

Nurseries Learning from the Turf Industry[©]

Todd Layt

Ozbreed Pty Ltd, PO Box 1011, Richmond, NSW 2153, Australia

Email: info@ozbreed.com.au

INTRODUCTION

Many chemicals and other specialist products are widely used in the turf industry. Many of these can have major benefits for the nursery industry, but only if they are ultimately registered or trialled in the growing of plants. Ronstar[®] (oxadiazon) is one such chemical that has a dual use in the turf and nursery industries. A new product for use on turf in Australia, sold under the brand name of Barricade[®] with the active ingredient prodiamine has been used for some time in the USA both on turf and in the nursery industry for growing plants in pots. This pre-emergent has only been registered for use as a turf pre-emergent in Australia, but in the USA it is a major chemical used to stop or reduce weed germination in many pot grown nursery crops in the USA. Many use it in the USA due to its lack of adverse effects on pot grown plants, and its ability to greatly reduce weed infestation. In Australia, most nurseries appear to use Rout[®] and Ronstar. Although good for weed control, I have witnessed firsthand many times the adverse effects on certain crops, particularly strappy leaf plants. Rout seems to be better suited to woody plants, such as trees. The other problem with these chemicals is they have to be applied in granular form. Often spraying over the top is more efficient, and the use of a chemical such as Barricade could greatly reduce costs for Australian nurseries. With the help of Syngenta, Ozbreed has for a 12 month period tested this chemical on a number of popular Australian nursery grown plants. As Ozbreed has these plants in the USA, where the chemical is registered, it was easy to test these plants. Barricade is widely used by nurseries growing Ozbreed plants in the USA. Indications are that this chemical has the potential to greatly reduce hand weeding in nurseries. Ozbreed also took cuttings and divisions of plants that had the chemical applied 3 months prior, and monitored the effect. Ozbreed also conducted limited testing on two brands of oryzalin, namely Prolan[™] and Embargo[®]. Both these have some registered use allowable on ornamentals.

Another product that is often used by the turf industry in Australia is Carbon Trader. Carbon Trader is a high loading formulation of carbon (activated charcoal) that also contains small amounts of nitrogen, phosphorous and potassium. It is used on turf to enhance winter growth, and keep turf greener in winter. Ozbreed recently tested this on a large number of replicated turf plots and plants. This research indicates this product has potential in growing better winter and early spring crops of many plant types. It was also tested for improved cutting strike on *Westringia* plants.

PRODIAMINE AND OXADIAZON RESEARCH

Literature Review

In the USA many chemicals are available and are widely used in the nursery industry. Many of these chemicals are not available, or are not registered for use in Australia. The nursery industry in the USA, mainly through universities have conducted many research projects on the use of pre-emergent chemicals. Chemicals such as isoxaben and metolachlor are also used in the USA to control nursery stock weeds. In Australia, the University of Queensland produced a document called *Weed Management in Woody Cut Flower Plantations*. Chemicals available for the Australian Nursery industry were discussed. However it is hard to find information on new chemicals that are now widely used in the USA. More Australian research and literature is needed on these chemicals, so the nursery industry can lobby the chemical companies to implement the rigorous task of having the chemicals registered. It is absolutely necessary to only use chemicals as per label, however industry funded research using permits could kick start companies spending the money in Australia to get product registered. Prodiamine is a perfect

example of that. Industry research has now sparked an interest in registering this product for the nursery industry. Research in the USA shows prodiamine moves less deeply in the soil or potting mix than oxadiazon, which for free draining potting mixes we use in Australia, could have important implications. Both these chemicals are listed for many similar plants in the USA, although oxadiazon is not listed for many ornamental grasses, whilst some literature from the USA shows you can use prodiamine on ornamental grasses.

MATERIALS AND TRIAL SET UP

Ozbreed Pty Ltd after researching the product in the USA for use on its plants, decided to conduct Australian research working with Syngenta under its permit. Between 10 and 50 plants of a large number of species were tested using different rates over a period of time. Plants were identified growing in gardens, growing in tubes, plugs, and in pots. These container plants were split into two groups. One for a control, and the other would have prodiamine applied at different rates over a 12-month period. The rates would start at the label rate based on information gathered from the USA. Later higher rates would be tested. In the garden, plants were selected to be sprayed, whilst the other plants in the garden would act as a control.

Testing

The container grown plants were placed on plastic pallets, one row the control and the other had the chemical applied. Plants in the garden were identified as the target group. In Autumn 2011, a rate of 30 ml per 100 m² was applied to the target group. The plants were observed. In Winter 2011, the target plants received a rate of 45 ml per 100 m². In mid and late Spring 2011, the target group received a rate of 60 ml per 100 m². In late Spring 2011, some of the plants that were treated had cuttings and divisions taken from them, and were placed in propagating trays in propagation mix and placed in a hot house with misting. These plants were monitored. No more than 80 plants of any species were tested. Twenty-four *Lomandra fluviatilis* 'ABU7', Shara™ lomandra were treated with 24 controls and placed in a hot house on the 4 May 2011. These were very weedy, but had just been hand weeded. The rate use was 45 ml per 100 m². The hot house and extra amount of weed seed was hoped to show visual differences.

In late summer another set of plants were organised, again split into two groups. The target group had oxadiazon applied at the label rate.

RESULTS

Prodiamine

Observations and monitoring showed a reduction of weeds in the first trial in early Autumn 2011 at the USA rate of 30 ml per 100 m², but some broadleaf weeds were noted. No difference was noted between the health of the target group and the control in any of the plants. Weeds were more numerous in the control than the target plants.

Observations and monitoring showed a larger reduction of weeds in the second trial in mid-winter 2011 at the rate of 45 ml per 100 m², but there were still some broadleaf weeds noted. No difference was noted between the health of the target group and the control in any of the plants. Weeds were far more numerous in the control compared to the target plants.

Observations and monitoring showed a complete reduction of weeds in the third trial in late spring 2011 at the rate of 60 ml per 100 m², and no broad leaf weeds were noticed in the target plants. No difference was noted between the health of the target group and the control in any of the plants. The control had lots of weeds, while the target plants had no weeds at all.

Both the garden and container trials showed similar results, although it was noted that the second trial in the garden reduced weeds by more than in the containers.

After each trial period all the plants were hand weeded.

The separate trial of 24 plants of Shara™ lomandra treated and placed in the hot house showed how well the Barricade stopped weeds at the 45 ml rate. See photo taken in August 2011 (Figs. 1 and 2).

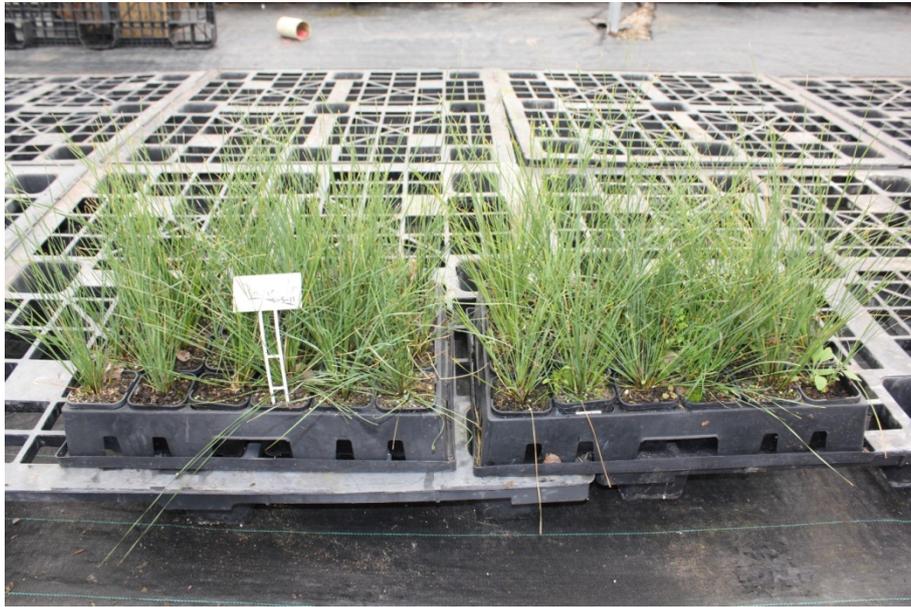


Fig. 1. Shara™ lomandra treated and placed in the hot house showed how well the Barricade® worked.



Fig. 2. The above photo shows Shara™ lomandra in Sept. 2011 in an outside trial. Left was treated with Barricade® at 45 ml per 100 m², and right was not treated.

Results using the plants sprayed with prodiamine, and for that matter Carbon Trader, for propagation, compared to the controls are listed in the following table (Table 1), and

graph (Fig. 3). The *Westringia fruticosa* ‘WES05’ and Mundi^{PPAF} coast rosemary were from cuttings and the SharaTM lomandra was from division.

Table 1. Results using the plants sprayed with prodiamine and Carbon Trader for propagation compared to the controls.

Date counted (dd/mm/yy)	Number of plants rooted out of 98 cell tray					
	Mundi ^{PPAF} sprayed with Barricade [®]	Mundi without Barricade	Mundi with Carbon Trader	Mundi without Carbon Trader	Shara TM sprayed with Barricade	Shara without Barricade
21.10.11	8	6	4	1	11	19
28.10.11	27	39	16	19	25	35
4.11.11	34	58	39	35	30	40
16.11.11	56	53	64	66	36	56
18.11.11	56	54	64	70	44	58

Date counted (dd/mm/yy)	Difference in sprayed vs. not sprayed		
	Mundi sprayed with Barricade - not sprayed	Mundi Carbon Trader - no Carbon Trader	Shara sprayed with Barricade - not sprayed
21.10.11	2	3	-8
28.10.11	-12	-3	-10
4.11.11	-24	4	-10
16.11.11	3	-2	-20
18.11.11	2	-6	-14

Mundi trays moved from hot house to shade house on 16.11.11.

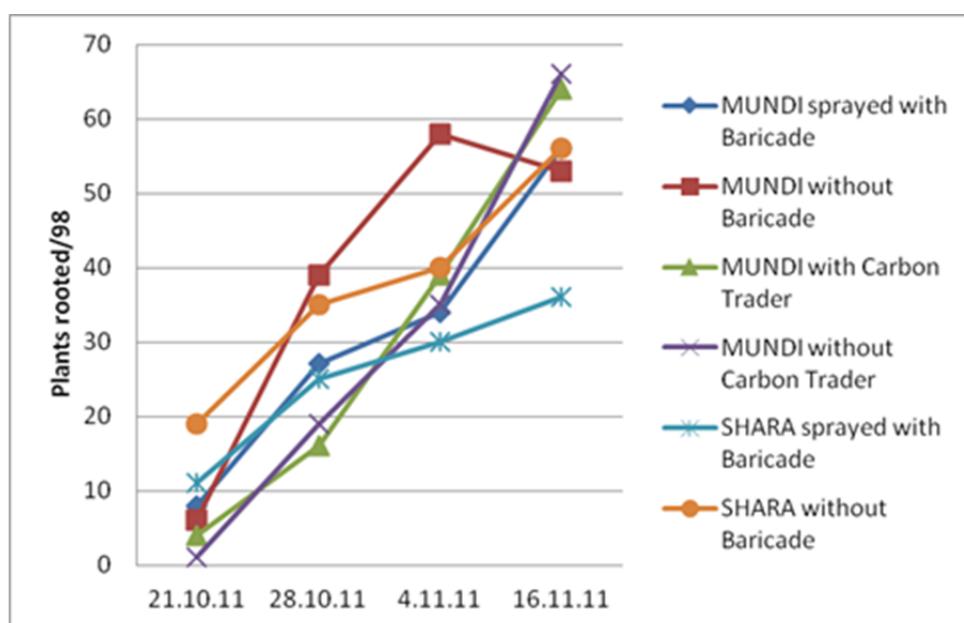


Fig. 3. Results using the plants sprayed with prodiamine and Carbon Trader for propagation compared to the controls.

Oxadiazon

Observations and monitoring showed a reduction of weeds in the first trial in early Autumn 2012 at the USA rate of 45 ml per 100 m², but some broadleaf and grass weeds

were noted. No difference was noted between the health of the target group and the control in any of the plants. Weeds were only slightly more numerous in the control than the target plants. The results for the oxadiazon were less weed reduction than for the 45 ml per 100 m² for the prodiamine for the container plants. The results from the garden trials were less clear. The results for oxadiazon have not been compiled into a table as yet, and are only preliminary results.

Further testing of oxadiazon at the higher rate of 68 ml per one 100 m² is needed. Ultimately to do a fair comparison between chemicals it would be good to use both chemicals, at the same time in a trial comparing the results of the two different chemicals compared to a control.

DISCUSSION

Prodiamine in these tests clearly showed a reduction in weeds. The most promising result was at the higher rate of 60 ml per 100 m², where over summer no weeds were found in the target plants. It must be noted that a residual from previous applications may have added to this, however with 4 months or more between applications, most of the chemical should have dissipated.

Prodiamine is widely used in the USA as a nursery pre-emergent. These trials show how effective it can be in Australia, and how the plants generally do not appear to be adversely affected by the application. It must be noted, that all plants used were well rooted into their container or the ground. As oxadiazon and prodiamine are root pruners, it would be advisable to ensure plants are well rooted before applying. It may not be advisable to plant a plug into a pot and make an application immediately, it may be better to wait a few weeks till the roots are down closer to the bottom of a pot. This still needs to be tested, as it is possible the plug would already have its roots deep enough. As potting mixes are well draining, it would be reasonable to expect the pre-emergent to move deeper into the potting mix substrate than it would in a normal garden soil. Testing needs to be conducted on planting into gardens, with immediate follow up applications of these chemicals. If successful, this could save the landscape industry large sums of money on weed control after planting.

Propagation using plants that had prodiamine applied 3 months before only had minor slowdown in rooting, and in the long run had little effect on the total success of plants rooted. So it is safer to not recommend the use of Prodiamine on nursery propagation mother stock for at least 3 months prior to cuttings and division. It must be noted it is rare for nurseries to use pre-emergent chemicals on cutting and division mother stock just prior to propagation.

CARBON TRADER

Literature Review

There are many listed theories on why or what activated carbon does to turf, seed and soil, and plants.

These include:

- Increases/enhances photosynthesis in the plant
- Increases cellular strength in the plant
- Allows the plant to store more carbohydrates
- Provides a food source for microbes
- The carbon attracts heat and lifts the turf canopy temperature
- Deactivates naturally occurring toxins in the soil

None of these theories have been proven with multiple replicated trials; hence there is no definitive evidence on the effects of activated carbon on turf or plants. This research did not delve into why this product may work, but just tested whether it improves winter quality on plants and turf or if it improves propagation on plants. A literature review showed testimonials from a number of turf maintenance professionals that Carbon Trader improved winter colour on turf.

Materials and Trial Setup

Replicated trial plots of turf that were installed a few years earlier for other testing work were used. They were all fertilised, watered and mown identically. The turf types are all listed in the results section. Some of the plots were treated and some were left as a control. Replicated plots were available for couch and kikuyu grasses. For buffalo and zoysia plots, only one plot of each type was available. For the couch, two plots of each selection were available. Half of each plot was treated the other half left as control. This meant each selection had two plots treated and two controls. On the kikuyu one plot of each was treated, and one plot of each of the three cultivars was left as a control. With the zoysia and buffalo half of each plot was treated. As there were many plots of each species, the trial was well replication on a species basis.

Plants in trial gardens were selected and some were treated with Carbon Trader and some were left as a control. Ornamental grasses, *Westringia*, *Hardenbergia*, *Callistemon*, *Agapanthus*, *Lomandra*, and *Liriope* were treated.

Testing

Label rates of Turf Culture's Carbon Trader were used at the higher rates. A knapsack was used to apply the Carbon Trader. The first treatment of Carbon Trader was on 9 May 2011. Evaluations and photos were taken at different times over winter. A second application was made in July. Cutting of a *Westringia* were made to see if the use of Carbon Trader improved strike in propagation.

Results

Table 2 shows the results from the turf plot evaluations. A number of people undertook the evaluations. From the results it is clear that Carbon Trader made a difference to winter quality of turf in general, with some cultivars showing more difference than others (Fig. 4). Based on this data Carbon Trader improved the average winter colour and quality of the turf over all plots by an average of 24%. Buffalo grass types showed no real significant difference between cultivars at this evaluation. One month later differences in buffalo grass types were clearer. The most winter active type, a cultivar of Kikuyu called Kenda showed larger differences between cultivars. One month later couch differences between treated and untreated were less viable yet still noticeable, but Kikuyu differences were slightly more evident, however these evaluations were only done by one person, so were not included in the full data due to the possibility of error.

Table 2. Results of the turf plot evaluations with and without Carbon Trader.

1 July 2011	Without Carbon Trader					With Carbon Trader				
	Todd	Marina	Stephen	Nathan	Average	Todd	Marina	Stephen	Nathan	Average
'Riley's Evergreen'	4	2	2	3	2.75	6	5	3.5	4	4.63
LEG 13A	4	2	3	3	3	5	3.5	5	3	4.13
'Grand Prix'	4.5	2	2.5	3	3	6	3.5	5	4	4.63
Legend®	4	2	2	3	2.75	5	3.5	4.5	3	4
Riley's Supersport	3.5	1.5	2	3	2.5	4.5	2	2.5	3	3
Cynosport™SS3A	3.5	1	2.5	2	2.25	4.5	3.5	3	3	3.5
Kenda®	8	8	7.5	8	7.875	9	9	9	9	9
Common kikuyu	6	6	5.5	6	5.875	8	7.5	8	8	7.88
Village Green	6	6	5.5	6	5.875	7	7.5	6.5	8	7.25
Empire™ zoysia	6	6	6	6	6	8	8	7.5	7	7.625
B12	6	6	7	6	6.25	7	7	8	7	7.25
KP1	6	7	7	6.5	6.625	7	7	8	7	7.25
Nara™ zoysia	6.5	5	6	5	5.625	8	6	7	6	6.75
P42	6.5	6.5	6	6	6.25	7	7	7	6	6.75
P3	6	6	5	5.5	5.625	7	7	6.5	6	6.625
SW1 Bermudagrass?	6	6	5	5.5	5.625	7	7	6.5	6	6.625
Mat1	5.5	5	5	5	5.125	6.5	6	6.5	6	6.25
P6	5.5			4.5	5	6.5			6	6.25
Total Average					4.88889					6.07



Fig. 4. The plot in the front was the best colour getting a rating of 9. It was the Kenda kikuyu sprayed with Carbon Trader. Notice in the background the colour of plots is not as good.

Clippings at the end of winter were taken from the Kikuyu plots, and significant differences between the treated and not treated plots were found. More clippings were measured from the treated plots. See Tables 3 and 4.

Table 3. Average of kikuyu clippings colour.

Combined scores	With Carbon Trader	Without Carbon Trader
Kenda [®]	8	6.5
Village Green	5	2.8
Common kikuyu	7	2.8
Average of all kikuyu	6.7	4

Table 4. Average weight of kikuyu clippings in grams per plot.

Combined scores	With Carbon Trader	Without Carbon Trader
Average of all kikuyu	909	334

Treated and non-treated plants were visually monitored, and clear differences were noticed. In most cases the ones treated with Carbon Trader appeared to be a darker colour, however this at some stages was due to the black nature of Carbon Trader, and this black could still be seen in small dots on the leaves of the plants. The photos used to show the differences were taken once this black had disappeared to the naked eye (Figs. 5 and 6). In many cases the plants appeared to grow more with Carbon Trader. These evaluations were of an informal nature, and were not structured like the evaluations on turf. Further

more structured evaluations are needed, however clear differences could still be seen between many untreated and treated plants. For whatever reason these difference occurred, this could allow many nurseries to ship better looking plants in winter and early spring, or to slightly protect plants in colder areas. Note; it took 4 to 6 weeks for most plants to no longer show the small dots of black on the leaf.



Fig. 5. The plant on the left was treated with Carbon Trader around a month earlier; the one on the right was not.

DISCUSSION

Carbon Trader has shown that it does improve turf quality in winter. Early evidence suggests further study for plants. For retail quality nurseries Carbon Trader could certainly be advantageous for quality in winter and early spring shipments. The last application of Carbon Trader should be done at least between 4 to 6 weeks before shipment. Larger leaves showed black dots for longer than small leaf types. For example shipping *Westringia* may be able to be done much sooner after application than *Hardenbergia* that has a bigger leaf. This research does not clearly prove Carbon Trader improves winter quality on plants, but it does suggest that it may have some effect.



Fig. 6. The callistemons on the right were treated with Carbon Trader, the ones on the left were not.

For turf the implication that a warm season turf can get a high quality rating of 9 out of 10 after many frosts, near the middle of winter, is that, a combination of Carbon Trader, and Kanda Kikuyu could eliminate the need for overseeding in many cooler winter regions of Australia. Further a turf that actively grows in winter could result in far better wearing sports fields for winter sports such as Rugby, AFL, and Rugby League.

CONCLUSION

The use of proflaminate and Carbon Trader is widespread in the turf industry. This research shows that proflaminate clearly reduces weed invasion without damage to most plants. Registration of this product would greatly help Australian nurseries. Syngenta has indicated that they will aim for registration of this product over the next 12 months. The industry should lobby for this to happen.

Further testing is need for oxadiazon, but higher rates may find this product will be effective for weed control in nurseries; however, the fact that it moves deeper in the potting mix according to literature, needs to be tested and taken into account.

Carbon Trader clearly shows benefit for many turf types in winter. Although early indications are that it may also have benefits for plant quality, this assertion needs to be tested in a more controlled way. That being said, it may be worth a try for nurseries wanting to improve the winter and early spring quality of their plants, particularly for those in colder areas.

Literature Cited

Neal, J.C. and Gordon, I. 2004. Weed Management in Woody Cut Flower Plantations. Centre for Native Floriculture, University of Queensland, Queensland, Australia.

