CONTROL OF INSECTS IN THE URBAN ENVIRONMENT WITH FILM-FORMING AQUEOUS SPRAY FORMULATIONS THAT MINIMISE THE USE OF HYDROCARBON SOLVENTS

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Abstract—Insecticidal space sprays are widely and effectively used for control of insects in the urban environment. They are especially useful for flying insect control, be it for disease vector or nuisance pest, but space sprays can also be very effective for rapid control of crawling pests such as cockroaches.

Consumer acceptance of insecticide treatments is an increasingly important aspect to be considered for successful insect control. Traditional techniques such as thermal fogging and misting employ large quantities of hydrocarbon solvents to both formulate and dilute the concentrates.

Ultra-low volume (ULV) techniques, which consume up to one hundredth the quantity of solvents used for thermal fogging, are more efficient. However, the move towards using water as diluent is not straightforward because of its greater volatility compared to diesel; this leads to droplets which rapidly shrink after generation and quickly become too small to impact efficiently on insects.

ULV formulations are described in which water is used not only as the diluent but also to replace most of the hydrocarbon solvent normally present in emulsifiable concentrate formulations. As a result of the surface film-forming action of these formulations, evaporation of water from the droplets is demonstrably reduced. Spray characteristics and biological performances against a variety of insect types and under different climatic conditions are described.

INTRODUCTION

Successful control of insect pests in the urban environment is dependent on a number of factors. When examined from the point of view of the user these may include effective and affordable treatments together with the knowledge that the product is safe in use and will not harm him or probably more importantly, his family.

One further factor that is extremely important in any larger scale treatment programme is the ability of the treatment operator to gain access to all areas requiring treatment; this depends on the willingness of the local inhabitants to accept the treatments involved and any of the above factors may be important to a greater or lesser degree.

A number of years ago these factors were examined with reference to space sprays which, it was felt, could be improved in a number of ways, especially for outdoor use. The availability of the highly active pyrethroids meant that they would not need to be used concentrated as was the case with the less active organophosphates such as malathion. In order to maintain a reasonable liquid distribution, pyrethroid space spray concentrates are usually diluted with a relatively involatile hydrocarbon solvent such as diesel.

The diluent is all-important with space sprays. Results from laboratory and field studies indicate that droplets need to remain within an effective size range for 50-100 metres as they drift downwind after generation; this is because as droplets shrink they become progressively less likely to impact on the target ie the insect. The relatively high volatility of water compared to diesel is therefore problematical when the former is used, but water would be the ideal diluent.

A patented range of products (European Patent No. 0331474) was developed that would encompass these features to a greater degree than has been the case for previous space sprays. By careful inclusion of long chain alcohols it was possible to reduce the evaporation of water from small droplets with a corresponding improvement in biological efficacy. Formulations of this type also allowed the reduction of hydrocarbon solvent content of the base formulation itself. It is the purpose of this paper to describe some of the data obtained.