NATURAL ENEMIES FOR INUNDATIVE AND SEASONAL INOCULATIVE RELEASE: POLICY ISSUES

N.A. MARTIN and C.H. WEARING

DSIR Plant Protection, Private Bag, Auckland

SUMMARY

Policy issues relating to inundative and inoculative release of natural enemies for pest control are discussed with particular reference to their registration, quality control, patenting, continuity of supply, and integration with pesticides. The need for grower education and advice is emphasised. Government support for the development of commercial production of natural enemies is advocated.

INTRODUCTION

Growers may use natural enemies in several different ways to control pests in agricultural and horticultural crops. Parasites and predators occurring naturally within the crop environment may control pests without grower intervention. On the other hand, growers may choose management practices which encourage or at least do not harm these natural enemies. Such techniques are often used in association with classical biological control which involves the deliberate introduction of beneficial organisms from overseas, but these practices may also assist indigenous natural enemies and those introduced accidentally. Two other interventionist biological control strategies are components of an increasing number of integrated pest management (IPM) programmes. One strategy, seasonal inoculative release, involves low numbers of a natural enemy being introduced into a crop at the appropriate time or times of year. The natural enemy multiplies in the crop and suppresses the pest population before it reaches the economic threshold. The other strategy, inundative release, requires high numbers of a natural enemy to be introduced into a crop to quickly knock down a pest population within a single generation. This paper discusses the policy issues associated with the successful application of the technology of inundative and seasonal inoculative releases of natural enemies.

REGISTRATION OF NATURAL ENEMIES FOR SALE

The use of natural enemies for pest control through inundative and seasonal inoculative release is similar to the use of pesticides. The latter must be registered before they can be sold. However, natural enemies such as *Phytoseiulus persimilis* (Acari: Phytoseiidae) and *Encarsia formosa* (Hymenoptera: Aphelinidae) are sold without registration. The registration procedure for pesticides ensures not only product efficacy but also its safety when used as recommended; excessive pesticide use is avoided provided the recommendations are followed. The benefits are protection of the environment, the user, and public health.

It may be that natural enemies which are sold should also be registered. However, unlike pesticides, legislating conditions for their use would be an inappropriate way of safeguarding against health and environmental harm. This is either because the parasite or predator already occurs naturally in New Zealand or because the risks are assessed prior to its introduction. Natural enemies will succeed in the market only if the experience of users confirms their value. For this reason it is essential for producers of natural enemies to be able to demonstrate the efficacy of their products. This does not need to be part of a formal registration process because there are no additional environmental or health risks incurred by the use of natural enemies.

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TESTING THE PESTICIDE TOLERANCE OF NATURAL ENEMIES

Natural enemies used in programmes requiring inundative or seasonal inoculative releases are often exposed to pesticides needed to control diseases or other pests. These pesticides are selected because they can be used with minimal harm to the natural enemies; and successful use of these biological control agents depends on knowing the effects of all chemicals that may be used on the crop. This includes pesticides registered for use in organic crop production systems. At present considerable information on specific natural enemies is available from overseas where these species are already sold. However, this information needs to be used with caution because of possible genetic differences between strains of natural enemies. It is very important to obtain local information. In addition, some pesticide companies provide information on the toxicity of their products to natural enemies used in important crops. However, this is frequently not the case. Requisite tests may be complex and, while direct toxicity can usually be readily measured, this is not so for some species, such as *E. formosa*. The more subtle but equally important sub-lethal effects are also often difficult to assess. The responsibility for providing information on pesticide tolerance should be shared by the producers of the natural enemies and the pesticide manufacturers. This may be supported by inputs from user (grower) groups, and the Crown.

Where the economic value of a natural enemy is well proven, procedures already exist for voluntary testing of the toxicity of pesticides in association with the pesticide registration process (e.g. *Typhlodromus pyri* (Acari: Phytoseiidae) (Wearing 1982)). Compulsory testing could be considered for a natural enemy clearly shown to provide major environmental or health benefits in reduced pesticide use.

QUALITY OF THE NATURAL ENEMIES

It is not easy for growers who purchase natural enemies to assess their quality. It is therefore essential for the producers of natural enemies to maintain effective quality control procedures. For example, the vigour of the whitefly parasite, *E. formosa*, is being assessed prior to sale in New Zealand by making newly emerged adults travel through a simple obstacle course (Martin and Workman unpublished). Such quality control procedures should be undertaken voluntarily by producers rather than being required by regulation.

AVAILABILITY AND CONTINUITY OF SUPPLY

It is essential for both inundative and seasonal inoculative release strategies, that the natural enemies are available as and when required by growers. Most of these organisms cannot be stored for more than a few days and reliable production and distribution systems are vital. The producers who carry the responsibility for ensuring that there are always sufficient natural enemies available must produce to excess and have contingency plans for accidents. Natural enemies are usually produced in batches and it is often not possible to increase production rapidly to make up for loss of a 'batch'. Where two companies are producing the same organism an agreement to assist each other in emergencies would be desirable. However, because of the small market in New Zealand, there are unlikely to be two companies producing the same organism and this means that emergency importation may be required. This would have to be arranged beforehand with both the overseas company and the local quarantine service. Several overseas companies produce and distribute natural enemies using methods that should satisfy quarantine requirements and arranging importation may be an appropriate option for New Zealand in the short term. However, there are disadvantages in relying permanently on imported natural enemies. Despite the best of intentions, there is increased risk of the introduction of undesirable organisms. Furthermore, more complex transport may adversely affect the quality of the natural enemies. For these reasons local production should be encouraged.

GROWER EDUCATION AND ADVISORY SERVICES

The cost of companies' advice on pesticide use is incorporated in the price of their products; this is probably a small percentage of the price today because growers have

become familiar with much of the technology involved. However, it should be remembered that growers had considerable government (as well as company) assistance in learning how to use synthetic pesticides when this technology was new. Likewise today, the use of inundative or inoculative releases of natural enemies requires a fresh approach to pest control by growers and will require considerable grower education before this different technology is widely and correctly adopted. Initially all major uses of natural enemies in greenhouse industries overseas were assisted directly or indirectly by government. New Zealand needs to provide similar assistance. In New Zealand the greenhouse industry in particular is based on small growing units which make it uneconomic to finance an adequate advisory service by charging for it in the price of natural enemies. The same is true for the sale of natural enemies for other crops, such as berryfruit.

IMPORTATION OF NEW STRAINS OR NEW SPECIES OF NATURAL ENEMIES

The policy issues associated with the importation of biological control agents for inundative or inoculative use are similar to those affecting other biological control programmes, such as classical biological control. However, definition is required of the circumstances which render a new strain sufficiently different from strains already in New Zealand to warrant full or partial environmental or social risk assessment. Each case may have to be considered on its merits, but risk assessment may again be required if a new strain has a different host or prey range or preferred habitat. New species proposed for import into New Zealand for inundative or inoculative release are likely to be in commercial production overseas. Most of these natural enemies will be accompanied by data that should assist the required assessment of risk. When new strains or species are introduced for sale, this offers the opportunity to recover costs of importation.

PATENTING AND LICENSING

Difficulty with patenting is often claimed to be one of the key reasons why biological control does not attract commercial investment (Corbet 1981). Without patenting or other procedures to protect commercial investment, natural enemies will continue to need government support for their development and application. DSIR has supplied a new synthetic pyrethroid-resistant strain of the predatory mite, *T. pyri*, to Agriculture Canada, under a licensing agreement. However, both patenting and licensing would benefit greatly from technology which would enable unequivocal identification of the strain of natural enemy being sold. Modern genetic engineering methods, such as DNA probes, may offer a solution to this difficult problem.

COSTS AND BENEFITS

Pesticides are regarded as potentially hazardous to the grower, consumer, and the environment, as well as to people handling them at all stages from manufacture to use (MacIntyre *et al* 1989). For these reasons a hazards tax has been proposed for pesticides. As pointed out earlier, Government in part subsidised the introduction of synthetic pesticides in the past by educating growers in their use. Natural enemies on the other hand reduce the use of pesticides and the associated risks. Present Government policy discourages the use of subsidies in agriculture and this puts natural enemies at a severe disadvantage compared to pesticides. We advocate an environmental subsidy for the production of natural enemies for sale to encourage their use and to help offset the costs of educating growers about this new technology.

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