



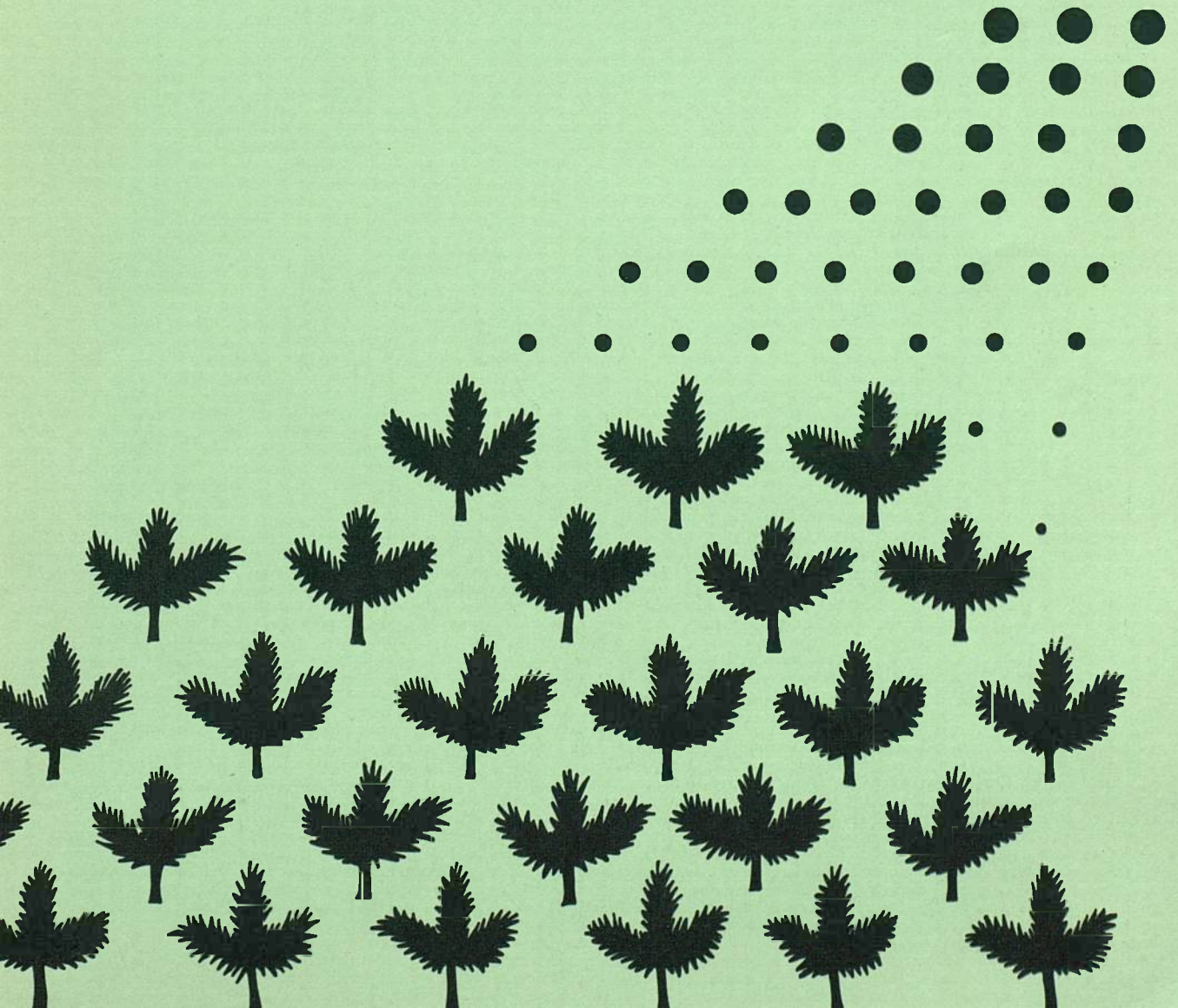
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Forest Nursery Herbicides

D.R. Williamson and W.L. Mason

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FOREST NURSERY HERBICIDES

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*Silviculturists,
Forestry Commission*

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FOREST NURSERY HERBICIDES

by D.R. Williamson and W.L. Mason

*Silviculturists,
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Abstract

Information is given on the application of forest nursery herbicides. Much of this information is based on Forestry Commission trials. A brief description of the types of herbicide is given followed by information on the various herbicides which can be used at the different growth stages of forest nursery stock.

Introduction

This Occasional Paper has been produced as a temporary measure to aid the selection of nursery herbicides prior to a nursery pesticides publication (revision of FC Booklet 52) being produced when the implications of the new pesticide legislation and its interpretation are clearer.

In the text, herbicides are presented according to the phase of the crop cycle, i.e. seedbed or transplants. Within a given phase, herbicides are listed and discussed by the chemical active ingredient. Where rates of herbicide are given these refer to the rate of **product** (litre or kg) to be applied **per treated hectare**. Representative products with which Forestry Commission researchers are familiar are also noted. Nursery managers wishing to control particular weeds should first consult Table 1 to identify suitable herbicides and then consult the main body of the text.

All the products mentioned in this Occasional Paper are approved under the Control of Pesticides Regulations 1986. However, many are not yet approved for use in forest nurseries. The use of such products is covered by the interim 'off-label' arrangements. For 1989 these arrangements allow products approved for use on any growing crop to be given provisional approval for use on additional specified minor crops. This includes non-edible crops grown in forest nurseries. In all cases those uses which are not specified on the approved product label are at users own risk. Where such uses are referred to they are identified by an asterisk (*). These interim arrangements are due to expire at the end of 1989.

By the end of 1989 MAFF hope to have assessed all outstanding applications for 'off-label approval'. If this is achieved it means that specific 'off-label approvals' will be available for 1990 and the interim arrangements will be dispensed with altogether. However, the actual position regarding specific 'off-label approvals' and the fate of the interim arrangements will not be clear until late 1989.

Caution

All recommendations in this text are based on small-scale research experiments. Nursery managers must determine the approval status of herbicides before using them in their own nursery. They should also conduct limited trials of a new herbicide before adopting it on a commercial scale.

Description of herbicide action

Managers should remember that herbicide efficacy is influenced by weather conditions: e.g. residual herbicides should be applied to moist soil to aid incorporation; do not apply herbicides in hot, sunny conditions because of the risk of crop damage.

There are some herbicides which have both contact and residual properties but usually their activity is biased towards one of these modes of action.

Soil acting (residual) herbicides

Residual herbicides should be applied to soil which has a fine tilth and is free from clods. These herbicides require moisture in the soil to be activated and many (particularly those rapidly degraded by sunlight) need to be incorporated immediately after application by irrigation with 10-15 mm of water. The length of time residual herbicides remain effective varies depending on the chemical in use, soil type and climate — particularly rainfall, sunlight and temperature.

Contact and translocated herbicides

These herbicides are absorbed through the point of contact on the leaf and stem and are independent of the condition of the soil. Most of these herbicides give better results when the target weed species is actively growing.

Table 1 Susceptibility of common forest nursery weeds to selective herbicides¹

Active ingredients	Atrazine	Chloridazon + chlorbutolam	Chlorthal-dimethyl	Clopyralid	Cyanazine + clopyralid	Diphenamid	Diphenamid with chlorthal-dimethyl	Metazachlor	Napropamide	Napropamide with simazine	Oryzalin	Oxadiazon	Propyzamide	Simazine
Weeds														
Annual meadow grass	S	MS	MS	R		S	S	S	S	S	S	S	S	S
Bitter cress, Hairy						S	S		MR	MS	S			
Black bindweed	MS	S	MS	MS	S		MS	MS	S	S		S	S	MS
Black nightshade	S		MS	MR		R	MS		R	S	MS	S	S	S
Charlock	S	S	MR	R	S			MR	R	S		S		S
Cleavers	MR	S	R	R				MS	S	S		S	S	MR
Common chickweed	S	S	S	MR	S	S	S	S	S	S	S	S	S	S
Common fumitory	MS	MS	R	R	S	R	R	R	S	S	S	S	MS	S
Common hemp nettle	S			R	S			MR	S	S				S
Common poppy	S			R				S	S	S				S
Dead nettle, Red	S		MS	R	S		MS	S	S	S	S	S		S
Henbit dead nettle	S	S					S	S	S	S	S	S		S
Fat hen	S	S	S	MR	S	MS	S	MS	S	S	S	S		S
Field pansy	MS	S	S	R			S	MR	MS	MS	S			MS
Field penny cress	S	S	R			S	S	R	R	S				S
Forget-me-not, Field	S	S			S			S	S	S	S			S
Groundsel	S	S	R	S	S	S	S	S	S	S	MS	S	R	S
Knotgrass	MR	S	S	MR		MS	S	R	MS	MS	S	S	S	R
May weed	S	S	R	S	S	MS	MS	S	S	S	S	S	R	S
Mercury, Annual	S		MS				MS							S
Redshank	MS	S	MR	MR	S	MS	MS	MS	MS	MS		S	S	MS
Scarlet pimpernel	S	MS		R				R	R	R			R	S
Shepherd's purse	S	S	R	R	S	S	S	S	MR	S	S	S	MS	S
Sorrel, Sheep's	MR					S	S	S	S	S	MS			
Small nettle	S	S	S	R		S	S	MS	S	S	S	S	S	S
Smooth sow thistle	S	S		S			S	S	S	S	S	S		S
Speedwells	MS	S	S	MR	S	S	S	S	S	S	S	S	S	S
Spurrey, Corn	S			R		S	S	MS	S	S	S	S	S	MS
Willow herb	MS		MS	MS		S	S		MS	MS	S	S		MS

Key:

- S — Susceptible
- MS — Moderately susceptible
- MR — Moderately resistant
- R — Resistant
- Not tested

Note:

1 — Alloxidim-sodium only controls grass weeds, but not annual meadow grass.

Herbicide resistance

Nursery managers are strongly advised against using the same herbicide repeatedly over a number of years on the same area of ground. This can lead to two main problems:

1. the development of herbicide resistant strains of particular weed species, e.g. groundsel and willowherb;
2. the development of soil microflora which can rapidly degrade the chemical active ingredient, thus reducing the persistence of residual herbicides.

It is therefore recommended that herbicides are used in rotation, e.g. using alternatives to triazines perhaps one year in four.

Weed control in seedbeds

Pre-sowing treatments

a. Soil sterilisation

This usually takes place in the late summer — early autumn of the year prior to sowing and controls many soil pests (nematodes, fungi) as well as weeds and weed seed. Sterilants will usually improve the growth of trees as well.

Dazomet Approved product Basamid; 98-99% a.i. Rate 380-570 kg/ ha depending on soil type. The high rate is used only on heavy soils.

Must be incorporated when soil temperature is at least 7°C. Should be incorporated by rotavation and sealed in by rolling or polythene sheeting. Wait at least 4 weeks before cultivating soil to release gas. If dazomet is applied in the autumn it is normal to wait until the spring before releasing the gas.

Methyl bromide Contains 98% methyl bromide + 2% chloropicrin as a warning odourant tear gas. Rate 300-500 kg/ ha.

Subject to the 1982 Poisons Act and the 1972 Poisons Rules and can only be applied by contractors.

Soil temperature should be at least 8°C at 15-20 cm depth. Treatment period 48-96 hours depending on temperature. Aerate soil for 7-21 days before sowing.

With both soil sterilants, it is important to aerate the soil and release all the sterilant residues prior to sowing. A recommended test for the presence of residues prior to sowing is to grow cress in sealed jars containing samples of sterilised soil. If the cress fails to grow, then further cultivation is required to release the sterilant.

b. Stale seedbed technique

This technique can be carried out either before or after seedbeds have been formed. A fine tilth is created which allows the germination of weeds; these are then killed by further cultivation or by herbicides.

		Rate	
		small weeds	large or established weeds
Glyphosate	Approved product Roundup; 360 g/l a.i.	1.5 l/ha	4.0 l/ha
Paraquat	Approved product Gramoxone; 200 g/l a.i.	3.0 l/ha	5.5 l/ha

Post-sowing treatments

a. Seedbed pre-emergence

Seeds of small-seeded broadleaved species and conifers are normally sown on to the surface of raised seedbeds and covered with 2-3 mm depth of grit. Pre-emergence herbicides are then applied immediately after sowing before crop germination. Large-seeded broadleaves such as oak, beech and sweet chestnut are usually drilled into seedbeds and then covered with at least 25 mm of soil. Such species are therefore usually more tolerant of pre-emergence herbicides.

Chlorthal-dimethyl Approved product Dacthal*; 750 g/kg a.i. Rate 11.0 kg/ha.

Controls a wide range of grass and broadleaved weeds. Apply immediately post-sowing. Tolerated by a large number of tree species but not pine.

Diphenamid Approved product Enide 50W; 500 g/kg a.i. Rate 8.0 kg/ha.

Tolerated by a wide range of tree species but birch, alder and occasionally larch are damaged by pre-emergence application. Does not control germinated weeds since it has no contact action.

Diphenamid with chlorthal-dimethyl { Approved product Enide 50W*; 500g/kg a.i. Rate 8.0 kg/ha.
Approved product Dacthal*; 750 g/kg a.i. Rate 6.0 kg/ha.

In mixture these two products control a wider range of weeds and give greater persistence than diphenamid on its own.

Paraquat Approved product Gramoxone; 200 g/l a.i. Rate 3.0 l/ha.

This can be used with care to clean up seedbeds post-sowing provided seed has not started to germinate. Check that no seed radicles are present before deciding to spray.

Simazine Approved product Gesatop; 500 g/kg a.i. Rate 4.0 kg/ha.

Treat only large-seeded broadleaved species, i.e. oak, beech and sweet chestnut, which have been drilled into seedbeds. Application should be immediately after drilling. Does not control germinated weeds due to lack of contact action.

b. Seedbed post-emergence

Diphenamid Approved product Enide 50W; 500 g/kg a.i. Rate 8.0 kg/ha.

Can be applied to all species post-emergence, including birch and alder. Apply when first true needles or leaves are fully extended. Stunting can occur if applied earlier. Subsequent application can be made at 6-weekly intervals.

Propyzamide Approved products Kerb 50W*; 500 g/kg a.i. Rate 3.0 kg/ha.
Kerb Flowable*; 400 g/l a.i. Rate 3.75 l/ha.

Propyzamide is tolerated by all commonly grown forest species and is particularly useful on standover beds when applied at the end of the first growing season. Apply October to December (January north of a line from Aberystwyth to London). For crop safety reasons Kerb products should not be used within 6 months of an application of simazine or atrazine.

Simazine Approved product Gesatop; 500 g/kg a.i. Rate 2.0 kg/ha.

Only apply to dormant second year seedbeds when plants are greater than 5 cm tall. All conifer species except Norway spruce may be treated. Do not treat within 2 weeks of undercutting, i.e. allow soil to settle around the roots of trees.

Weed control in transplant lines

Residual herbicides are widely used in transplant lines. These are normally applied immediately after lining out and repeated as necessary. Many of the residual herbicides listed do not control germinated weeds and therefore must be applied before weeds emerge.

Undercut stock can generally be treated in the same way as transplants, provided herbicide application does not occur until soil has settled after undercutting/wrenching. This is because of the risk of herbicides coming into direct contact with tree roots.

- Alloxydim-sodium** Approved product Clout; 750 g/kg a.i. Rate 1.5-3.0 kg/ha.
Used to control grass weeds only (useful on couch). Annual meadow grass, red fescue and all broadleaved weeds are resistant. Rate depends on growth stage of grass. Best results are obtained when applied in cool mild weather when there is adequate soil moisture and weeds are in active growth. All forest trees species can be treated.
- Atrazine** Approved product Gesaprim*; 500 g/kg a.i. Rate 4.0 kg/ha.
Use on conifer transplant lines. Normally applied in spring prior to flushing. Use half rate on sensitive species (e.g. Norway spruce, larch and western hemlock). No control of triazine resistant weeds. Is mobile in the soil and can be washed into low lying areas causing local overdosing.
- Chloridazon + chlorbufam** Approved product Alicep*; 250 + 200 g/kg a.i. Rate 4.5 kg/ha.
Dormant Sitka spruce have been treated successfully immediately after lining out and in established transplant lines. Limited information on other forest tree species.
- Clopyralid** Approved product Dow Shield*; 200 g/l a.i. Rate 0.5 l/ha.
Dormant Sitka spruce have been treated successfully immediately after lining out and in established transplant lines. Limited information on other forest tree species.
- Cyanazine + clopyralid** Approved product Coupler SC*; 350 + 60 g/l a.i. Rate 1.0 l/ha.
Dormant Sitka spruce have been treated successfully immediately after lining out and in established transplant lines. Limited information on other forest tree species.
- Diphenamid** Approved product Enide 50W; 500 g/kg a.i. Rate 10.0-12.0 kg/ha.
A wide range of tree species are tolerant. Does not control germinated weeds. Repeat treatments can be applied at 6-weekly intervals.
- Metazachlor** Approved product Butisan S; 500 g/l a.i. Rate 2.5 l/ha.
Tolerated by a wide range of tree species. Apply immediately after lining out. May be repeated as weeds begin to germinate. Some contact action.
- Napropamide** Approved product Devrinol; 450 g/l a.i. Rate 9.0 l/ha.
Broken down by sunlight so best applied November-March unless irrigated in with at least 25 mm of water. Apply immediately after lining out. Has proved satisfactory on most conifers, but only limited information is available for broadleaves.
- Napropamide with simazine** { Approved product Devrinol; 450 g/l a.i. Rate 3.5 l/ha.
{ Approved product Gesatop; 500 g/kg a.i. Rate 1.0 kg/ha.
Crop tolerance as napropamide but care is needed on simazine sensitive tree species.

- Oryzalin** Approved product Surflan; 480 g/l a.i. Rate 4.5-6.0 l/ha.
Apply shortly after lining out to clean soil. Soil must be settled around trees prior to treatment. Does not control germinated weeds. Treat all common forest tree species.
- Oxadiazon** Approved product Ronstar; 250 g/l a.i. Rate 4.0 or 8.0 l/ha.
Dose depends on weeds to be controlled. Only apply in late winter before buds start to swell. Avoid contact with young leaves and shoots. Has both residual and contact activity and will control weeds up to the first true leaf stage. Tolerated by most conifers (e.g. spruces, pines and larches) but there is only limited information on broadleaves.
- Propyzamide** Approved products Kerb 50W; 500 g/kg a.i. Rate 3.0 kg/ha.
Kerb Flowable; 400 g/l a.i. Rate 3.75 l/ha.
Timing of treatment — see seedbed post-emergence. Treat all common forest tree species. For crop safety reasons propyzamide products should not be used within 6 months of an application of simazine or atrazine.
- Simazine** Approved product Gesatop; 500 g/kg a.i. Rate 2.0-4.0 kg/ha.
All conifer transplant lines may be treated as well as all commonly planted deciduous species except ash. Does not control germinated or triazine resistant weeds. Higher rate is used on heavier soils. Soils must be moist and sufficiently compacted to prevent herbicide washing down to the rooting zone of trees. Use half rate on sensitive species (e.g. larch).

The two herbicides listed below can be used as a directed spray, avoiding all contact with the crop, to control established weeds in transplant lines.

- Glyphosate** Approved product Roundup; 360 g/l a.i. Rate 1.5-4.0 l/ha.
Paraquat Approved product Gramoxone; 200 g/l a.i. Rate 3.0-5.5 l/ha.

Weed control in fallow areas

The fallow period in a forest nursery rotation provides an opportunity for controlling deep-rooted perennial weeds by a combination of cultivation and chemical control. Repeat applications may be necessary to achieve adequate control.

- Glyphosate** Approved product Roundup; 360 g/l a.i. Rate 1.5-4.0 l/ha.
Repeat applications combined with intervening cultivation can be particularly useful against deep-rooting weeds such as *Equisetum* spp.
- Paraquat** Approved product Gramoxone; 200 g/l a.i. Rate 3.0-5.0 l/ha.
Only useful against non-rhizomatous weeds. Best used pre-plant to clean up flushes of germinating weeds after cultivation.
- Sodium chlorate** Approved product Atlacide Soluble Powder; 580 g/kg a.i. Rate 375-500 kg/ha.
Should only be used in extreme circumstances to control persistent weeds, e.g. *Equisetum* spp. At least 6 months should elapse between treatment and sowing or lining out. A cress test should be carried out before any crop is planted on the treated area.

**BEFORE ANY HERBICIDE IS USED READ THE LABEL.
IT CARRIES FULL INSTRUCTIONS FOR USE AND FOR THE
PROTECTION OF THE OPERATOR AND THE ENVIRONMENT.**

