



# Nurseries learning from the turf industry.

By Todd Layt

***There is the potential to greatly reduce hand weeding  
and keep plants greener in winter in Australian nurseries.***

## Biographical information

Todd Layt (Bcom AFAMI)

Managing Director of Ozbreed Pty Ltd

Todd is a well-known plant and turf breeder, with tens of millions of his varieties being sold in Australia, USA, Europe, Japan, and New Zealand. He specialises in breeding tough landscape plants. Prior to founding Ozbreed, he owned and ran a successful turf farm, and a large wholesale nursery that specialised in native grasses, Strappy leaf plants, wetland plants, and other revegetation plants. Todd Layt designed this investigation, supervised the growing of the plants and turf plots for this trial, as well as helping with data collection, and writing this paper. He also made photographic records of this investigation.

## 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. Oxadiazon sold under the brand name of Ronstar in Australia 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 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. 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 woodies, 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 Prodiamine could greatly reduce costs for Australian nurseries. With the help of Syngenta, Ozbreed has for a 12 month period tested Prodiamine 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 in the past to Prodiamine. 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 of Oryzalin. This chemical has 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 Oryzalin 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-emergents. 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 Australian information on new nursery Chemicals that are now widely used in the USA, that are not registered in Australia for nursery use. 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 the product registered. Prodiamine is a perfect example of that. Industry research has now sparked an interest in registering this product for the Nursery industry. USA research shows Prodiamine moves less deeply in the soil or potting mix than Oryzalin, 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 Oryzalin 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 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 2 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 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. After each chemical application, the irrigation was run for at least 5 minutes. In Autumn 2011, a rate of 30ml per 100 square metres was applied to the target group. The plants were observed. In Winter 2011, the target plants received a rate of 45 ml per 100 square metres. In Mid and late Spring 2011, the target group received a rate of 60ml per 100 square metres. 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. 24 Shara, a Lomandra type were treated, and 24 untreated and placed in a hot house on the 4th of May 2011. These were very weedy, but had just been hand weeded. The rate use was 45ml per 100 sq mtrs. The hot house and the extra amount of weed seed was hoped to show visual differences.



## List of plants tested

In Early 2012 another set of plants were organised, again split into two groups. The target group had Oryzalin applied at the label rate.

### Results for Prodiamine:

Observations and monitoring showed a reduction of weeds in the first trial in Early Autumn 2011 at the USA rate of 30ml per 100 square metres, 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.

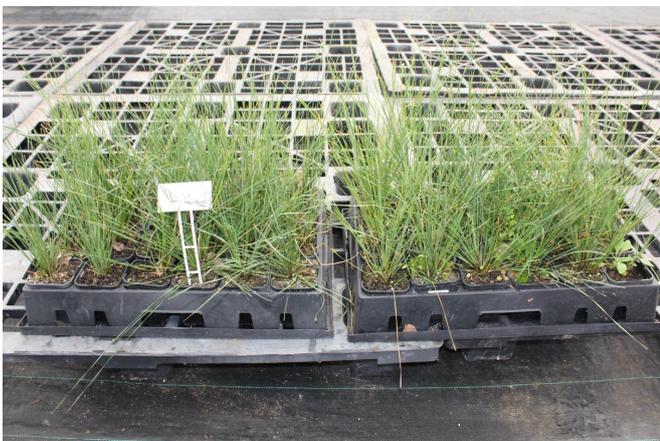
Observations and monitoring showed a larger reduction of weeds in the second trial in mid-Winter 2011 at the rate of 45ml per 100 square metres, but there were still some broadleaf weeds noted. No difference was noted between the health of the target group and the control in any of the plants. Weeds 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 60ml per 100 square metres, 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 except there were minor adverse effects in the Gazania and the Scaevola at this rate. Both these plants were in small 3cm wide plug sizes for the trial. The control had lots of weeds, while the target plants had no weeds at all. A full spread sheet showing rates and effects on plants was created for the full chemical report.

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 treated and placed in the hot house showed how well the Barricade stopped weeds at the 45ml rate. See photo taken in August 2011.



*Shara: Barricade stopped weeds at 45ml rate.*



*The above photo shows Shara in September 2011 in an outside trial. Left was treated with Barricade at 45ml per 10-0 square metres, 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 tables, and graphs. The Mundi was from cuttings, and the Shara was from division.



<b>Number of plants rooted out of 98 cell tray</b>						
<b>Date counted</b>	<b>MUNDI sprayed with Baricade</b>	<b>MUNDI without Baricade</b>	<b>MUNDI with Carbon Trader</b>	<b>MUNDI without Carbon Trader</b>	<b>SHARA sprayed with Baricade</b>	<b>SHARA without Baricade</b>
<b>21.10.11</b>	<b>8</b>	<b>6</b>	<b>4</b>	<b>1</b>	<b>11</b>	<b>19</b>
<b>28.10.11</b>	<b>27</b>	<b>39</b>	<b>16</b>	<b>19</b>	<b>25</b>	<b>35</b>
<b>4.11.11</b>	<b>34</b>	<b>58</b>	<b>39</b>	<b>35</b>	<b>30</b>	<b>40</b>
<b>16.11.11</b>	<b>56</b>	<b>53</b>	<b>64</b>	<b>66</b>	<b>36</b>	<b>56</b>
<b>18.11.11</b>	<b>56</b>	<b>54</b>	<b>64</b>	<b>70</b>	<b>44</b>	<b>58</b>

<b>Difference in sprayed vs not sprayed</b>			
<b>Date counted</b>	<b>Mundi sprayed with Barricade - not sprayed</b>	<b>Mundi Carbon Trader - no Carbon Trader</b>	<b>Shara sprayed with Barricade - not sprayed</b>
<b>21.10.11</b>	<b>2</b>	<b>3</b>	<b>-8</b>
<b>28.10.11</b>	<b>-12</b>	<b>-3</b>	<b>-10</b>
<b>4.11.11</b>	<b>-24</b>	<b>4</b>	<b>-10</b>
<b>16.11.11</b>	<b>3</b>	<b>-2</b>	<b>-20</b>
<b>18.11.11</b>	<b>2</b>	<b>-6</b>	<b>-14</b>

NOTE: Mundi trays moved from hot house to shade house on 16.11.11

### **Results for Oryzalin:**

Observations and monitoring showed a reduction of weeds in the first trial evaluation in Mid Autumn 2012 at the USA rate of 45ml per 100 square metres, 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 Oryzalin were less weed reduction than for the 45ml per 100 square metres for the Prodiamine for the container plants. The results from the garden trials were less clear. The results for Oryzalin have not been compiled into a table as yet, and are only preliminary results.

Further testing of Oryzalin at the higher rate of 68ml per one hundred Square metres 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 60ml per 100 metres squared, 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. Summer is also the worst time for weeds, and to get a result like this at that period is encouraging.

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 Oryzalin and Prodiamine are root pruners, it would be advisable to ensure plants are well rooted before applying this. 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 three 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 may be 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 soil they were growing on would be classed as poor. These plots were designed that way originally. The turf types are all listed in the results section.



Some of the plots were treated with Carbon Trader and some were left as a control. Replicated plots were available for Couch and Kikuyu. For Buffalo and Zoysia plots, only one plot of each variety was available. For the Couch 2 plots of each variety was available. Half of each plot was treated, the other half left. This meant each variety had 2 plots treated, and two controls. On the Kikuyu one plot of each was treated, and one plot of each of the three varieties 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, Nandina and Liriope were treated.

### **Testing:**

Label rates of 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 the 9th of May 2011. Evaluations and photos were taken at different times over winter. A second application was made in July. Cuttings of Westringia were made to see if the use of Carbon trader improved strike in propagation.

### **Results:**

Table 1.2 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 varieties showing more difference than others. 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 types showed no real significant difference between varieties at this evaluation. One month later differences in Buffalo types were clearer. The most winter active type, a variety of Kikuyu called Kenda showed bigger differences between varieties. One month later couch differences between treated and untreated were less visible and only just noticeable, but Kikuyu differences were slightly more evident, however these evaluations at the later date were only done by one person, so were not included in the full data due to the possibility of error.



*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.*



**Table 1.2**

1-Jul-11	Without Carbon Trader					With Carbon Trader				
	Todd	Marina	Stephen	Nathan	Average	Todd	Marina	Stephen	Nathan	Average
<b>RE Couch</b>	4	2	2	3	<b>2.75</b>	6	5	3.5	4	<b>4.625</b>
<b>Lg13 Couch</b>	4	2	3	3	<b>3</b>	5	3.5	5	3	<b>4.125</b>
<b>GP Couch</b>	4.5	2	2.5	3	<b>3</b>	6	3.5	5	4	<b>4.625</b>
<b>Leg Couch</b>	4	2	2	3	<b>2.75</b>	5	3.5	4.5	3	<b>4</b>
<b>RS Couch</b>	3.5	1.5	2	3	<b>2.5</b>	4.5	2	2.5	3	<b>3</b>
<b>Cy Couch</b>	3.5	1	2.5	2	<b>2.25</b>	4.5	3.5	3	3	<b>3.5</b>
<b>Kenda Kikuyu</b>	8	8	7.5	8	<b>7.875</b>	9	9	9	9	<b>9</b>
<b>Common Kikuyu</b>	6	6	5.5	6	<b>5.875</b>	8	7.5	8	8	<b>7.875</b>
<b>Competitor Kikuyu</b>	6	6	5.5	6	<b>5.875</b>	7	7.5	6.5	8	<b>7.25</b>
<b>Em Zoysia</b>	6	6	6	6	<b>6</b>	8	8	7.5	7	<b>7.625</b>
<b>B1 Buffalo</b>	6	6	7	6	<b>6.25</b>	7	7	8	7	<b>7.25</b>
<b>KP1 Buffalo</b>	6	7	7	6.5	<b>6.625</b>	7	7	8	7	<b>7.25</b>
<b>Nr Zoysia</b>	6.5	5	6	5	<b>5.625</b>	8	6	7	6	<b>6.75</b>
<b>P42 Buffalo</b>	6.5	6.5	6	6	<b>6.25</b>	7	7	7	6	<b>6.75</b>
<b>P3 Buffalo</b>	6	6	5	5.5	<b>5.625</b>	7	7	6.5	6	<b>6.625</b>
<b>SW1 Buffalo</b>	6	6	5	5.5	<b>5.625</b>	7	7	6.5	6	<b>6.625</b>
<b>Mat1 Buffalo</b>	5.5	5	5	5	<b>5.125</b>	6.5	6	6.5	6	<b>6.25</b>
<b>P6 Buffalo</b>	5.5			4.5	<b>5</b>	6.5			6	<b>6.25</b>
<b>Total Average</b>					<b>4.88889</b>					<b>6.076389</b>



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 below.

<b>Average of Kikuyu clippings colour</b>		
<b>Combined Scores</b>	<b>With Carbon Trader</b>	<b>Without Carbon Trader</b>
<b>Kenda</b>	<b>8</b>	<b>6.5</b>
<b>Competitor Kikuyu</b>	<b>5</b>	<b>2.75</b>
<b>Common</b>	<b>7</b>	<b>2.75</b>
<b>Average of all Kikuyu</b>	<b>6.67</b>	<b>4</b>
<b>Average weight of Kikuyu clippings in grams per plot</b>		
<b>Combined Scores</b>	<b>With Carbon Trader</b>	<b>Without Carbon Trader</b>
<b>Average of all Kikuyu</b>	<b>909</b>	<b>334</b>



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 mainly disappeared to the naked eye. 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 reasons 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 3 to 6 weeks for most plants to no longer show the small dots of black on the leaf.



*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 it may help some 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 3 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.



*The Callistemons on the right were treated with Carbon Trader, the ones on the left were not.*



For turf there are important implications that a warm season turf can get a high quality rating of 9 out of 10 after many frosts, near the middle of winter. This shows a combination of Carbon Trader, and Kenda 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 Prodiamine and Carbon trader is widespread in the turf industry. This research shows that Prodiamine 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 consider lobbying for this to happen. Further testing is needed for Oryzalin, 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 benefits 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.