HNS 31a

TREE AND SHRUB SEED BEDS : CONTINUED EVALUATION OF WEED CONTROL TREATMENTS

PROJECT TITLE:	**Continued evaluation of weed control treatments for tree and shrub seed beds.**
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PROJECT NUMBER:	HNS 31a
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LOCATION OF PROJECT:	Tilhill Nurseries, Farnham, Surrey. Oakover Nurseries, Charing, Kent. Wyevale Nurseries, Hereford.
PROJECT CO-ORDINATOR:	Mr T Wood
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CONTENTS

RELEVANCE TO GROWERS AND PRACTICAL APPLICATION

Objectives and background

With the withdrawal of Enide 50W from the market there are currently only two herbicides with specific recommendations for use on seed beds. These are paraquat and simazine; paraquat however can only be used in the production of 'stale' seed beds.

Chemical soil sterilisation is often the chosen commercial weed control treatment as it will also control a range of soil borne pests and diseases. However, the cost of this treatment is at least ten times that of a herbicide programme.

HNS 31 (the previous trial), highlighted several herbicides including; Flexidor, Butisan S, Kerb 50 W and Goltix WG, which when applied at reduced rates could possibly be used in the commercial production of seedlings. It also emphasised the large cost savings which could be achieved using a much reduced rate of Basamid to sterilise the seed beds prior to seed sowing.

This trial, a continuation of HNS 31, was designed to elicit:-

(a) the most suitable application rates of the herbicides identified in HNS 31;

(b) if lower rates of Basamid are likely to be a viable long term option;

(c) if lower rates of Basamid can be used in combination with herbicides applied post seedling emergence to achieve commercially acceptable levels of weed control.

Summary of results

As a result of rabbit damage midway through the trial, the amount of information generated by HNS 31a was limited, but a number of key observations were made.

Section 1 : Evaluation of weed control treatments (Tilhill Nurseries).

A reduction in the pre-emergence rates of many of the herbicides examined in the trial led to lower initial levels of phytotoxicity. However, the post seedling emergence applications of Venzar, Butisan S and Flexidor produced a moderate amount of foliage scorch and in some cases seedling death.

As a result of reducing the pre-emergence rates of the herbicides, the levels of weed control attained by the herbicide treatments were generally poor. Only one treatment, Goltix WG, consistently achieved over 50% weed control on all three assessment dates. The average level of weed control attained by this treatment was approximately

90%. The same treatment also produced the highest level of weed control attained by any herbicide in the trial (92%).

The three Basamid treatments produced good levels of weed control, with little difference between the 380 and 100 kg/ha rates. The lowest rate of Basamid (50 kg/ha) initially gave rise to a poorer level of weed control than the other two treatments, but the post seedling emergence applications of Flexidor improved the subsequent level of weed control.

The highest rate of Basamid led to a reduction in the level of germination of a number of the crop species examined in the trial, this observation could not be explained.

Section 2: Evaluation of lower rates of Basamid (Oakover, Tilhill and Wyevale Nurseries).

The lack of any correlation between the various Basamid rates applied, the level of weed control attained and the effect of the treatments upon germination and subsequent seedling vigour, makes it impossible to draw any conclusions from this section of the trial.

Action points for growers

When the information obtained from the preceding two year trial, HNS/31, is combined with that gained from this trial, several conclusions can be drawn;

1. If weed control rather than disease or pest suppression is the main reason for using Basamid, then the 100 kg/ha rate of Basamid should be considered. Results from HNS/31 and HNS/31a (excluding Section 2 of this trial) have shown the 100 kg/ha rate to perform as well as the 380 kg/ha rate in terms of weed control. Combining low rates of Basamid with suitable herbicides (such as reduced rates of Flexidor or Butisan S) should also be considered.

2. Reducing the pre-emergence application rates of Venzar, Butisan S and Flexidor minimised the amount of phytotoxicity initially noted, however the post seedling emergence treatments still gave rise to seedling death and leaf scorch. It may be possible to create a programme using lower rates of the herbicides both pre and post seedling emergence, but this may well give rise to levels of weed control which are not commercially acceptable.

3. Other herbicides with possible potential noted from HNS/31 and HNS/31a include -

(a) Goltix WG. This herbicide produced good levels of weed control in most years, however it also caused moderate levels of phyotoxicity.

(b) Kerb 50W. Similarly to Goltix WG, this herbicide has given reasonable levels of weed control with only moderate levels of phytotoxicity. For best effect the herbicide needs to be applied as early in the year as possible and irrigated in.

Practical and financial benefits

This trial has highlighted a number of potential herbicides which could be used pre and post seedling emergence to achieve weed control in seed beds. The results obtained give some indication of the efficacy and safety of such herbicides when applied to a range of crop species, presenting the grower with valuable background information on which to base future nursery herbicide programmes.

The trial also highlighted the large cost savings which could be achieved by using the lower rate of Basamid to achieve satisfactory weed control. The 100kg/ha rate of Basamid costs approximately £578 per hectare, compared to the 380 kg/ha rate which costs approximately £2,199 per hectare (chemical costs only).

EXPERIMENTAL SECTION

Introduction

With the withdrawal of Enide 50W from the market there are currently only two herbicides with specific recommendations for use on seed beds, these are paraquat and simazine; paraquat however can only be used in the production of 'stale' seed beds.

HNS 31 highlighted a number of herbicides which could possibly be used in the commercial production of seedlings. It also emphasised the cost savings which could be achieved using a lower rate of Basamid (dazomet) to sterilise the seed beds prior to seed sowing.

This trial, a continuation of HNS 31, was designed to elicit the most suitable rates of the herbicides identified in HNS 31 and to determine if lower rates of Basamid are likely to be a viable option in the long term.

Materials and method

Section 1 : Evaluation of weed control treatments (Tilhill Nurseries).

The seed beds were prepared by nursery staff on 6 November 1995. Four seed beds were used for the trial, each seed bed being 42.5 m long and 1.6 m wide. Basamid was applied to the appropriate plots by hand on the same day. The 380 kg/ha equivalent rate was forked into the top 15-20 cm of soil, the 100 kg/ha and 50 kg/ha equivalent rates were raked into the top 5 cm of soil. The treated plots were then covered with polythene which remained over the plots until early March 1996.

Towards the end of March 1996 the four seed beds were treated with a contact herbicide to eradicate any weed seedlings which had emerged.

On 1 April 1996 further soil preparation by hand took place to produce a fine surface tilth on the seed beds. Following this operation, the various seeds were sown at standard nursery rates according to the plan presented in Figure 1. Each plot was divided equally into six segments, each segment containing a particular plant species; *Acer pseudoplatanus, Almus glutinosa, Berberis thunbergii atropurpurea, Betula pubsecens, Cornus sanguinea* and *Prunus avium*. Each plot was separated from the next by a guard row of *Fraxinus excelsior*.

The same split plot layout was repeated for each plot throughout the entire trial. Each of the eleven treatments and a control were replicated four times in the trial.

After the seeds were sown they were covered with approximately 0.5 cm of grit.

The following treatments were then applied;

1. Control, untreated.

2. Propyzamide (Kerb 50 W) at 2 kg/ha pre-emergence (and 1.5 kg/ha 10 weeks later, post seedling emergence).

3. Napropamide (Devrinol) at 5 litres/ha pre-emergence only.

4. Metamitron (Goltix WG) at 3 kg/ha pre-emergence (and 3 kg/ha every 5 weeks post seedling emergence).

5. Lenacil (Venzar) at 0.5 kg/ha pre-emergence (and 1.5 kg/ha every 5 weeks post seedling emergence).

6. Oxadiazon (Ronstar Liquid) at 2 litres/ha pre-emergence only.

7. Metazachlor (Butisan S) at 1 litre/ha pre-emergence (and 1.5 litres/ha 10 weeks later, post seedling emergence).

Figure 1

Evaluation of weed control treatments - trial layout

8	6	11	5
5	12	8	10
1	4	4	6
12	10	5	3
6	2	7	2
9	9	1	12
10	11	3	1
3	8	6	8
4	1	12	9
2	7	10	4
7	5	9	7
11	3	2	11

Plot layout

A	B
C	D
E	F

A - *Prunus avium* **B** - *Alnus glutinosa*

C - *Betula pubescens* **D** - *Acer pseudoplatanus*

E - *Cornus sanguinea* **F** - *Berberis thunbergii atropurpurea*

Guard plots at the start and end of each plot - *Fraxinus excelsior*.
Plot dimensions -1.6 m x 3 m, guard plot dimensions - 1.6 m x 0.5 m.

***Treatment summary** (see text for full details)*

1. Control (untreated)
2. Kerb 50 W
3. Devrinol
4. Goltix WG
5. Venzar
6. Ronstar Liquid
7. Butisan S
8. Flexidor
9. Stomp
10. Basamid 380 kg/ha
11. Basamid 100 kg/ha
12. Basamid 50 kg/ha + Flexidor

8. Isoxaben (Flexidor) at 100ml /ha pre-emergence (and 200 ml/ha 10 weeks later, post seedling emergence).

9. Pendimethalin (Stomp 400 SC) at 3 litres/ha pre-emergence only.

The Basamid treatments are summarised below;

10. Dazomet (Basamid) 380 kg/ha, soil incorporation to a depth of 15-20 cm.

11. Dazomet (Basamid) 100 kg/ha, soil incorporation to a depth of 5 cm.

12. Dazomet (Basamid) 50 kg/ha, soil incorporation to a depth of 5 cm, followed by isoxaben (Flexidor) at 125 ml/ha every 5 weeks post seedling emergence.

The trial was then irrigated via an overhead irrigation system.

Assessments were then made on the 10 May, 14 June and 19 August 1996 to record;

(a) Weed number and species present.

(b) Comparative seedling germination. A score of 0-9 was used to assess germination, 0 represented 0% germination, 1 represented 0-10% up to 9 which represented 80% + germination.

(c) Seedling vigour. A score of 0-9 was used to assess plant vigour, 0 represented minimal growth following germination through to 9 which represented the most vigorous seedlings.

(d) Phytotoxic damage. A score of 0 represented no damage through to 9 which represented severe damage and seedling death.

Unfortunately, due to severe rabbit damage only the plots containing *Acer pseudoplatanus* were recorded for the latter three parameters on the last two assessment dates.

Throughout the trial a standard spray programme was applied to control pests and diseases.

Section 2: Evaluation of lower rates of Basamid (Oakover, Tilhill and Wyevale Nurseries).

The seed beds at two of the nursery sites (Tilhill Nurseries and Wyevale Nurseries) were prepared by nursery staff on the 6 and 9 November 1995 respectively. The seed beds at Oakover Nurseries were prepared by ADAS staff on 7 November 1995. Three seed beds were used at each site, each seed bed measuring 10.5 m long by 1.5 m wide.

Basamid was applied by hand to the appropriate plots immediately after the beds were prepared. The 380 kg/ha Basamid treatment was forked into the top 15-20 cm of soil,

the 100 kg/ha and 50 kg/ha treatments were raked into the top 5 cm of soil. The treated plots were then covered with polythene until the following March.

All the plots at all the sites were hand weeded and gently raked prior to seed sowing. Seed sowing took place at the Tilhill site on 1 April 1996, at the Oakover site on 3 April 1996 and at the Wyevale site on 4 April 1996. *Alnus glutinosa* and *Betula pubescens* were sown by hand following the plans shown in Figures 2-4.

After sowing, the seeds were covered with with sand or grit and the beds irrigated via an overhead sprinkler system.

All the seed came from one source (Tilhill Nurseries) to reduce any germination or vigour differences.

The follow up application of Butisan S (Treatment 4) was made on 10 June 1996 at the Wyevale site and on 14 June 1996 at the Tilhill site. The Butisan S was applied in the equivalent of 400 litres/ha of water. Due to excessive weed colonisation at the Oakover site, the trial was halted on 12 June 1996 and the Butisan S follow up treatment was not applied.

Trial assessments were made on the following days;

(i) Wyevale Nurseries - 10 June and 23 August 1996.

(ii) Oakover Nurseries - 12 June 1996 only.

(iii) Tilhill Nurseries - 14 June and 19 August 1996.

Figure 2

Trial site: Tilhill Nurseries

Betula 2	Alder 2
Betula 4	Alder 4
Betula 1	Alder 1
Betula 3	Alder 3

Betula 1	Alder 1
Betula 3	Alder 3
Betula 4	Alder 4
Betula 2	Alder 2

Betula 2	Alder 2
Betula 4	Alder 4
Betula 3	Alder 3
Betula 1	Alder 1

Plot dimension - 2.0 m x 1.5 m

KEY:

Alder- *Alnus glutinosa*
Betula- *Betula pubescens*

1 - Control
2 - Basamid 380 kg/ha
3 - Basamid 100 kg/ha
4 - Basamid 50 kg/ha + 10 weeks later, Butisan S 1.5 litres/ha.

Figure 3

Trial site: Wyevale Nurseries

Betula 1	Alder 1	Betula 3	Alder 3	Betula 4	Alder 4
Betula 2	Alder 2	Betula 1	Alder 1	Betula 1	Alder 1
Betula 4	Alder 4	Betula 2	Alder 2	Betula 2	Alder 2
Betula 3	Alder 3	Betula 4	Alder 4	Betula 3	Alder 3

Plot dimension - 2.0 m x 1.5 m

KEY:

Alder- *Alnus glutinosa*
Betula- *Betula pubescens*

1 - Control
2 - Basamid 380 kg/ha
3 - Basamid 100 kg/ha
4 - Basamid 50 kg/ha + 10 weeks later, Butisan S 1.5 litres/ha.

Figure 4

Trial site: Oakover Nurseries

Betula 1	Alder 1
Betula 3	Alder 3
Betula 4	Alder 4
Betula 2	Alder 2

Betula 2	Alder 2
Betula 1	Alder 1
Betula 3	Alder 3
Betula 4	Alder 4

Betula 4	Alder 4
Betula 2	Alder 2
Betula 3	Alder 3
Betula 1	Alder 1

Plot dimensions - 2 m x 1.5 m

KEY:

Alder- *Alnus glutinosa*
Betula- *Betula pubescens*

1 - Control
2 - Basamid 380 kg/ha
3 - Basamid 100 kg/ha
4 - Basamid 50 kg/ha + 10 weeks later, Butisan S 1.5 litres/ha

The following parameters were recorded:

(a) Weed number and species present.

(b) Comparative seedling germination. A score of 0-9 was used to assess germination, 0 represented 0% germination, 1 represented 0-10% up to 9 which represnted 80% + germination.

(c) Seedling vigour. A score of 0-9 was used to assess plant vigour, 0 represented minimal growth following germination through to 9 which represented the most vigorous seedlings.

(d) Phytotoxic damage. A score of 0 represented no damage through to 9 which represented severe damage and seedling death.

Throughout the trial a standard spray programme was applied to control pests and diseases.

Results

Section 1 : Evaluation of weed control treatments (Tilhill Nurseries).

(a) Weed Control

As can be seen from Table 1, the herbicide treatments generally gave rise to relatively poor levels of weed control. Two of the treatments, Goltix WG and Stomp, initially produced good levels of weed control, at 90% relative to the control. The Kerb 50W treatment also produced a moderate initial level of control (73%). The remaining herbicide treatments did not even achieve 50% weed control at the first assessment.

The Goltix WG programme of treatments achieved the highest consistent level of weed control throughout the trial (an average level of 90%).

As the Stomp treatment was a single pre-emergence application, the level of weed control reduced with time. However, the treatment still achieved 47% weed control four months after application.

The Kerb 50W programme of treatments maintained a moderate level of weed control throughout the trial.

Two of the pre and post seedling emergence herbicide treatment programmes (Venzar and Butisan S) produced higher levels of weed control with time. This was especially true in the case of the Venzar programme of treatments, where the percentage level of weed control rose from 14% at the first assessment to 67% by the last assessment.

The Flexidor programme of treatments performed no better than the untreated control throughout the entire trial.

The 380 kg/ha and 100 kg/ha rates of Basamid performed almost identically in terms of weed control. Both treatments attained weed control levels of over 90%.

The 50 kg/ha treatment produced a lower level of weed control (58%), however the post seedling emergence treatment of Flexidor every 5 weeks improved the level of weed control (up to 85%).

(b) Seedling Germination

The germination scores for all the species on the first assessment are presented in Table 2, Table 1 presents the scores for *Acer pseudoplatanus* only.

As can be seen from Table 2, poor germination was initially experienced with *Betula pubescens*, *Cornus sanguinea* and *Alnus glutinosa*.

With regard to the *Prunus avium*, all the treatments except Basamid, applied at 50 kg/ha, appeared to have some deleterious effect on germination.

Table 1

Summary of weed control and seedling assessments

Treatment	10 May 1996				14 June 1996				19 Aug 1996			
	Percentage weed control	Germination score	Vigour score	Phytotoxicity score	Percentage weed control	Germination score	Vigour score	Phytotoxicity score	Percentage weed control	Germination score	Vigour score	Phytotoxicity score
Untreated control	-	20	-	0	-	29	25	0	-	24	21	2
Kerb 50W pre emergence and 10 weeks later	73	20	-	0	47	27	25	3	61	24	17	5
Devrinol pre emergence only	14	21	-	0	0	26	24	5	17	25	13	10
Goltix WG pre emergence and every 5 weeks	90	25	-	1	87	28	25	3	92	25	23	5
Venzar pre emergence and every 5 weeks	14	20	-	1	58	28	24	10	67	25	19	6
Ronstar Liquid pre emergence only	46	24	-	1	48	31	26	2	53	28	17	8
Butisan S pre emergence and 10 weeks later	27	19	-	1	33	23	22	0	42	22	14	12
Flexidor pre emergence and 10 weeks later	0	23	-	0	0	28	26	0	0	23	12	14
Stomp pre emergence only	91	25	-	0	44	31	28	0	47	29	18	7

Table 1 (cont)

Summary of weed control and seedling assessments

Treatment	10 May 1996				14 June 1996				19 Aug 1996			
	Percentage weed control	Germination score	Vigour score	Phytotoxicity score	Percentage weed control	Germination score	Vigour score	Phytotoxicity score	Percentage weed control	Germination score	Vigour score	Phytotoxicity score
Basamid 380 kg/ha	100	16	-	1	98	23	30	3	99	28	31	3
Basamid 100 kg/ha	91	23	-	0	97	30	30	3	96	29	28	0
Basamid 50 kg/ha + Flexidor every 5 weeks	58	23	-	0	85	27	29	6	84	31	23	1

KEY

Germination score (0-36) - a high figure represents good germination, a low figure represents poor germination.
Vigour score (0-36) - a high figure represents good vigour, a low figure represents poor vigour.
Phytotoxicity score (0-36) - a high figure represents damage to the seedlings, a low figure represents minor scorching.

Germination, vigour and phytotoxicity scores relate to *Acer pseudoplatanus* only.
Scores are the total for all four replicates.

Table 2

Summary of germination assessments on 10 May 1996

Treatment	10 May 1996 Germination Score Per Species					
	Prunus avium	*Alnus glutinosa*	*Betula pubescens*	*Acer pseudo-platanus*	*Cornus sanguinea*	*Berberis thunbergii Atropurpurea*
Untreated control	18	8	0	20	1	20
Kerb 50W pre emergence and 10 weeks later	14	0	0	20	5	21
Devrinol pre emergence only	14	3	0	21	5	19
Goltix WG pre emergence and every 5 weeks	16	2	0	25	2	24
Venzar pre emergence and every 5 weeks	15	7	0	20	4	23
Ronstar Liquid pre emergence only	17	4	0	24	4	22
Butisan S pre emergence and 10 weeks later	16	3	0	19	8	20
Flexidor pre emergence and 10 weeks later	14	8	0	23	6	25
Stomp pre emergence only	14	2	0	25	3	24
Basamid 380 kg/ha	10	2	0	16	7	15
Basamid 100 kg/ha	13	6	0	23	4	24
Basamid 50 kg/ha + Flexidor every 5 weeks	19	10	0	23	5	22

KEY

Germination score (0-36) - a high figure represents good germination, a low figure represents poor germination.

The scores presented are the total for all four replicates.

A reduction in the level of germination of *Acer pseudoplatanus* was noted at the first and second assessments, as a result of using the recommended rate of Basamid (380 kg/ha) treatment. A reduction in the germination level as a result of the Butisan S treatment was also noted at the second assessment.

The germination level of the *Berberis thunbergii atropurpurea* was only slightly reduced by using the recommended rate of Basamid, the other treatments did not appear initially to reduce the germination level.

(c) Seedling Vigour

No vigour scores were recorded at the first assessment, as seedling germination had only just occurred and the seedlings were still at the cotyledon/first true leaf stage.

Differences in the vigour of the *Acer pseudoplatanus* seedlings were noted at the last assessment on 19 August 1996. The Devrinol, Butisan S and Flexidor treatments all had a deleterious effect on seedling vigour.

(d) Phytotoxicity

Very little phytotoxicity was noted at the first assessment (6 weeks after the pre-emergence herbicides were applied) on any of the species in the trial. The first signs of damage were noted at the second assessment (*Acer pseudoplatanus* only), 5 weeks after the second (post seedling emergence) herbicide application. Seedling death and foliage scorch were noted in response to applications of Venzar, Devrinol (applied pre-emergence) and Flexidor (applied as a follow up treatment to Basamid). Seedling death and foliage scorch were still noted at the final assessment in response to Flexidor, Butisan S, Devrinol, Ronstar Liquid, Stomp and Venzar.

Section 2: Evaluation of lower rates of Basamid (Oakover, Tilhill and Wyevale Nurseries).

(a) Weed Control

Weed control was generally very poor at all the sites, with the exception of the 380 kg/ha rate of Basamid and the 50 kg/ha rate of Basamid followed by Butisan S at the Tilhill site (Tables 3-7). At the Oakover site all three treatments failed to achieve any improvement in the level of weed control when compared with the untreated control.

The weed control levels noted in the trial did not correlate with the amount of Basamid applied to the plots. At the Wyevale site for example, the highest level of weed control was attained by the 100 kg/ha rate of Basamid, whilst the 380 kg/ha rate of Basamid performed no better than the 50 kg/ha rate.

Table 3

Summary of assessments - Tilhill Nurseries, 14 June 1996

Treatment	Percentage weed control	Germination		Seedling Vigour		Phytotoxicity	
		Betula	Alder	Betula	Alder	Betula	Alder
Untreated control	-	3	2	7	3	0	0
Basamid 380 kg/ha	76	3	1	7	1	0	0
Basamid 100 kg/ha	0	2	0	2	0	0	0
Basamid 50 kg/ha + Butisan S 1.5 l/ha	28	3	2	6	2	0	0

Table 4

Summary of assessments - Tilhill Nurseries, 19 August 1996

Treatment	Percentage weed control	Germination		Seedling Vigour		Phytotoxicity	
		Betula	Alder	Betula	Alder	Betula	Alder
Untreated control	-	1	1	3	1	0	0
Basamid 380 kg/ha	70	2	1	4	1	0	0
Basamid 100 kg/ha	0	1	0	2	0	0	0
Basamid 50 kg/ha + Butisan S 1.5 l/ha	53	1	1	3	2	0	0

Table 5

Summary of assessments - Wyevale Nurseries, 10 June 1996

Treatment	Percentage weed control	Germination		Seedling Vigour		Phytotoxicity	
		Betula	Alder	Betula	Alder	Betula	Alder
Untreated control	-	2	3	4	5	0	0
Basamid 380 kg/ha	4	1	7	2	11	0	0
Basamid 100 kg/ha	35	1	7	3	6	0	0
Basamid 50 kg/ha + Butisan S 1.5 l/ha	0	2	9	3	11	0	0

Table 6

Summary of assessments - Wyevale Nurseries, 23 August 1996

Treatment	Percentage weed control	Germination		Seedling Vigour		Phytotoxicity	
		Betula	Alder	Betula	Alder	Betula	Alder
Untreated control	-	4	8	8	11	0	0
Basamid 380 kg/ha	0	2	7	8	10	0	0
Basamid 100 kg/ha	22	3	8	7	11	0	0
Basamid 50 kg/ha + Butisan S 1.5 l/ha	0	3	8	7	12	0	0

Table 7

Summary of assessments - Oakover Nurseries, 12 June 1996

Treatment	Percentage weed control	Germination		Seedling Vigour		Phytotoxicity	
		Betula	Alder	Betula	Alder	Betula	Alder
Untreated control	-	0	0	0	0	0	0
Basamid 380 kg/ha	0	0	0	0	0	0	0
Basamid 100 kg/ha	0	0	0	0	0	0	0
Basamid 50 kg/ha + Butisan S 1.5 l/ha	0	0	0	0	0	0	0

Table 8

Weed species noted at each site

Site	Weeds noted in order of numerical significance
Tilhill	
	Black Nightshade (*Solanum nigrum*)
	Small Nettle (*Urtica urens*)
	Chickweed (*Stellaria media*)
	Knotgrass (*Polygonum aviculare*)
	Groundsel (*Senecio vulgaris*)
	Redshank (*Polygonum persicaria*)
	Fat Hen (*Chenopodium album*)
	Sowthistle (*Sonchus sp*)
Oakover	
	Spurrey (*Spergula arvensis*)
	Red Deadnettle (*Lamium purpureum*)
	Fat Hen (*Chenopodium album*)
	Groundsel (*Senecio vulgaris*)
	Speedwell (*Veronica sp*)
	Cranesbill (*Geranium sp*)
Wyevale	
	Clover (*Trifolium sp*)
	Fat Hen (*Chenopodium album*)
	Sowthistle (*Sonchus sp*)
	Annual Meadow Grass (*Poa annua*)
	Chickweed (*Stellaria media*)
	Dandelion (*Taraxacum officinale*)

(b) Seedling Germination

Germination was variable between the sites. The highest levels were noted at the Wyevale site. No seedling germination was noted at the Oakover site as the weeds which germinated, quickly smothered the plots. Germination did not appear to be affected by the various Basamid treatments.

(c) Seedling Vigour

Seedling vigour varied quite markedly between the sites. However seedling vigour appeared unaffected by the various treatments applied.

(d) Phytotoxicity

No signs of phytotoxicity were noted in response to any of the treatments.

Conclusions

Section 1 : Evaluation of weed control treatments (Tilhill Nurseries).

As a result of rabbit damage mid way through the trial, the amount of data obtained was limited. However the trial provided enough information to allow some comparison with previous trials carried out as part of HNS 31.

With the exception of the Ronstar Liquid and Devrinol treatments, all the phytotoxic damage noted was the result of herbicides applied post seedling emergence. Reducing the pre-emergence rates of the Venzar, Flexidor and Butisan S treatments appeared to minimise the amount of phytotoxic damage noted in the first few weeks after herbicide application. However, the post seedling emergence applications of the herbicides still caused damage even though the rates used were well below those recommended for nursery stock. This damage may in part have been due to the prevailing weather conditions at the time of application (warm and bright) even though the treatments were irrigated in on the day of application.

Table 9

Percentage weed control levels obtained after 10 weeks 1993 v 1996

Herbicide	Rate of Application		% weed control 10 weeks into the trial	
	1993	1996	1993	1996
Venzar	1.5 kg/ha pre-emergence, 1.5 kg/ha every 5 weeks post seedling emergence	0.5 kg/ha pre-emergence, 1.5 kg/ha every 5 weeks post seedling emergence	90	58
Ronstar Liquid	4 litres/ha pre-emergence.	2 litres/ha pre-emergence.	65	48
Butisan S	1.5 litres/ha pre-emergence, 1.5 litres/ha 10 weeks post seedling emergence	1 litre/ha pre-emergence, 1.5 litres/ha 10 weeks post seedling emergence	67	33
Flexidor	200 ml/ha pre-emergence, 200 ml/ha 10 weeks post seedling emergence	100 ml/ha pre-emergence, 200 ml/ha 10 weeks post seedling emergence	71	0

Note - 1993 trial held at Oakover Nurseries, 1996 trial held at Tilhill Nurseries.

The reduction in the pre-emergence rates of many of the herbicide treatments led to a reduction in the level of weed control attained, especially in the first few weeks of the trial. This reduction is clearly demonstrated when weed control levels obtained after 10 weeks in 1993 are compared with those obtained in this trial (Table 9). Although the two trials were held at different nurseries with different weed pressures, weed spectrums, soil types etc, reducing the pre-emergence rate of the herbicides appears to have had a considerable effect on the overall level of weed control achieved.

The three Basamid treatments performed as expected in terms of weed control, in that the 380 kg/ha rate of Basamid performed the best, followed by the 100 kg/ha rate and then the 50 kg/ha rate. From a practical point of view however, the 100 kg/ha performed as well as the 380 kg/ha rate.

The initial level of weed control attained by the 50 kg/ha rate was only moderate, the subsequent post seedling emergence applications of Flexidor improved the level of weed control and ensured the longevity of the treatment.

It is still not known why the 380 kg/ha rate of Basamid had a deleterious effect on the germination of *Prunus avium*, *Alnus glutinosa*, *Acer pseudoplatanus* and *Berberis thunbergii atropurpurea*. None of the other herbicides appeared to have this initial effect on so many of the species examined in the trial.

As only the *Acer pseudoplatanus* seedlings were left untouched by the rabbits, it is difficult to draw any general conclusions from this particular trial about the longer term effects of the herbicide treatments on germination, seedling vigour and quality of a range of tree and shrub species. However, when the information obtained from HNS/31 is combined with that from HNS/31a, several conclusions can be drawn;

1. If weed control rather than disease or pest suppression is the main reason for using Basamid, then the 100 kg/ha rate should be considered. Results from HNS 31 and HNS 31a (excluding section 2) have shown the 100 kg/ha rate to perform as well as the 380 kg/ha rate in terms of weed control. Combining low rates of Basamid with suitable herbicides should also be considered.

2. Reducing the pre-emergence rates of Venzar, Butisan S and Flexidor minimised the amount of phytotoxicity initially noted, however the post seedling emergence treatments still gave rise to seedling death and leaf scorch. It may be possible to create a programme using even lower rates of the herbicides both pre and post seedling emergence, however as highlighted in Table 9, this may well give rise to levels of weed control which are not commercially acceptable.

3. Other herbicides with possible potential include -

   (a) Goltix WG. This herbicide has given rise to good levels of weed control in most years, however it also caused moderate levels of phyotoxicity.

   (b) Kerb 50W. Like Goltix WG, this herbicide has given reasonable levels of weed control with only moderate phytotoxicity. For best effect the herbicide needs to be applied as early in the year as possible and irrigated in.

Section 2: Evaluation of lower rates of Basamid (Oakover, Tilhill and Wyevale Nurseries).

The generally poor levels of weed control attained by all the Basamid treatments over both years of the trial and the lack of any correlation between the Basamid rate applied, the level of weed control attained and the effect of the treatments upon germination and subsequent seedling vigour, make it impossible to draw any conclusions from this section of the trial.

APPENDIX 1

Site soil analyses - samples taken 09/09/96

Site	pH	Lime t/ha (arable)	Phosphorus mg/l (index)	Potassium mg/l (index)	Magnesium mg/l (index)
Tilhill	5.2	12	101 (6)	34 (0)	40 (1)
Wyevale	6.9	0	57 (4)	120 (1)	148 (3)
Oakover	6.1	4	61 (4)	121 (1)	76 (2)

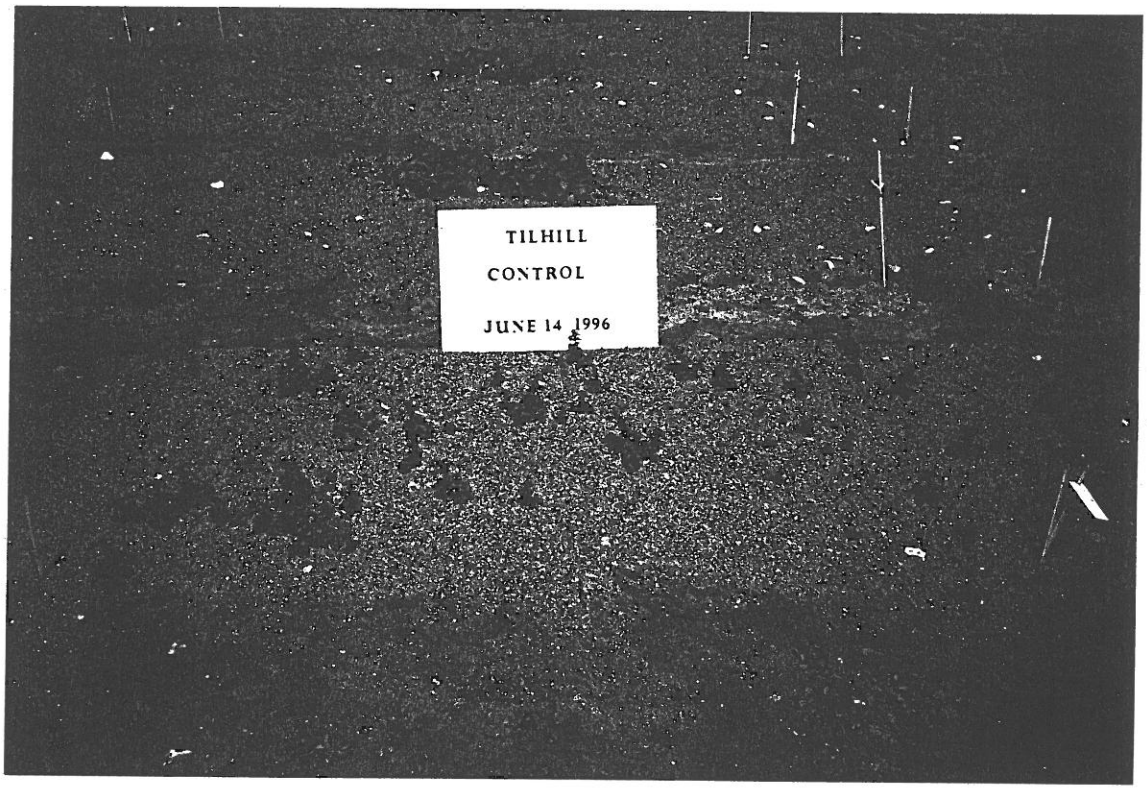
APPENDIX 2

The effect of Venzar on *Acer pseudoplatanus*

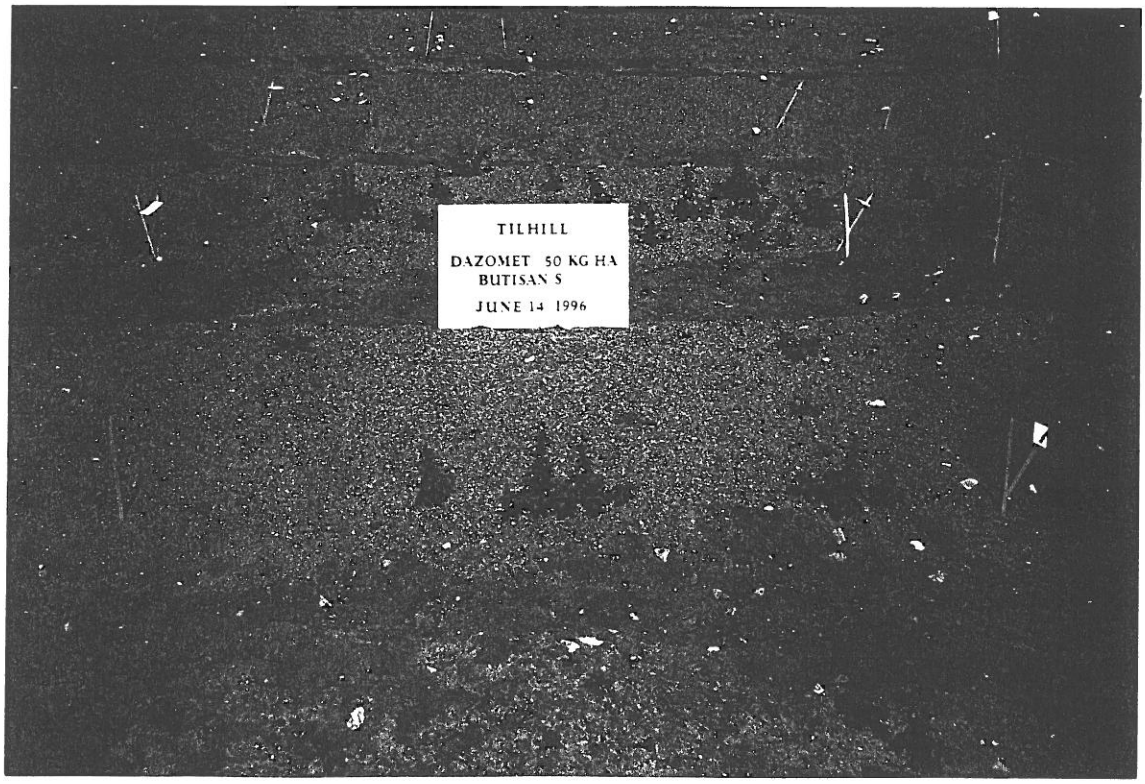
APPENDIX 3

Weed control levels attained by the various rates of Basamid at the Tilhill Nursery site

(a) Control - no treatment



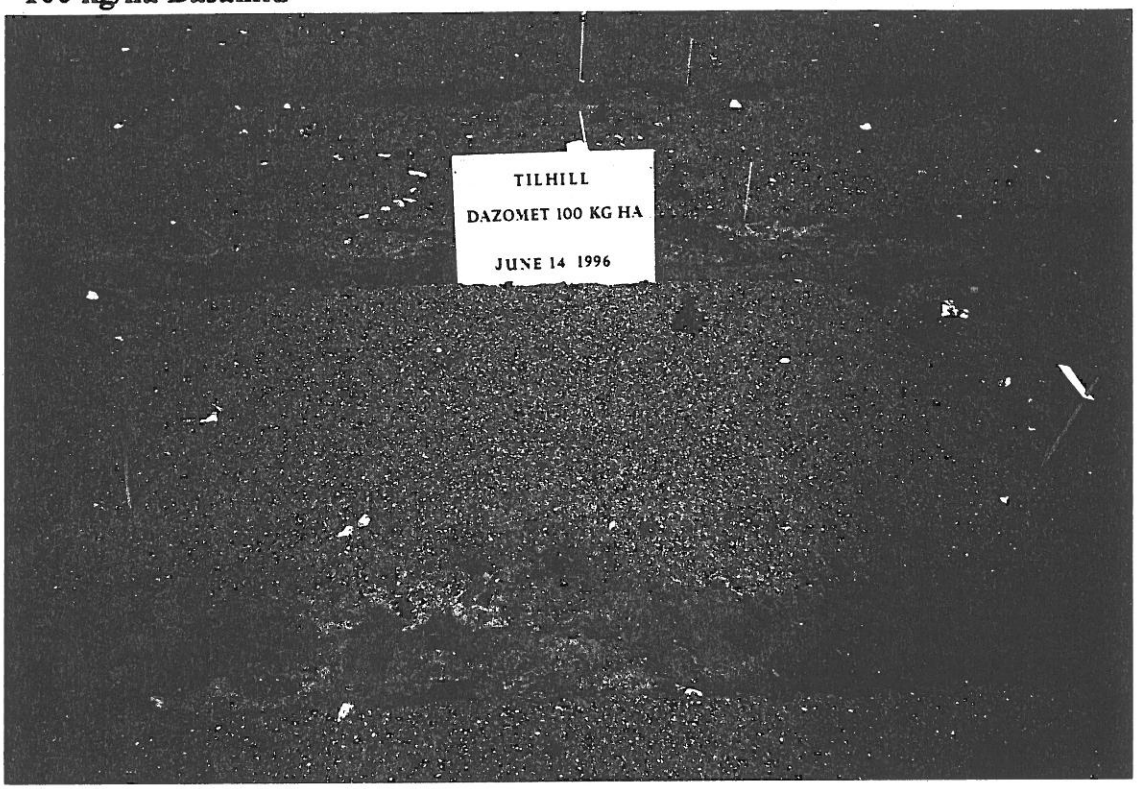
(b) 50 kg/ha Basamid followed by Butisan S



APPENDIX 3

Weed control levels attained by the various rates of Basamid at the Tilhill Nursery site

(c) 100 kg/ha Basamid



(d) 380 kg/ha Basamid

APPENDIX 4

Approximate cost of the treatments used in the trial

Treatment	Cost (£) Per Hectare
Kerb 50W pre-emergence and 10 weeks later	158
Devrinol pre-emergence only	190
Goltix WG pre-emergence and every 5 weeks	210
Venzar pre-emergence and every 5 weeks	169
Ronstar Liquid pre-emergence only	65
Butisan S pre-emergence and 10 weeks later	91
Flexidor pre-emergence and 10 weeks later	63
Stomp pre-emergence only	29
Basamid 380 kg/ha	2,199
Basamid 100 kg/ha	578
Basamid 50 kg/ha followed by Flexidor every 5 weeks	342
Basamid 50 kg/ha followed 10 weeks later by Butisan S	344

Costs relate to the pre-emergence treatment and two post emergence treatments where the interval between applications is five weeks and one post emergence treatment where the interval is ten weeks.

Price of Flexidor 125 substituted for Flexidor, with the herbicide application rates altered accordingly.

Price of Sovereign substituted for Stomp 400 SC.

APPENDIX 2

The effect of Venzar on *Acer pseudoplatanus*

Weed control levels attained by the various rates of Basamid at the Tilhill Nursery site

(c) 100 kg/ha Basamid

(d) 380 kg/ha Basamid

APPENDIX 3

Weed control levels attained by the various rates of Basamid at the Tilhill Nursery site

(a) Control - no treatment

(b) 50 kg/ha Basamid followed by Butisan S