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THE USE OF MARSHAL/SUSCON GRANULES TO PROTECT PLANTS FROM *HYLOBIUS* DAMAGE,

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Abstract

This Note describes aspects of the safe and judicious use of Marshal/suSCon granules to protect plants from damage from *Hylobius abietis* and species of *Hylastes* beetles. Methods for the use of this product are discussed. The action of the active ingredient is described and it is recommended that10g of Marshal/suSCon granules are applied to the base of the hole at time of planting. Initial protection for the plants should be provided by permethrin applied as a pre-planting treatment or as a top spray after planting. The results of one experiment which was part of a programme forming the basis for the current recommendations are summarised.

Background

1. All species of plants used for restocking ex-conifer plantations are at risk of damage from the large pine weevil *(Hylobius abietis).* Although *Hylobius* is susceptible to most commonly used insecticides, a number of features of its biology and also of site conditions make damage reduction difficult:

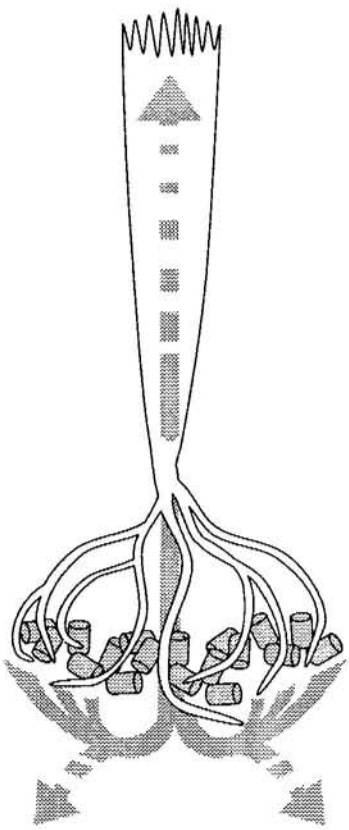
   - The adult insects feed on the bark of young trees at any time of the year when temperatures are high enough for insect activity. However, there tends to be two peaks of damage, the first starting in April/May and the second in August or September. The precise timing of these periods will depend on local climate and it is not possible to predict their timing and magnitude with current knowledge.
   - Damage levels to untreated plants vary unpredictably from site to site, with total loses occurring on some. Sites may retain damaging populations of *Hylobius* for up to six years after felling. Although plants remain susceptible to damage for at least the first two growing seasons, aqueous formulations of insecticides used to treat plants before planting will only provide adequate protection for the first year.
   - The terrain of many restocking sites makes finding and spraying plants after planting an expensive and unreliable method of plant protection in the second year. These difficulties may be increased in areas with high rainfall as the application must be made during dry conditions. Several applications of spray may be required to protect plants throughout their period of susceptibility.

2. Marshal/suSCon granules provide a solution to many of these problems. When correctly applied, this product can protect plants for at least the first two growing seasons. This is the most vulnerable period for Sitka spruce and Scots pine although some species such as Douglas fir may remain susceptible to damage for significantly longer.

Application methods

3. The use of any insecticide for the protection of plants from insect damage must be approved for this purpose by the Pesticide Safety Directorate (PSD) of the Ministry of Agriculture, Fisheries and Food under the Food and Environment Protection Act 1985 (FEPA) and Control of Pesticides Regulations 1986 (COPR). Their use and storage is governed by the 1994 Control Of Substances Hazardous to Health (COSHH) Regulations.

4. Carbosulfan is the only insecticide approved by PSD as a slow release formulation for the treatment of forest plants at time of planting. It is a carbamate insecticide widely used in agriculture against a broad spectrum of insect pests. After application to the soil, it is absorbed by plant roots and transported to the stem and leaves. It is only slightly soluble in water and is therefore, fairly immobile in the soil. It does, however, break down very rapidly, lasting only a few days in both soil and plant tissues.



5. When formulated as Marshal/suSCon granules, the carbosulfan is contained within a plastic matrix to form a small controlled release granule. The structure of the granule prevents the insecticide being broken down and controls its release into the surrounding soil over a two year period. This ensures that the concentration of carbosulfan around the plant roots is maintained. The process is dynamic, with the insecticide constantly broken down and replaced. For this reason, it is not possible to treat bare-rooted plants with this active ingredient in the nursery to provide more than a few days protection.

6. Because the insecticide is relatively immobile in the soil, it is important that the granules are placed in close contact with the plant roots at the time of planting. The treatment will not be effective if the granules are placed on the soil surface after planting and there is a high risk of birds and small mammals feeding on the toxic granules. For treatment, 10g of granules should be placed in the planting hole by hand. Alternatively, a special applicator has been developed which feeds the correct dose of granules to the planting hole (Dewar, 1995 and Saunders, 1996).

7. Marshal/suSCon controls *Hylobius* by stomach action and some feeding will occur prior to ingestion of a toxic dose. Some damage to the bark of treated plants may be expected, particularly in areas of high populations. In most plantations, this damage will have no significant impact on growth.

8. Treatment of containerised plants by mixing the granules with the compost can be effective but this is not yet approved by PSD. However, some of the active ingredient is lost from the granules during the time between treatment and planting and this will reduce the period of protection in the forest. The granules are phytotoxic to germinating seedlings and, to be effective, must be applied during re-potting of the seedlings in the nursery. This may increase plant handling and production costs. The volume of granules necessary to achieve two years protection may represent a high proportion of the container volume and it would be difficult to ensure that granules are not lost during planting. Research on this technique is continuing.

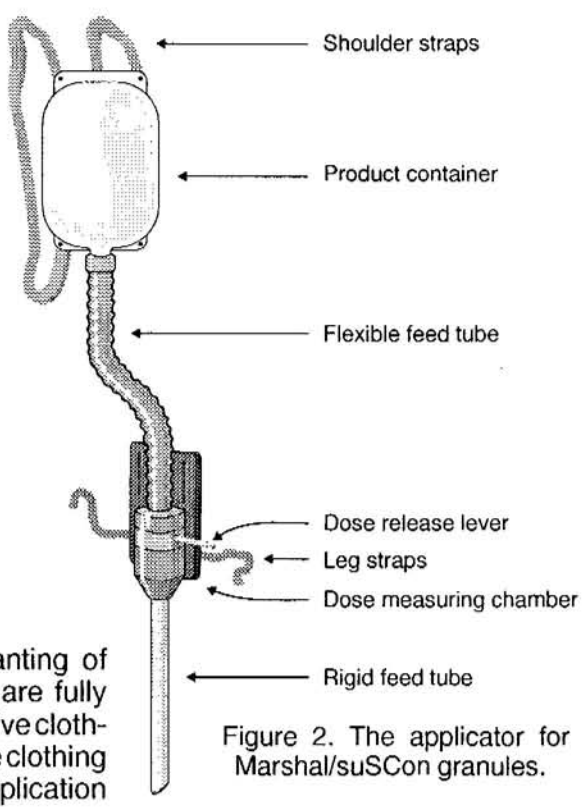


Figure 2. The applicator for Marshal/suSCon granules.

Safety and protective clothing

9. It is essential that plant treatment and the planting of treated plants is carried out by personnel who are fully trained and equipped with the appropriate protective clothing. There are different specifications of protective clothing required for handling the granules and for their application during planting.

10. When additional treatment methods such as dipping or the use of the Electrodyn have been employed, it will be necessary to comply with the protective clothing requirements for these treatments as well as for the use of Marshal/suSCon (see Figures 3, 4 & 5).

11. Clean gloves must be used at the start of each work period and replaced during use if damaged. Before removal, the outside of the gloves must be washed and surplus moisture wiped off. All protective clothing must be carefully washed down at the end of each period of use and planting suits changed daily in accordance with manufacturers' instructions. Personal clothing must be kept separate from protective clothing which should be stored in ventilated accommodation.

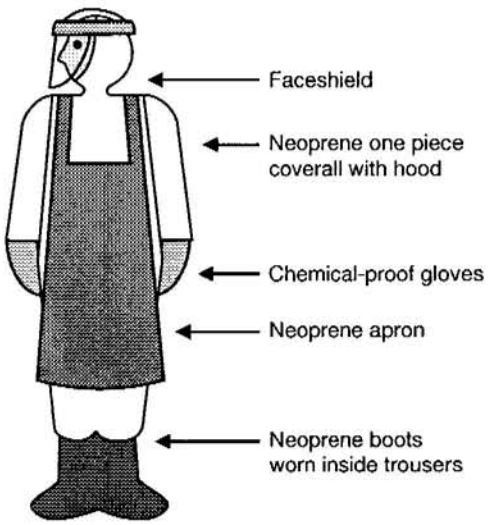


Figure 3. Protective clothing for handling granules.

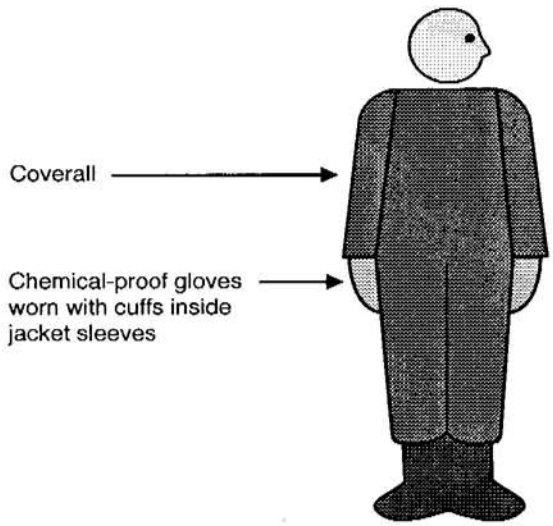


Figure 4. Protective clothing for planting untreated plants.

12. Engineering controls may replace personal protective equipment if a COSHH assessment shows that they provide an equal or higher standard of protection. In addition to these requirements, it is necessary to establish a system of operator monitoring throughout the work. The product contains an anticholinesterase carbamate compound and should not be used if under medical advise not to work with such compounds.

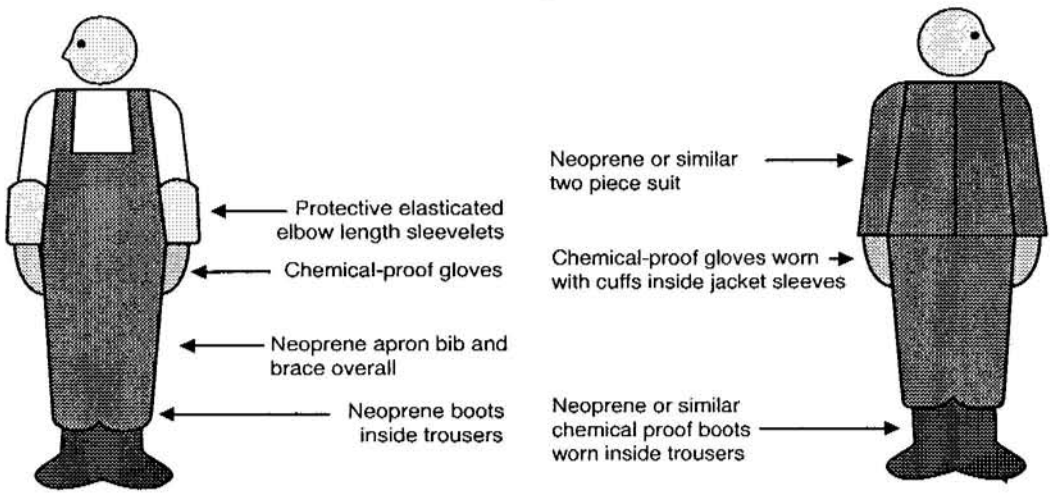


Figure 5. Protective clothing for planting young trees previously treated with insecticide.

Care of the environment

13. This insecticide is non-specific and is dangerous to non-target organisms such as fish, birds, and animals. Great care should be taken to ensure that the risk from accidental loss during the treatment process is minimised by burying any spillage. Authorised waste contractors should be used to dispose of used containers and washing water. Care should be taken to ensure that granules or used containers do not contaminate surface water and ditches.

Experimental evidence for the recommendations

14. Experience of the use of Marshal/suSCon granules to protect several species of conifers from weevil damage has been gained through a number of experiments and field trials. The protection of broadleaves using Marshal/suSCon granules has not been tested for efficacy nor phytotoxicity in the UK. Figure 5 shows the results from one experiment which compared the levels of damage to Sitka spruce transplants (1½ + 1½) treated with Marshal/suSCon granules with those dipped in aqueous permethrin. Damage to untreated control plants reached 89% by the end of the second growing season which is higher than the average damage levels expected in restocking areas. Treatment of plants by dipping protected plants in the first season but failed to provide an adequate level of protection in the second season.

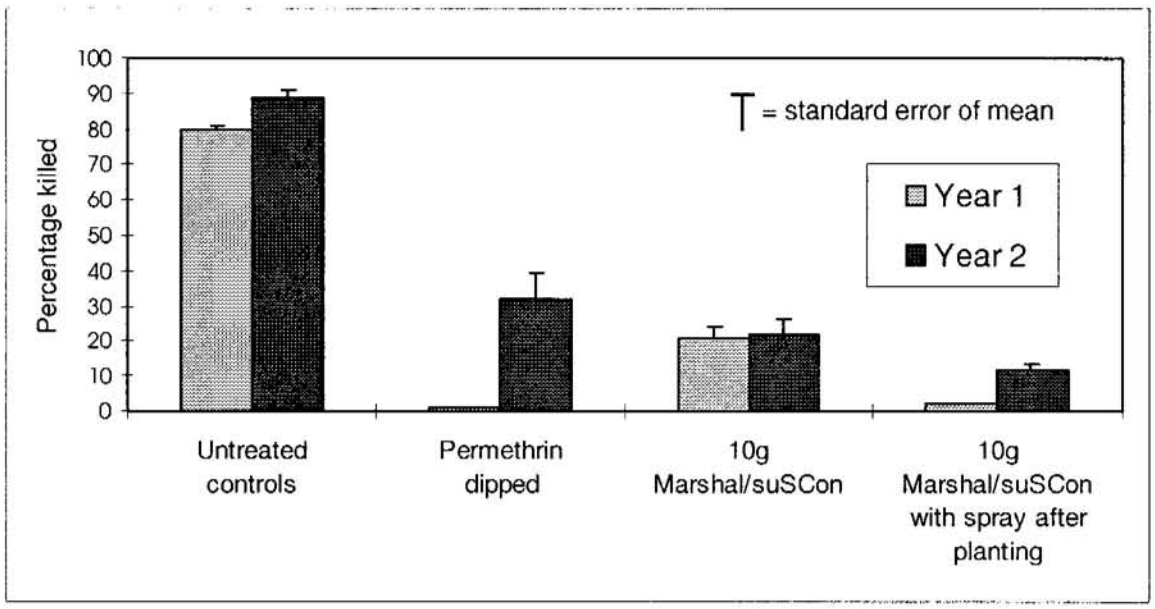


Figure 6. The damage levels to Sitka spruce for the first two years after planting.

15. Most of the damage to plants treated with Marshal/suSCon granules occurred soon after planting and there was little additional damage in the second year. Plants that were treated with Marshal/suSCon granules and were also sprayed with permethrin immediately after planting received the best protection over the first two growing seasons. Any of the pre-planting insecticide treatments should protect the plants during the period immediately after planting and before sufficient carbosulfan has been taken up. Alternatively, plants planted with Marshal/suSCon granules early in the planting season may be protected by the time the insects become active. Because the timing of this is dependent on the weather and the numbers of insects on the site, this may be a risky option.

References

Dewar, J.A. (1995). *Marshal/suSCon insecticide application.* Forestry Commission Technical Development Branch, Technical Note 9/94.

Saunders, C. (1996). *The evaluation of applicators for Marshal/suSCon granules.* Forestry Commission Technical Development Branch, Technical Note 15/95.

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