EFFICIENCY OF A NEWER INSECTICIDE DDVP AS A SPACE SPRAY

A. P. Srivastava, R. S. Dixit and P.N. Agarwal

Defence Research Laboratory (Materials), Kanpur

(*Received* 26 *Nov.* 64; *revised* 22 *April* 65)

The insecticidal properties of DDVP in relation to pyrethrins was investigated as space spray against the houseflies, *Musca nebulo* Linn. and the mosquitoes, *Culex fatigans* Wied. DDVP was found much superior to pyrethrins in its killing properties. The knockdown property of DDVP as compared to pyrethrins was poor especially against the mosquitoes.

Quarterman[1] suggested the possibility of using the organophosphorus insecticide DDVP with a high vapour pressure in public health field. Yerington and Stafford[2] reported DDVP to be promising in the form of an aerosal for controlling *Drosophila* spp. Ramkrishnan *et al*[3]. have shown that DDVP is highly toxic to the houseflies, *Musca nebulo* Linn. and the bed bugs, *Cimex hemipterus* Linn. though it is ineffective against the ratfleas, *Xenopsylla cheopis*. Although space sprays, in general, are not feasible in a national eradication programme they are of specific interest in localized areas where it is not possible to control insects by the conventional methods due to the development of resistance to the insecticide employed. In view of this it appeared of interest to find out the potentialities of a newer insecticide DDVP, when used as a space spray for the control of insect vectors of diseases. The paper gives results on the efficiency of the insecticide in relation to pyrethrins against the housefly, *Musca nebulo* Linn. and the mosquito *Culex fatigans* Wied.

MATERIALS AND METHODS

DDVP used in these investigations was obtained from M/s Ciba Private Ltd., Bombay. The pyrethrins were obtained by the extraction of pyrethrins flowers in the laboratory. Adult houseflies, *M. nebulo*, 4 to 5 days old and adult female mosquitoes, *C. fatigans*, 40 to 60 hours old, obtained from laboratory cultures reared in a room at 26 $\pm$ 1°C and 73 $\pm$ 2 per cent. R.H., were used as test insects.

The efficiency of DDVP in relation to pyrethrins as space spray against the houseflies and the mosquitoes was assessed by the method described by Dixit and Perti[4]. The temperature and relative humidity during the experiments were 26 $\pm$ 1°C and 73 $\pm$ 2 per cent R.H. respectively. There were six replicates in each assay.

After each experiment, the residue and the vapours were completely removed by cleaning the chamber with cotton wool saturated with alcohol containing 10% acetone and by introducing ammonia vapours for the complete removal of left over vapours of the insecticide. Ammonia vapours were then removed through an exhaust connected to the chamber before any new exposure was carried out.

RESULTS AND DISCUSSION

The results obtained in the various experiments are summarised in Tables 1 and 2. It will be seen that DDVP shows great promise for the control of flies and mosquitoes. However, on critical examination of its killing and knockdown property (Table 1), in comparison to pyrethrins, it will be observed that DDVP is similar in its toxicity but very

TABLE 1

TOXICITY OF DDVP & PYRETHRINS TO *M. NEBULO*

Insecticide	Concentration %	Knockdown (10 minutes after exposure) %	Mortality (24 hours after exposure) %
DDVP	0·20	100	100
	0·15	76	100
	0·10	63	100
	0·07	44	91
	0·06	34	83
	0·05	27	68
	0·04	18	50
	0·03	7	42
	0·02	0	27
Pyrethrins	0·50	100	100
	0·40	100	90
	0·35	100	83
	0·30	100	76
	0·25	100	68
	0·20	100	61
	0·10	97	51
	0·09	66	41
	0·06	49	25
	0·05	37	18

NOTE—Kerosene oil used for dissolving insecticides for atomization was not toxic to the insects *ie* there was no knockdown (in 10 minutes) or kill (in 24 hours) of the insects when exposed to the mist formed by atomization of 0·25 ml of the solvent alone.

much inferior in effecting high knockdown of mosquitoes. Initially it may appear to be a great handicap of this insecticide, but it is really not so. On careful examination of the results it is seen that even very low concentrations, which do not produce any knockdown, cause high kill of the mosquitoes. The pyrethrins, on the other hand, though even in very low concentrations cause good knockdown but do not produce any kill. However, the picture in respect of flies is somewhat different than the pyrethrins. It will be seen that DDVP is far superior in producing high kill of the flies. However, it is slightly inferior in effecting high knockdown of the insects as compared to pyrethrins.

The reasons for taking very low volumes for spraying in the chamber was mainly due to very high vapour toxicity of DDVP (Yerington & Stafford[2], Jay *et al.*[5], and Snetsinger & Miner[6]) which otherwise might have interfered in assaying its true contact properties *i.e.*, in respect of knockdown and kill of the insects. The insecticidal action of pyrethrins

TABLE 2

TOXICITY OF DDVP & PYRETHRINS TO *C. FATIGANS*

Insecticide	Concentration %	Knockdown (10 minutes after exposure) %	Mortality (24 hours after exposure) %
DDVP	0·30	100	100
	0·25	97	100
	0·20	61	100
	0·15	32	100
	0·10	2	95
	0·09	0	91
	0·08	0	83
	0·07	0	77
	0·06	0	62
	0·05	0	53
	0·04	0	42
	0·03	0	32
	0·02	0	18
Pyrethrins	0·15	100	100
	0·10	100	94
	0·09	100	88
	0·08	100	80
	0·07	100	73
	0·06	100	60
	0·05	100	51
	0·04	100	38
	0·03	100	26
	0·02	100	15
	0·01	96	9
	0·009	89	0
	0·008	83	0
	0·007	71	0
	0·006	61	0
	0·005	51	0
	0·004	42	0
	0·003	32	0
	0·002	23	0

NOTE—Kerosene oil used for dissolving insecticides for atomization was not toxic to the insects *ie.*, there was no knockdown (in 10 minutes) or kill (in 24 hours) of the insects when exposed to the mist formed by atomization of 0·25 ml. of the solvent alone.

is known to be due to contact toxicity, whereas DDVP (Van Asperen[7]) acts both as a contact poison and as a fumigant. Snetsinger and Miner[6] have reported that the vapours of DDVP breakdown quickly and no cumulative effects of the insecticide are observed. In view of this DDVP appears to be quite a promising insecticide for the control of houseflies and mosquitoes. However, the operators should avoid its inhalation and contact with the skin; while spraying respirators may be used.

ACKNOWLEDGEMENTS

The authors thank Dr. J. N. Nanda, Director for interest and encouragement in the work. Thanks are also due to M/S. Ciba Private Ltd., Bombay for the supply of DDVP.

REFERENCES

1. QUARTERMAN, K.D., *Publ. Health. Report*, **70** (1955), 729.
2. YEBINGTON, A.P. & STAFFORD, E.M., *Western Fruit Grower*, **17** (1963), 17.
3. RAMAKRISHNAN, S.P., KRISHNAMURTHY, B.S. & KALRA, R.L., *Indian J. Mal.*, **17** (1963), 115.
4. DIXIT, R.S. & PERTI, S.L., *Indian J. Mal.*, **16** (1962), 231.
5. JAY, E.G., PHILLIPS, K.H. & HAGEN, B.G., *J. Eco. Entomol.*, **57** (1964), 413.
6. SNETSINGER, R. & MINER, D., *J. Eco. Entomol.*, **57** (1964), 182.
7. VAN ASPEREN, K., *Entomol. Exp. appl.*, **1** (1958), 130