10 Loach, K. and D N Whalley 1978 Water and carbohydrate relationships during the rooting of cuttings. *Acta Hortic* 79 161-168

11 Loreti, F and P L Pisani 1982 Physiological and technical factors affecting rooting in woody species *Proc. 21st Inter Hort Congress.* 1 294-309

12 Rowell, D J 1981 Etiolation of stock plants for improved rooting of cuttings II Initial experience with hardy ornamental nursery stock *Proc Inter Plant Prop Soc* 31 392-395

EXPERIENCES WITH HERBICIDES ON CONTAINERS

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INTRODUCTION

It has been established for some time that labour is the highest cost when producing nursery stock. Therefore there is a need to ensure the highest proportion of those labour costs should go into production. Despatching and aftercare are the other high labour areas. Aftercare sometimes implies afterthought, or the time we have left between potting and despatching.

There is a neglected argument of forethought with herbicides, as this should be the first rule of growing. Good weed control, like early propagation, comes down to timing. The criteria is to apply a herbicide seal to the compost as soon after potting as possible and follow it up at regular intervals, not allowing an infestation to take place. With labour costs high you cannot afford to delay a routine spray, as problem weeds germinate all too quickly and hand weeding is labour intensive and costly.

To my surprise I have found few species of problem weeds, but these few are not to be underestimated. They include, especially in the propagation stage *Cardamine hirsuta*, which if controlled at this stage, would not lead to problems once the plants are on the container beds, and *Epilobium spp.* which has an extreme ability to produce vast numbers of seed and then remain as a perennial weed over the winter period. Also *Poa annua* which builds up mainly due to the overuse of one herbicide (Tenoran).

We shall, firstly, look at the chemicals which have given the most success in preventing germination of weed seeds:

A personal comparison of pre-emergence herbicides:

SIMAZINE (50% w/w Simazine)

For use with containerised nursery stock I have found half-rate Simazine at 1 lb/acre in 100 gallons of water gives fair control of wide ranges of weeds, and is useable on many species of nursery stock including green conifers, i.e. × *Cupressocyparis leylandii*. The chemical is cheap and long lasting but is not the complete answer as it does damage certain species. I have had problems with *Forsythia*, *Deutzia*, *Philadelphus* and *Weigela*. Affected plants may not grow out of damage for the following season. Washing off, as in the case of Tenoran (chloroxuran) has helped to minimise damage. Simazine when applied 4-6 weeks after potting, will be the only application in the season. Best control is given, however, when used in conjunction with other chemicals, i.e. Ronstar (oxidiazon) after potting, Simazine, and then Tenoran, on every other application (8 weeks between sprays). The Tenoran is of particular benefit for the control of liverwort and mosses and other types of weeds that Simazine does not control.

TENORAN (Chloroxuron)

I find some nurserymen shying away from this chemical, especially after damage has occurred, but this can be eliminated by washing off quickly and thoroughly after application. When I came out of college the recommendations for interval between applications were: 6-12 weeks (Weed Control Handbook, Vol II), 6-8 weeks (manufacturer's recommendation), but this gave poor control and much embarrassment. With shortening the spray interval to four weeks I achieved excellent control.

In conjunction with this, uneven application is the biggest problem and so I developed a boom to work in conjunction with a Centurian sprayer, to give the maximum coverage and wash off. Any such boom should be designed ideally with an extra angled nozzle to cover the edges of the bed. This is usually the worst place for germinating weeds. The rate of 2 lbs c.p in 100 gallons is effective.

RONSTAR granules (Oxidiazon)

I have been using the granular formulation of Ronstar for about four years now and have found it especially useful for applying after potting, before other routine sprays. Application has proved difficult as uneven placement of the granule occurs, tending to bounce off the pots, or with dense foliage not penetrating to the compost surface. There is also the need to apply the chemical when the foliage is dry and tap off with a cane, as contact with foliage may result in scorching. The application rate is 2kg over 100M. This interval between appli-

cation is 10 weeks, which makes it longer lasting than Tenoran, but like Simazine it is best used in conjunction with Tenoran to control a broader range of weed species, including liverworts and mosses. The application is by the pepper pot type Kerb applicator or hand granular applicator costing £55. With increasingly large areas to cover, a power knapsack type duster costing £250 looks like a better method of application. Recommendations so far only indicate two genera as susceptible to damage — *Hydrangea* and *Spiraea*, but I have not noticed any problems occurring. Ronstar has been good in polyhouses and glass until this year when it defoliated newly-potted *Skimmia japonica* liners.

These three chemicals work very well, but should not be relied on absolutely. There is still a need for labour intensive hand weeding to be carried out before seeding and residual herbicide application.

This year I set out to find an effective alternative to hand weeding especially prior to despatch.

Spray trials for the control of existing perennial weeds:

The objective of these trials is to reduce the amount of hand weeding of containerised nursery stock prior to despatch. In 1983/84 season the main problem on our site was *Epilobium* spp.

Another aim is to reduce other weeds which tend to flower and seed quickly, which cause great problems in the spring. In this category the most serious problems are caused by *Poa annua* and *Cardamine hirsuta*.

To find a chemical which will be selective enough to kill the weed and not cause any economic damage to a broad spectrum of nursery stock was not easy; my only previous experience of this kind of control was connected with evergreen nursery stock in the open ground using Kerb 50W.

The plants used in the trial were as follows:

Berberis "coccinea"
B. darwinii
Cotoneaster horizontalis
C 'Hybridus Pendulus'
C microphyllus
C 'Royal Beauty'
× *Cupressocyparis leylandii*
× *C leylandii* 'Castlewellan'
Escallonia rubra var *macrantha*
Euonymus fortunei 'Emerald Gaiety'
E fortunei 'Emerald Gold'
Hebe 'Cranleigh Gem'
Ilex aquifolium 'Argenteo-marginata'
Pinus sylvestris
Rubus cockburnianus
Sarcococca hookerana var *humilis*
Symphoricarpos 'White Hedge'

The trial was set up on the 14th of February. Four plots were laid out, one for each chemical. All are five square metres in area. Plants were chosen from the nursery beds with the highest infestation of weeds and the broadest cross section

of weed species. I found little point in conducting the trial on containers with low weed populations.

The chemicals trialed were:

i) Goal — Oxyfluorfen at 5 litres/ha.

ii) Ronstar — Oxydiazon at 4 litres/ha.

iii) R.H. 666 — experimental granular herbicide which consists of Goal/Kerb (oxyfluorfen 1.67%/propizamide 2.83%) at 600 kg/ha.

iv) Kerb — Propizamide 4% at 3.4 kg/ha.

Results were as follows:

GOAL. All weeds died off completely after 2-4 weeks but re-emergence from the crown was rapid.

Damage: Cotoneaster 'Royal Beauty' and *C. horizontalis* received slight retardation of growth. In *Escallonia* 75% of leaves dried; *Sarcoccoa* 40% of leaves died. *Euonymus fortunei* 'Emerald 'n Gold' and 'Emerald Gaiety' — both completely defoliated.

Post trial control: After 8-10 weeks complete and severe re-emergence of *Epilobium spp.*, also *Poa annua* and *Cardamine hirsuta* which were at this stage flowering and seeding.

RONSTAR. All weeds died off completely after 2-4 weeks. Re-emergence occurred from *Epilobium* at the crown.

Damage: Escallonia suffered 75% leaf death.

Post trial control: 8-10 weeks severe *Epilobium* problem returned along with infestations of *Cardamine* and *Capsella bursa-pastoris.*

R H 666. There was a complete browning of weeds early on. In April some *Epilobium* died back into the crown.

Damage: Escallonia leaves affected but regrowth soon followed.

Post trial control. 8-10 weeks later re-growth of all weeds occurred.

KERB. This was slow to act at first but by early May there was a complete burning of weed foliage, *Poa annua* and *Epilobium* dying off.

Damage. none.

Post trial control: Re-emergence of *Epilobium spp.* but all were severely weakened having an especially poor root system which enabled them to be hand-weeded very easily.

NOTE: While this trial was being conducted Kerb 50 W was applied to the main nursery container area at the 1.5 kg/ha. The spray was directed at patches of *Epilobium*, avoiding

clean batches of crop plants. This hit and miss attempt gave better control than the trial chemicals. A complete kill occurred with little re-emergence from the crown. I can only speculate about the success of this method. I think that the lower rate was taken in slowly and absorbed into the root system more efficiently.

In conclusion, Kerb 50 W for the control of existing *Epilobium* infestations applied in the winter months, can give control over a broad range of nursery stock. This range remains to be specified by further trials.

Pre-emergence trials.

After becoming very complacent with Tenoran and Simazine, I decided last month to try something new. On the 23rd June I again treated our trial plot at Spot Acre Nurseries with three of the newer pre-emergence chemicals. Here is a brief summary of the trial to date.

i) Goal/Kerb 30 gms/ 5 m^2. Looking very clean, no damage but some *Sagina procumbens* starting to cover the pots.

ii) Goal/Kerb 60 gms/5 m^2. As above.

iii) Goal liquid 2 ml/5 m^2, 2 litres of water in knapsack and washed off well. No emergence of weed seedlings but very severe scorching on all trial plants.

iv) Ronstar granules 60 mgs/5 m^2. No damage, but very many patches of germinating weed seeds.

Indications so far show that the Goal/Kerb granules are low risk and give good weed control. I understand that this granule may be on the market next year, released through P.B.I. (Pan Britanica Industries). Indications from other trials suggest a greater control over a much wider weed spectrum than oxydiazon. It also has a low phytotoxicity even at double rate to trees and shrubs, and without the need to tap off the granule.

Goal/Kerb granules: Oxyfluorfen 1.67% a.i. + Propizamide 2.83% a.i.

Hand weeding is probably the most demeaning job on the nursery and, to a large extent, can be overcome with herbicides. Like slow-release fertilisers it really is a case of trialing the chemicals and finding which one suits your own production programme.