



AUT HERBICIDES TRIAL

JANUARY 2022

CONTEXT

Glyphosate is the most widely used agrichemical in New Zealand and the rest of the world. There is currently a lot of discussion around the ethics of its use from both an environmental and health standpoint. Being in the business of green space management, we believe it is our responsibility to be driving sustainable innovation in the weed management space for the health of our ecosystems, our communities, and our staff.

Hundreds of **ROUNDUP LAWSUITS** say the world's most popular herbicide causes non-Hodgkin's lymphoma.

400 - 500 CASES NATIONWIDE

- CALIFORNIA federal court
- MISSOURI state court
- DELAWARE state court

Manufactured by agrochemical giant Monsanto, the weedkiller Roundup relies on glyphosate as its active ingredient.

WHAT IS GLYPHOSATE?

Roundup is also used as a drying agent at harvest time on 160 "conventional" crops.

GLYPHOSATE IS IN ROUNDUP AND OTHER WEED-KILLERS SPRAYED ON A WIDE VARIETY OF FOOD CROPS.

90% of U.S. corn, soy, sugar, canola and cottonseed is genetically modified and Roundup-sprayed.

It is in our soil, water, food and the poison accumulates in our bodies.

THE EFFECTS OF GLYPHOSATE

- Recognized independent scientists cite hundreds of studies showing that glyphosate and companion chemicals in Roundup ARE EXTREMELY TOXIC.
- Scientists' research has linked glyphosate to BIRTH DEFECTS AND LIFE-THREATENING ILLNESSES. THEY CONCLUDE THAT GLYPHOSATE IS HARMFUL TO HUMAN CELLS AND TO EMBRYOS.
- Roundup sprayed wheat has been suspected in rising incidents of celiac disease.



GLYPHOSATE

- "probably carcinogenic to humans"
- "positive association has been observed for non-Hodgkin lymphoma"

- International Agency for Research on Cancer, July 2015

Exposure to glyphosate is widespread:

- FARMERS
- LANDSCAPERS
- GARDEN CENTER AND NURSERY WORKERS
- HOME GARDENERS

THE PRODUCT LAWYERS

TRIAL OBJECTIVE

In Christchurch, the council have decided that glyphosate use in public spaces has will be replaced by pine oil derived fatty acids. There have been a few learnings from this transition that we want to factor in as we look to offer our clients other alternatives to glyphosate. Our objective is to observe the effect of various weed control techniques by addressing soil health and efficacy. By doing so we can equip ourselves with the right information and evidence on:

- SOIL HEALTH:** this is a big one for us as a company. Soil is one the earth's most important natural resources. There is often the perception that switching from synthetic to natural alternatives is better for the health of our communities, our ecosystems, and our staff. We want to be certain that the solutions we advocate for are not harming our soils and the micro-organisms within it.
- EFFICACY:** weeds can stunt the growth of neighboring plants and in NZ, we are seeing exotic weeds threatening our native species. Without effective control, can cause an array of problems in green spaces, therefore we need our weed management techniques to be highly effective.
- PUBLIC PERCEPTION AND EDUCATION:** switching from glyphosate means there will be some changes in the aesthetic of our green spaces – having our facts straight and being confident to deliver the right messaging to engage our communities will be crucial during this transition.

DESCRIPTION

Trial Location & Plot

The trial will be held at a low-profile area at AUT's north campus. This area is a steep bank that is populated by various weed species. This trial plot will be divided into 12-15 replicate plots along the bank which will be marked by builders pegs.

We identified 3 plots (plots A, B and C) that were suitable for the trial. We divided each plot up into 6 equally sized cells (1-6). One cell for each formulation, therefore a total of 18 cells across the 3 plots.

Soil Samples

Our agronomist, Blair will be organising soil microbiology tests. Soil samples will be taken before and after the trial to observe any changes in soil activity from each weed control technique. These will cost ~\$100 each so approx. \$500-600.

A baseline soil sample was organised by Blair from SSDM.

Applications & Observations

Applications will be made on the same day. Spray signs have been made to inform any students of what is being applied. Jonathan will be doing the applications (equipped with all necessary training & PPE) and will use iAuditor to record weed ID weather, humidity, temperature, time of day and other factors that may effect the outcome of the trial.

Observations will be made weekly, photos will be taken and uploaded via iAuditor and any necessary commentary will be made.

WEED CONTROL FORMULATIONS:

1. **GLYPHOSATE + WATER:** this will be used as our benchmark for efficacy and impact on soil health.
2. **WEEDX + WATER:** bio-herbicide that uses a combination of acetic acid and citric acid. Non-systemic and non-selective. This product prevents normal photosynthesis of the target plant by removing the protective layer of the leaf which is essential in retaining water. Without water the plant cannot obtain nutrients or continue its life cycle.
3. **WEEDX + MANUKA HYDROSOL:** Manuka possesses a herbicidal active ingredient called β -triketones. Manuka hydrosol is a waste product from the distillation of Manuka oil that possesses these β -triketones in small quantities therefore. These β -triketones can break down the chlorophyll in plants which inhibits them from absorbing sunlight. For this to happen, it needs to be able to penetrate the leaf's waxy layer and into the stems. Our thinking being, if we combine WeedX which works by breaking down the waxy layer in the plant then we may see the synergy needed for it to be effective.
4. **LOCAL SAFE WEED TERMINATOR + WATER:** The active ingredient is the naturally occurring compound nonanoic acid found in many plants including geraniums and pelargonium oil. Also contains limonene (10-30%) a naturally occurring oil derived from citrus fruit peel. Local Safe works very much the same as WeedX in which it breaks down the waxy layer and dehydrates the plant as it cannot retain water.
5. **LOCAL SAFE + MANUKA HYDROSOL**
6. **NO SPRAY CONTROL**

Update: The trial started mid-July, weekly observations and photos have been taken. The last observation before being interrupted by the lockdown, was on the 11th of August. It is clear even from these early stages that none of the products are systemic upon their first application, therefore interval timing and re-application are important considerations.

1. Glyphosate & Water: Slow moving effects, no visible effects after 1 week, completely knocked-down by week 2. Still completely knocked-down by week 4.
2. WeedX + Water: Potent vinegar smell that may upset some people in public spaces. Requires a very high concentration (1:2 for grass and general weeds) and retails at \$90 + shipping for a 20L containers making it an expensive option. Very fast moving results with obvious knock down within 24 hours. Kikuyu had noticeable re-growth at the 3 week mark but the other weeds stayed knocked-down up to the 4 week mark.
3. WeedX + Manuka Hydrosol: Hydrosol got rid of the potent vinegar smell. Hydrosol is a waste product and if we were purchasing in bulk than we could get it for very cheap but it is still more expensive than water – price to be confirmed. Very similar results to the WeedX + Water solution on kikuyu but prolonged re-growth on the other weeds.
4. Local Safe Weed Terminator + Water: No offensive smell. Requires a concentration of 5:100 with the 5L container costing \$155 making it 33% cheaper per diluted L than WeedX. Very fast knock-down (visible within 24 hours) the kikuyu stayed knock down at the 3 week mark but visible re-growth was coming through at week 4, all other weeds were mostly knocked-down at the 4 week mark.
5. Local Safe Weed Terminator + Manuka Hydrosol: The kikuyu had visibly less regrowth at the 4 week mark compared to the water dilution.

PLOT A - KAIKUYU

LOCKDOWN

Pre Application



Day 1



Day 5



Day 20



Day 27



Day 100



Glyph



WeedX



Glyph



WeedX



Glyph



WeedX



Glyph



WeedX



Glyph



WeedX



Glyph



WeedX



WeedX + Hydrosol



Local Safe



WeedX + Hydrosol



Local Safe



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No Spray



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No Spray



Local Safe + Hydrosol



No Spray



Local Safe + Hydrosol



No Spray



Local Safe + Hydrosol



No Spray



Local Safe + Hydrosol



No Spray



PLOT B – MIXED WEEDS

LOCKDOWN

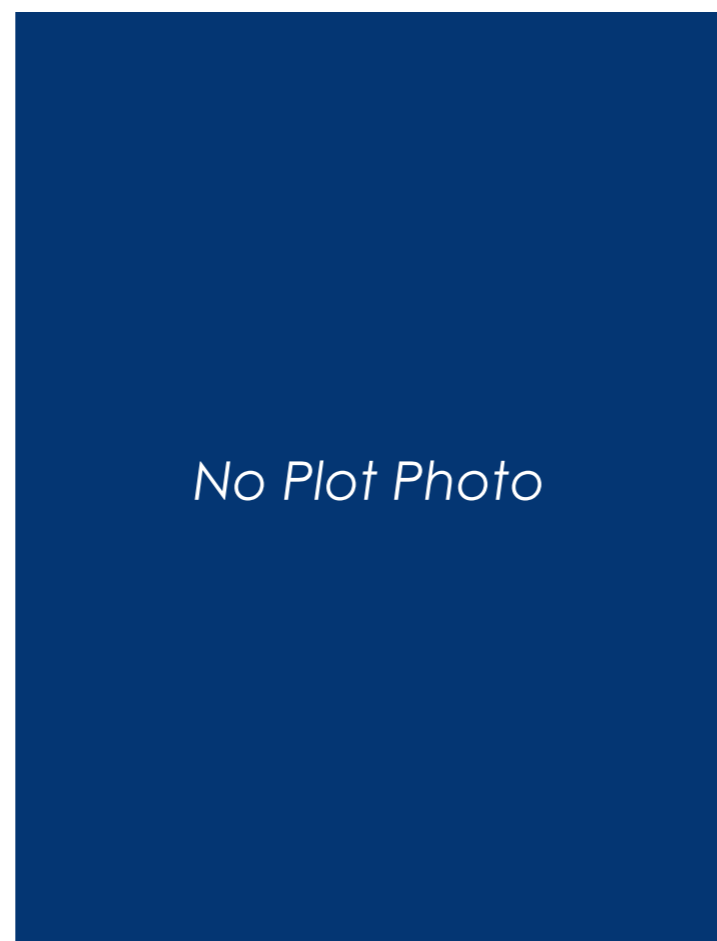
Pre Application



Day 1



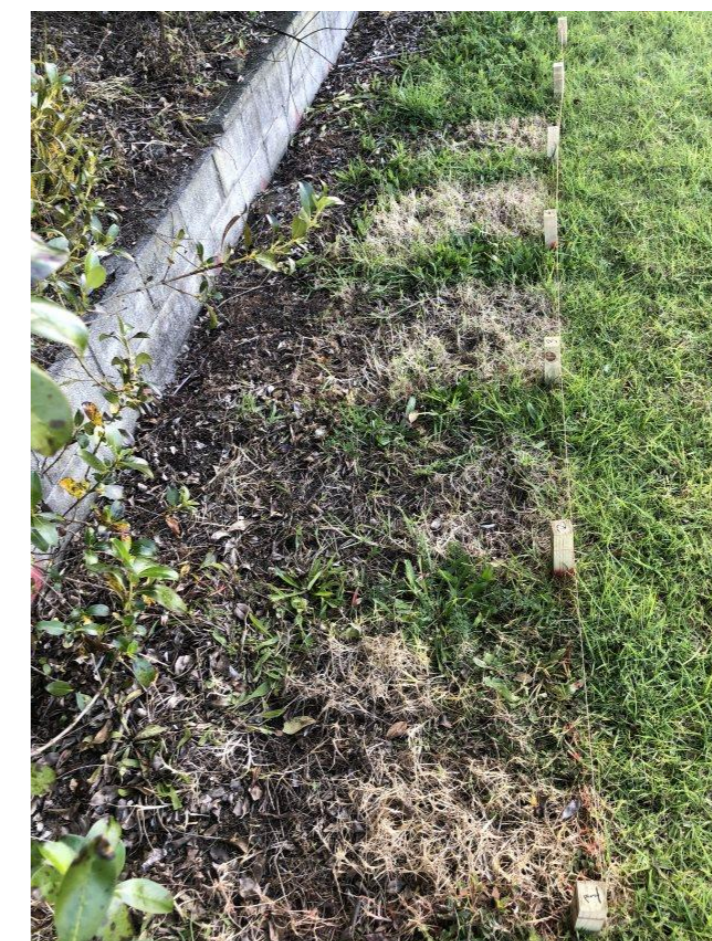
Day 5



Day 20



Day 27



Day 100



Glyph



WeedX



Glyph



WeedX



Glyph



WeedX



Glyph



WeedX



Glyph



WeedX



Glyph



WeedX



WeedX + Hydrosol



Local Safe



WeedX + Hydrosol



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No Spray



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Local Safe + Hydrosol



No Spray



Local Safe + Hydrosol



No Spray



PLOT C – MIXED WEEDS

LOCKDOWN

Pre Application



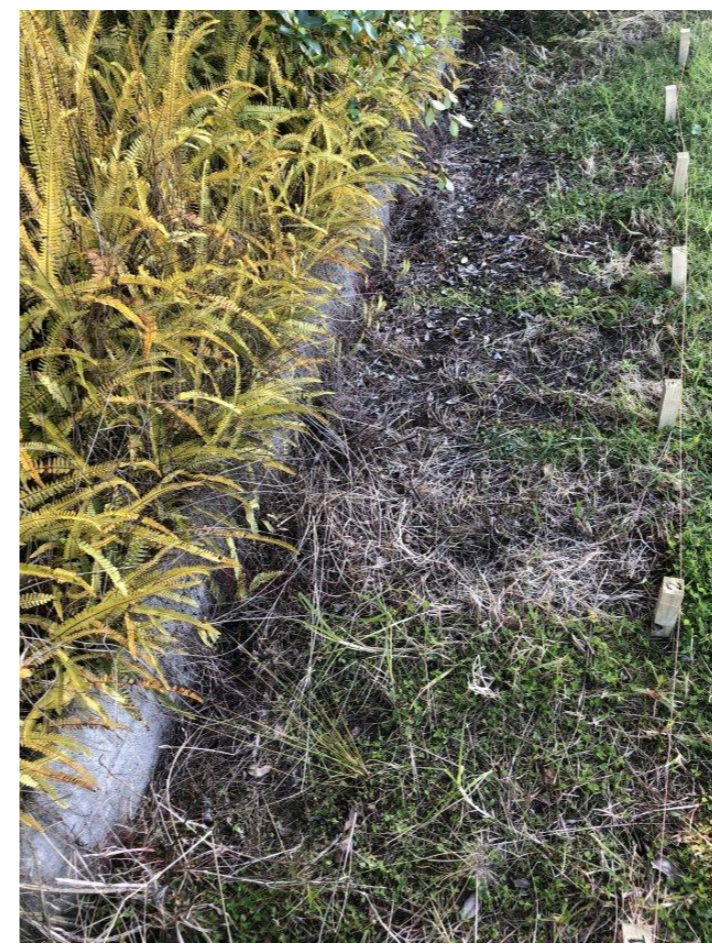
Day 1



Day 5



Day 20



Day 27



Day 100



Glyph



WeedX



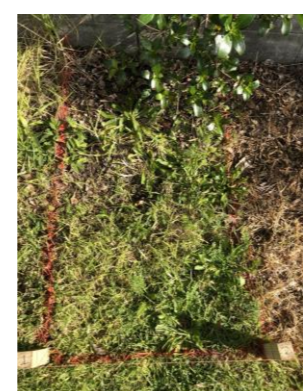
Glyph



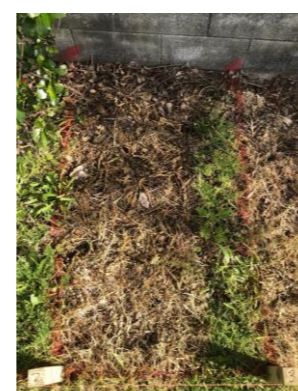
WeedX



Glyph



WeedX



Glyph



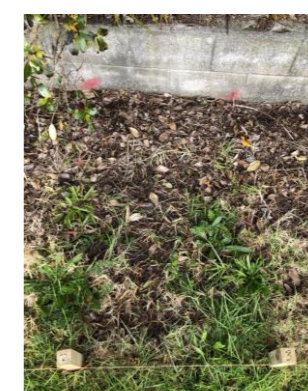
WeedX



Glyph



WeedX



Glyph



WeedX



WeedX + Hydrosol



Local Safe



WeedX + Hydrosol



Local Safe



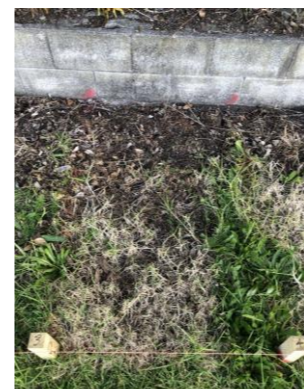
WeedX + Hydrosol



Local Safe



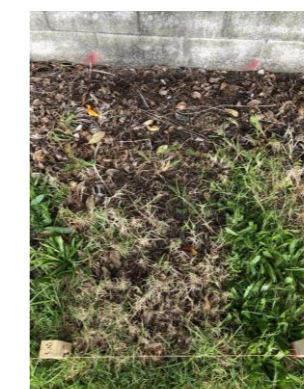
WeedX + Hydrosol



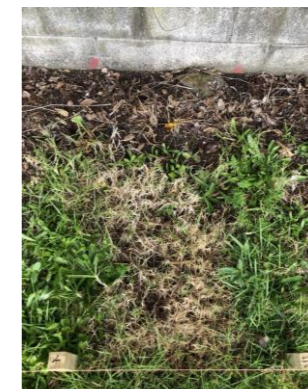
Local Safe



WeedX + Hydrosol



Local Safe



WeedX + Hydrosol



Local Safe



Local Safe + Hydrosol



No Spray



Local Safe + Hydrosol



No Spray



Local Safe + Hydrosol



No Spray



Local Safe + Hydrosol



No Spray



Local Safe + Hydrosol



No Spray



Local Safe + Hydrosol



No Spray



APPLICATION – WEATHER CONDITIONS

Conditions at time of application – no obvious impacts to the trial. There was also no rain following the application.

