

Biodegradable Pots, the Whys and the Wherefores — A Journey into the Unknown[©]

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Lyndale Nurseries Auckland Ltd. is a specialist propagation nursery situated in Whenuapai, Auckland. It grows approximately 3 million young plants per annum covering a wide range of (some 900 different cultivars) outdoor trees and shrubs, which are sold to growers all over the country (population 4.3 million).

Lyndale worked in conjunction with a plastic pot manufacturer to produce a biodegradable pot in which to supply its young liner plants.

Young woody plant production in New Zealand is unique in that plants have over the last 40 years been supplied in plastic 4-, 5-, and 7-cm pots, which are charged on invoice but fully refundable on return. With legal restriction placed on the use of methyl bromide there has been no effective practical way to sterilize the used pots.

INTRODUCTION

A yachting trip in the outer Hauraki Gulf of Auckland produced the catalytic moment.

I saw at first hand plastic waste washed up on an otherwise pristine white sandy beach. Waste which was directly linked to our industry.

A plastic plant pot was washed up in amongst the sand dunes and led me to decide that I could do a little better than this. I decided at that point to explore the possibility of not growing in plastic pots but something that was more environmentally friendly.

Working primarily with Ronald Davidson of Interworld Plastics, we set about exploring biodegradable plastics.

We designed a pot incorporating the advantageous side slots we saw in forestry tree handling systems. One of the motivating factors was to have as many openings as possible to enhance air exchange, encourage air pruning of roots, and, last but not least, to have less bio plastic in the structure.

We developed a pot design that worked well but failed to get the unit cost down to a price which we believed would ensure success, i.e., general acceptance of the concept.

CHINESE INPUT

Some 4 years into the project we had unsuccessfully tried a myriad of additives to the biodegradable plastic resins in an attempt to “dilute” the expense of this product.

A chance encounter with a Chinese company producing plant containers out of rice husks led us to offer them our starter pot design for production.

We now had a young plant or propagation growing on line (GOL) pot, which was priced close to its plastic equivalent and was biodegradable.

Trials back in New Zealand with a range of formulations led us to select a formulation, which was expected to degrade in a period of 12–18 months.

Our trailing indicated that this formulation was in fact breaking down slightly faster than this in our nursery situation.

We have subsequently learnt that the matrix of available water, temperature, nutrients, and the presence of soil organisms all play significant roles in determining

how quickly or not the biological degradation occurs. Within this matrix the presence of available water is the single most significant factor influencing the planned degradation period.

By way of explanation of this statement, if a biodegrading time period of 12 months is built into the pot and the pot is constantly dry then the pot will take a considerably longer time to degrade.

THE MARK 1 POT — AND A REALITY CHECK

Lyndale Nurseries Auckland Ltd. made the commercial decision to change 100% from plastic to biodegrading “eco pots” in July 2008. This meant that by January 2009 95% of all plants (young plants) in the nursery (approx 2.5 million) were grown and supplied in the Mark 1 formulation biodegradable pot.

We noticed several things; an increased rate of growth, and a decline in the incidence of disease and weed infestation.

While this had not been our original motivation, with hindsight we had broken the disease and weed infestation cycle. This cycle had become a hidden factor in liner production in New Zealand, with its industry wide dependence on recycling pots with no genuine method of sterilization between usages.

Industry acceptance of the change was at first positive but not universal. Growers were initially encouraged to save one whole process in their potting procedure by planting the liner in its biodegradable pot, relying on the extensive side slots to allow root growth into the new substrate in the larger container.

Resistance to this practice came quickly for two reasons.

The Mark 1 pot did not reliably break down in the time it took for the liner to reach a saleable size in its new pot (this was particularly an issue with fast-growing plants such as *Lavandula* and ericaceous plants with weak fibrous roots).

The second issue was visual. The top collar of the biodegradable pot was often visible which led to problems especially at a retail level. Curious shoppers attempting to pull the plant out, or questioning the value in buying a small plant “stuck” into a larger pot.

Faced with negative retail feedback growers resorted to taking the biodegradable pots off and planting as they had always done with liners grown in the industry standard plastic 5-cm pot.

THE MARK 2 POT

The Mark 2 biodegradable pot was in reality about the fourth formulation we trialed.

Propagation nurseries in Australia had embraced the concept and were able to contribute to refining the formulation determining the speed of breakdown. With our combined experience a clear picture was emerging.

It became apparent that soil temperature, water availability, and the level of microbial activity all had a major bearing on the rate of degradation.

Hence a faster rate of breakdown was experienced in summer than was found in winter.

The addition of charcoal to the formulation altered the colour of the pot so that they were less visible.

However it also sped up the rate of breakdown in some environmental circumstances, a factor which had to be taken into account when arriving at a formulation which was a compromise between lasting long enough in the nursery but not too long.

SUMMARY

Our adoption of the Mark 2 “eco pot” (6–9 month breakdown) has met many of the concerns which arose out of the earlier longer breakdown Mark 1 pot.

This has led to a focus on some of the unexpected benefits.

- Increased rate of plant growth.
- Less weed control input required.
- Fewer incidences of pest and disease.
- Potting into new clean pots has made the adoption of mechanization that much easier.

While our original motivation to explore the possibilities of a biodegrading pot came from a wish to see us use less plastic in the supply of young plants, other considerations have emerged which are of more direct benefit.

Breaking the cycle of disease associated with growing in constantly recycled pots which are not sterilized has been the biggest and most immediate benefit, specific to the New Zealand context.

I am sure that the evolution of the biodegradable pot is not complete. However the direction is clear and positive and well worth the journey.