the spray coverage on clover plants with the same spraying equipments was higher for CAPL-2, followed by CAPL-1 and Solar EC., but percentage lost spray on ground was oppositely correlated with spray coverage on clover plants. The percentage lost spray on ground was affected by spraying machine type for the same treatment, also it was affected by mineral oil type for the same spraying machine.

On the other hand, Table 3 shows surface tension and viscosity values for the tested spray oils under 1.5% concentration which indicated that, CAPL-2 had the lowest value of surface tension followed by CAPL-1 and Solar EC. This decrease in surface tension gives a prediction of good wettability, spreading and improving the spray coverage on cards on Clover plants and on the leaf coverage of Clover also (O'sipow 1964), therefore, it could be predict that CAPL-2 will give more leaf coverage followed by CAPL-1 and Solar EC. This expection was found as mentioned before in Table 2, since sticking ability and coverage are increased by increasing viscosity value of spray solution (Schwartz *et al.*, 1958), therefore it could be said that, CAPL-2 which showed the highest viscosity value will give more coverage than CAPL-1 and Solar which was found really, in Table 2, as mentioned before.

Results of biological effect of the tested materials against cotton leafworm larvae under low-volume ground spraying equipments, Table 4, indicated that, larvae reduction percentages were increased by increasing the period after treatment. In case of tested mineral oils reduction percentage after 6 days of treatment was correlated with percentage of spray lost on ground (as shown in Table 2) and this is due to its high deposition on ground, where old larvae live, while in case of reduction percentage was inversely correllated with spray lost on ground. All tested mineral oils showed higher reduction percentage than Lannate.

Generally, solar EC. showed high reduction percentage after 6 days of treatment followed by CAPL-2 and CAPL-1. Spraying equipment which gave high reduction percentage are Micro ULVA sprayer for CAPL-1, Micronair for CAPL-2 and knapsack motor Arimistu for Solar EC.

Finally, it could be said that, all tested materials are safe, cheep, available and locally formulated. Mineral oils are more effective than lannate insecticide in controlling larvae of cotton leafworm on clover plants. Solar EC., could be recom-

Table 2. Spray deposit distribution and percentage of spray deposit on ground of certain products produced by low volume ground spraying equipments in clover plants during 1996 season.

Chemical	Equipment	Spray volume L/fed.	Card's on Clover plants						Card's between plants on ground			total spray coverage (D)	% lost spray on ground C/Dx100
			Upper (A)			Lower (B)							
			N/cm2	VMD µm	Coverage N/cm2xvmd	N/cm2	VMD µm	Coverage N/cm2xvmd	N/cm2	VMD µm	Lost spray on ground (C)		
CAPL-1 EC.	Motor+Micronair	10	259	71	18389	155	56	10075	70	83	5810	34270	16.95
	ULVA sprayer	13	70	170	11900	50	150	7500	46	100	4600	24000	19.16
	Motor sprayer	20	290	199	57710	150	122	18300	89	120	106800	86690	12.31
CAPL-2 EC.	Motor+Micronair	10	300	56	16800	80	70	5600	90	60	5400	27800	19.42
	ULVA sprayer	13	90	140	12600	70	120	8400	40	100	4000	25000	16.0
	Motor sprayer	20	320	150	48000	210	144	30240	140	100	14000	92240	15.17
Solar EC.	Motor+Micronair	10	170	80	13600	122	50	6100	120	30	3600	23300	15.45
	ULVA sprayer	13	130	66	8580	88	50	4400	50	56	2800	15780	17.14
	Motor sprayer	20	220	120	26400	100	101	10100	91	100	9100	45600	19.95
Lannate EC.	Motor+Micronair	10	200	85	17000	121	65	7865	100	90	9000	33865	26.50
	ULVA sprayer	13	75	120	9000	40	100	4000	60	80	8400	17800	26.96
	Motor sprayer	20	300	100	30000	210	80	16800	90	115	10350	57159	18.11

mended the most cheepest, available and effective mineral oil with knapsack motor Arimistu for controlling cotton leafworm larvae on clover plants.

Table 3. Surface tension and viscosity values of spray oils solution under dilution rate 1.5% (v./v.).

Mineral oil	Surface tension (dyne/cm)	Viscosity (millipoise)
CAPL-1	34	13
CAPL-2	30	15
Solar EC.	36	12
Water	72	10

Table 4. Reduction percentage in cotton leaf-worm larvae in different treatments.

Tratment	Spraying machines	Pre-treatment no*	Post-treatment after					
			2		4		6 dayes	
			No	%R.	No.4	%R.	No.6	%R.
CAPL-1	Micro ULVA	33	21	63.79	19	71.92	5	88.06
	Motor A*	28	17	69.64	17	73.97	10	75.27
	Motor M*	23	18	60.86	17	68.32	7	78.92
CAPL-2	Micro ULVA	33	14	78.78	15	80.51	6	87.41
	Motor A*	44	20	77.27	17	83.44	10	84.26
	Motor M*	31	14	77.42	6	91.70	3	93.30
SolarEC.	Micro ULVA	14	11	60.71	8	75.51	2	90.10
	Motor A*	14	15	46.42	6	81.63	1	95.05
	Motor M*	35	21	70.00	18	77.95	11	78.24
Lannate	Micro ULVA	14	2	21.42	18	44.89	8	60.43
	Motor A*	20	22	45.00	14	70.00	7	75.76
	Motor M*	10	18	10.00	20	14.28	6	58.46
Untreated		9	18	-	21	-	13	-

Motor A = Knapsack motor Arimistu

No = larvae number

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كفاءة الات الرش الأرضية ذات حجم الرش القليل فى مكافحة يرقات دودة ورق القطن على البرسيم

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أجريت تجارب حقلية على حقل برسيم مصاب بشدة بيرقات دودة ورق القطن بمركز أدفينا (محافظة البحيرة) وذلك لعمل تقيم حقلى لالات رش أرضى تعمل بنظام حجم الرش القليل وهى الرشاشة ميكرو أولفا الاقتصادية – الموتور الظهرى أرميستو – والموتور الظهرى أرميستو مع ميكرونير وذلك لرش زيوت معدنية محلية كابل ١، كابل ٢، وسولار مستحلب مقارنة بالمبيد الموصى به (اللانيت) . تم الحصول على تغطية مرضية على نباتات البرسيم. تم معملياً تقدير الخواص الطبيعية للزيوت المعدنية (التوتر السطحى واللزوجة) تحت ظروف معدلات الاستخدام الحقلى، وتم مقارنتها مع غطاء الرش للمعاملات المختبرة فى الحقل.

أوضحت النتائج ان النسب المئوية للخفض ليرقات دودة ورق القطن فى الزيوت المعدنية مرتبطة بالنسب المئوية للفاقد من محلول الرش على الأرض حيث تعيش اليرقات الكبيرة بينما فى حالة مبيد اللانيت حدثت نتائج عكسية.

أختلفت نتائج آلات الرش المناسبة من معاملة لاخرى، فمثلاً الرشاشة ميكرو أولفا الاقتصادية كانت مناسبة فى رش الزيت المعدنى كابل (١). والموتور الظهرى ارميستو مع الميكرونير كان مناسباً فى رش الزيت المعدنى كابل ٢، والموتور الظهرى ارميستو كان مناسبا فى رش السولار المستحلب.

وأعطت كل الزيوت المعدنية المحلية نسب مئوية للخفض أعلى من مبيد اللانيت وبدون حدوث أى تأثير سام ضد نباتات البرسيم.

ويمكن القول بان السولار المستحلب هو أرخص المركبات وأكثرها توافراً فى السوق المحلى وفعال كزيت معدنى مستحلب عند رشه بالموتور الظهرى ارميستو لمكافحة يرقات دودة ورق القطن على نباتات البرسيم وذلك بحجم قدره ٢٠ لتر/فدان.