Management Options for Chilean Needle Grass Research from NSW DPI




1. Seedbank, population dynamics (ongoing)
2. Grazing management (ongoing)
3. Alternative chemicals (ongoing)
4. New projects – NSW DPI biosecurity

NSW GOVERNMENT Department of Primary Industries

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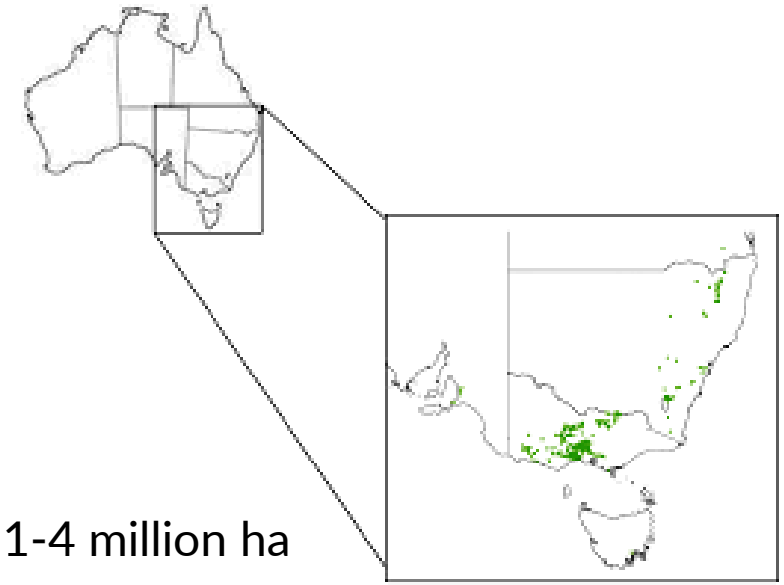
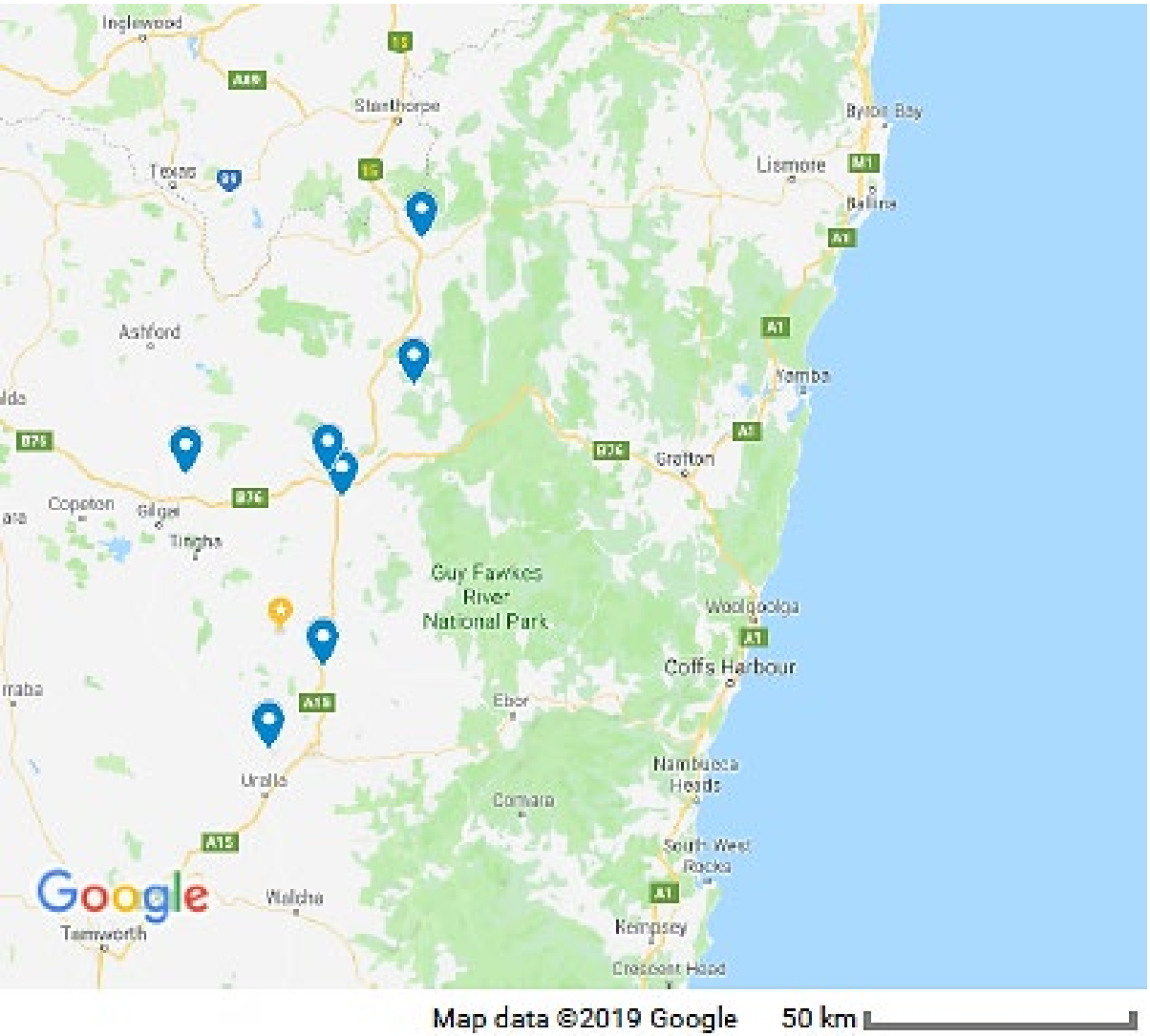
CNG – a weed of national significance



1-4 million ha

- Significant cost to industry – productivity, control costs
- Once seedbank established – eradication unlikely

1. Impact of land management on CNG seed banks on the Northern Tablelands of NSW

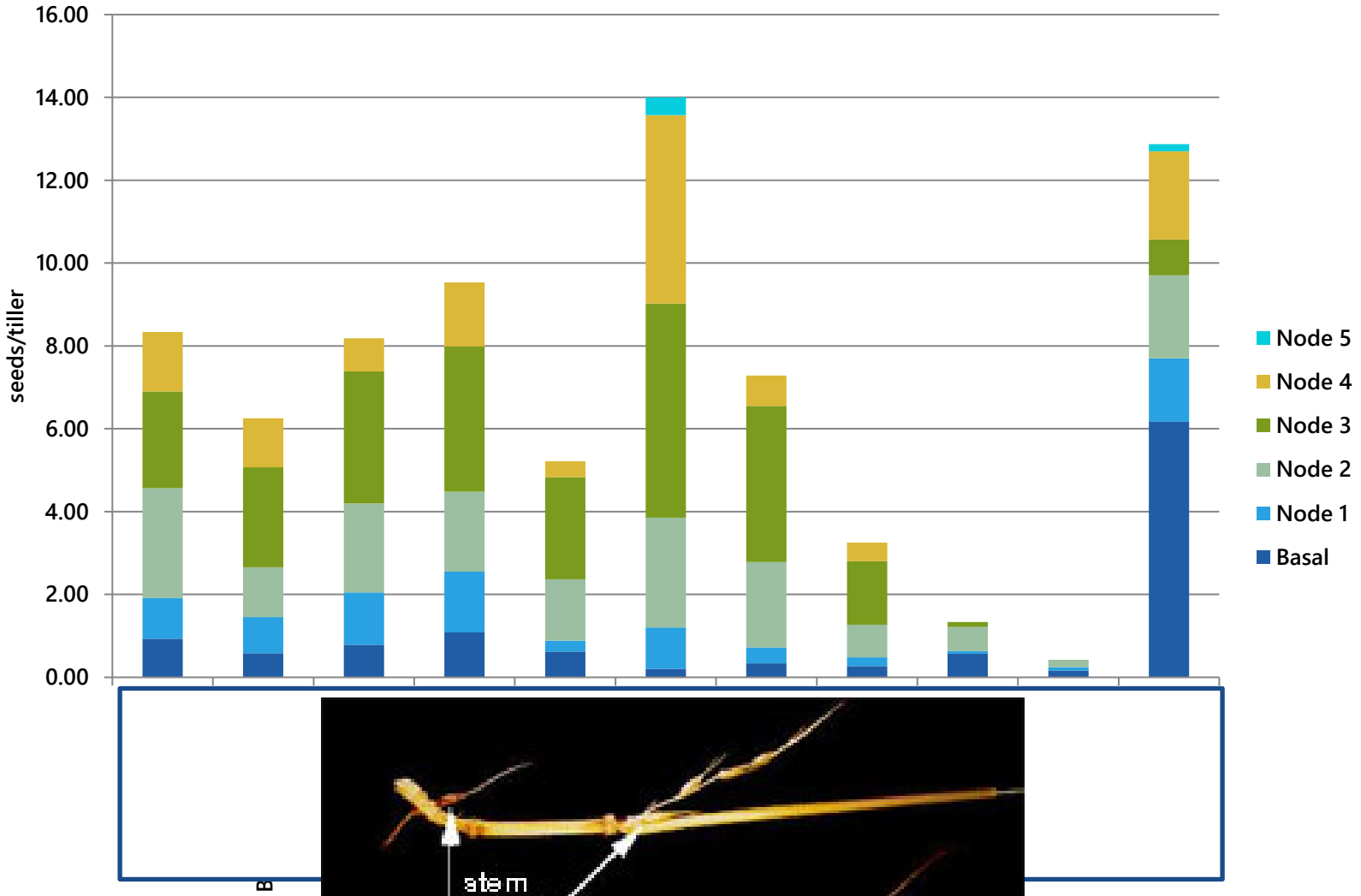


- Assess & monitor CNG seedbanks on NT's
- Survey sites of varying management
- Survey of CNG composition
- Flowering characteristics
- Seed bank pre & post seed fall
- Seed viability & survival

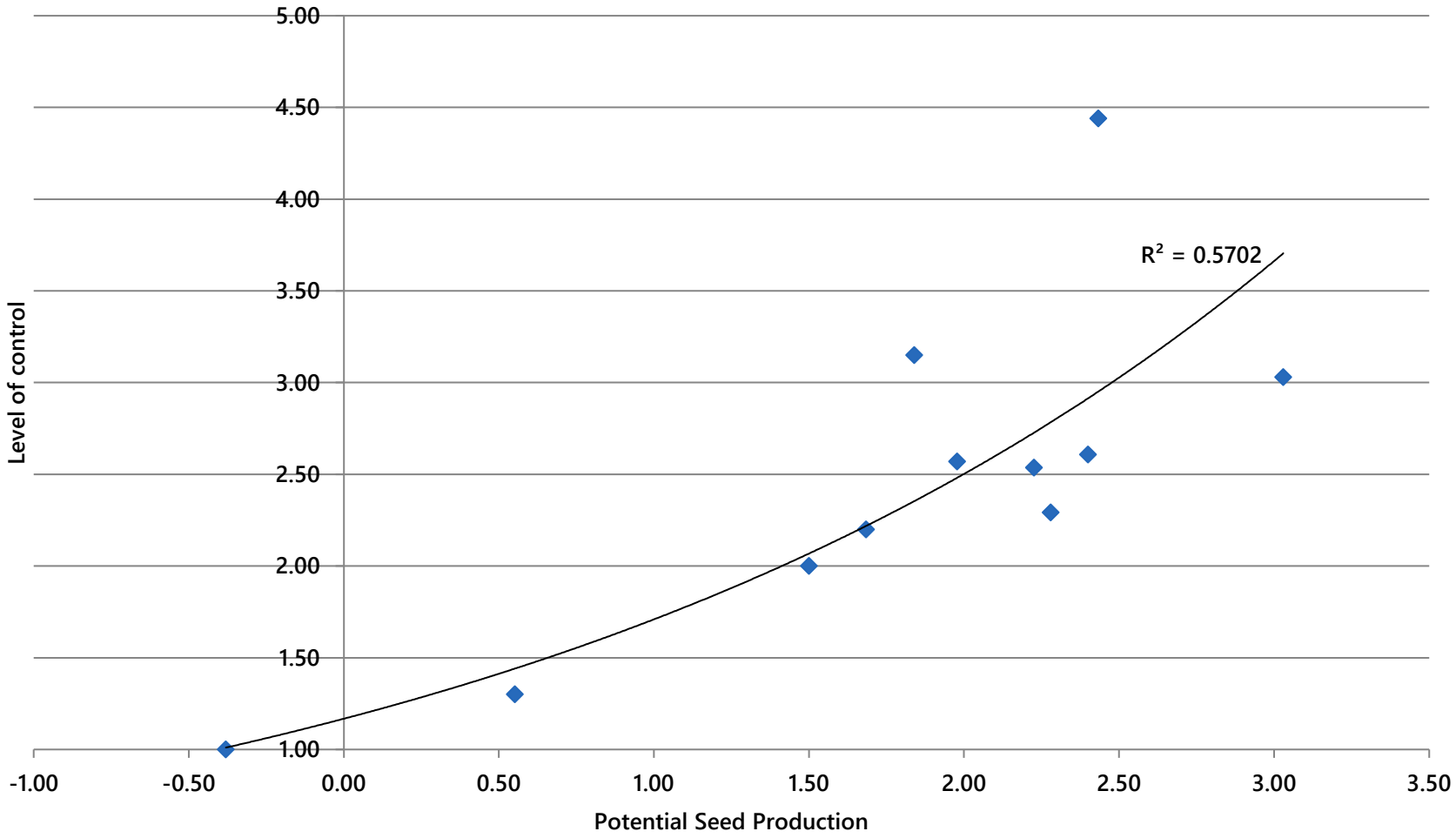
Seed bank dynamics

Site	Pre seed fall Aut 2016 seeds/m2	Flowering tillers Spring 2016 tillers/m2	Ave No Seeds/tiller Spring 2016	Potential seed fall 2016 seeds/m2	Post seed fall Aut 2017 seeds/m2
1	256	271	65	17615	2062
2	67	69	28	1932	118
3	399	95	37	3515	1625
4	670	40	63	2520	961
5	10	18	12	216	85
6	2968	1027	15	15405	16990
7	561	324	46	14904	9034
8	1434	168	36	6048	2003
9	86	10	12	120	143
10	138	48	13	624	532
11	365	191	17	3247	960
12	1020	114	55	6270	2941
Ave	665	198	33	6035	3121
Max	2968	1027	65	17615	16990
Min	10	10	12	120	85

Basal and nodal cleistogene seeds per tiller



Correlation between level of Control (1=intense management, 5= little or no management) and potential seed production (seeds/m^2 Log10 scale)



2. Impact of grazing management

High intensity rotational grazing <100 seeds/m2 with strategic herbicide applications

No grazing management, limited herbicides (~17 000 seeds/m2)

Seedbank study highlighted the need for future research to identify key stages in CNG growth to implement grazing, chemical and fertiliser strategies

CNG quality – case study

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV 1	NOV 2	DEC 1	DEC 2	JAN 1	JAN 2	FEB	MAR
% CNG	39	50	47	46	63	81	86	77	81	78	71	56	66	59	55
Yield kg DM/ha	1513	1242	865	770	843	830	857	1180	1295	1345	1150	1250	714	840	1114
% green	50	60	65	54	53	61	59	67	74	72	60	60	50	59	60
CNG growth stage	V	V	V	V	V	V	V, SE	B, F	F	F, SS	F, SS, SD	SS, SD	SD	SD	V
% snip samples with CNG obviously grazed	93	90	100	94	88	100	64	60	30	10	10	5	5	5	95
Digestibility (%)	60.0	52.0	58.0	56.0	60.0	68.0	67.0	59.0	58.0	58.0	55.0	49.0	59.0	58.0	62.0
Crude Protein (%)	13.1	12.1	12.8	12.2	13.8	15.2	15.8	13.1	13.1	13.0	12.2	12.1	13.2	13.2	13.9

High

Low

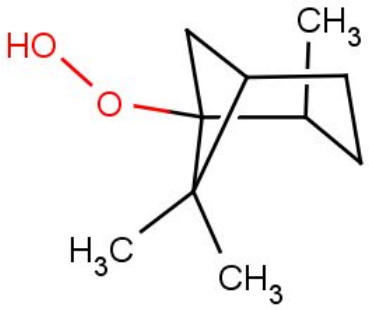
Grazing study

- Replicated experiment GI ARAS
- Five grazing treatments (nil, 3, 6, 9, 12 weeks)
- Three fertiliser treatments (nil, moderate and high N)
- Nutritive quality every 3-4 weeks over 24 mths
- At each sampling, CNG growth stage, BC (%) & biomass
- Other – plant competition (tropical grasses), silage, EOs

3. Effect of essential oils on CNG – Why?

- Herbicides an important tool for CNG management
- Variable results, potential for resistance – alternatives?
- Community concerns about synthetic chemicals
- Growing interest in organic herbicides
- Some limited results on *Nassella* genus

What are essential oils (EOs)?



- Volatile oils derived from plants parts
- Extracted by hydro or steam distillation
- Non-systemic, does not translocate through the plant
- Strips lipid layer of leaves – inability to retain water
- Plant growth reduction, loss of chlorophyll

Advantages

- Fast acting (< 1hour)
- Safe on soil – breakdown with in 72hours
- No WHP
- Safe use for operators/public
- No specific cellular target so resistance unlikely

Disadvantages

- Must come in contact with plant part to kill
- Requires high volumes of water
- Does not kill woody plant parts i.e. stems
- Plant recovery? Repeated application

What, where, how

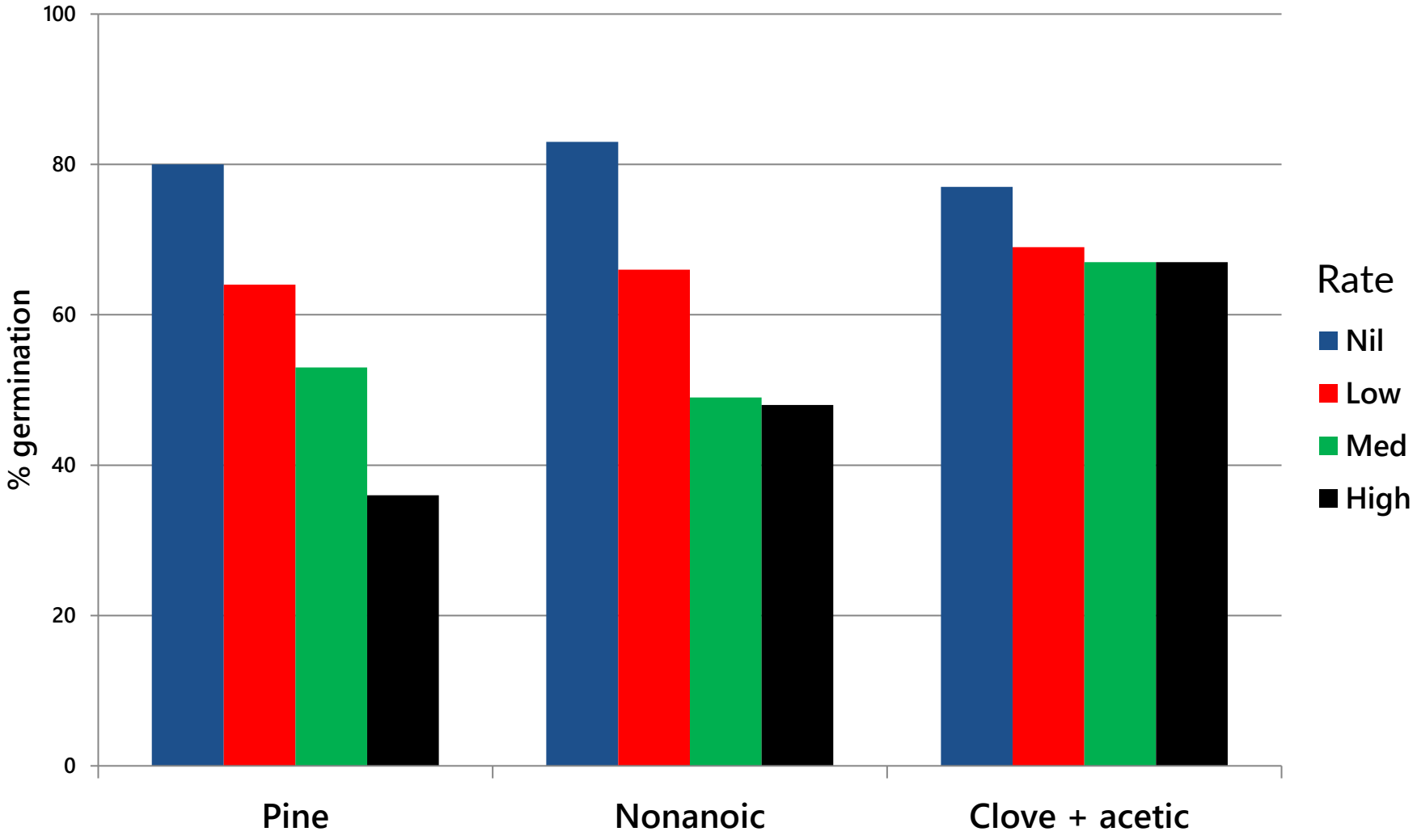
Active ingredient
680 g/L pine oil
525 g/L nonanoic acid
40.4 g/L clove oil & 40.4 g/L acetic acid
450 g/L glyphosate

Glasshouse replicated experiments at GI ARAS

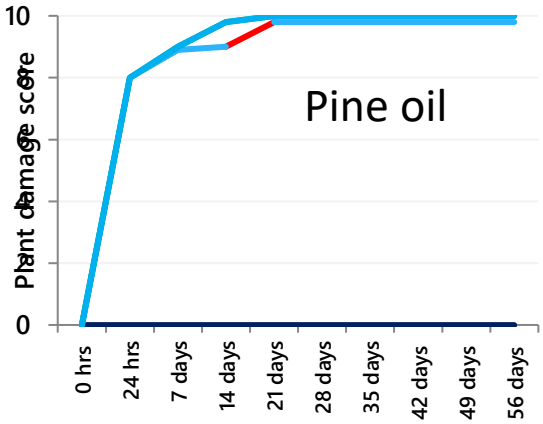
Seed germination – 3 EOs x 4 rates x 10 reps

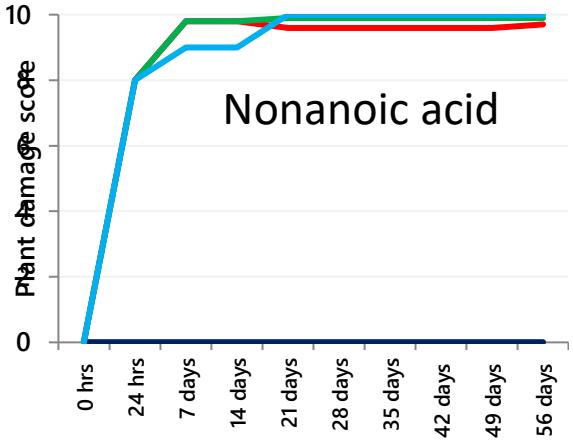
Replicated pot experiments – all chemicals x 4 rates x 4 species x 10 reps @ 2 growth stages – seedling, mature plants and simulated swards with CNG at variable plant densities

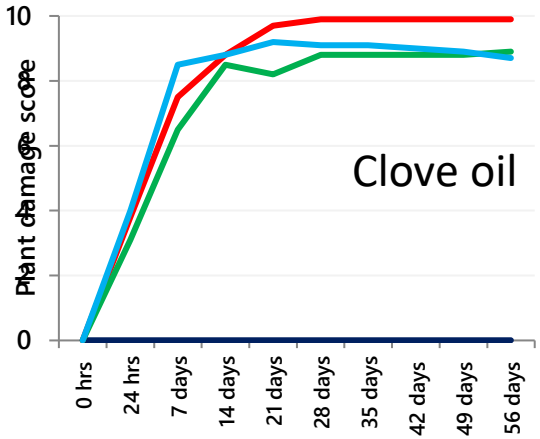
EOs impact on germinating seeds

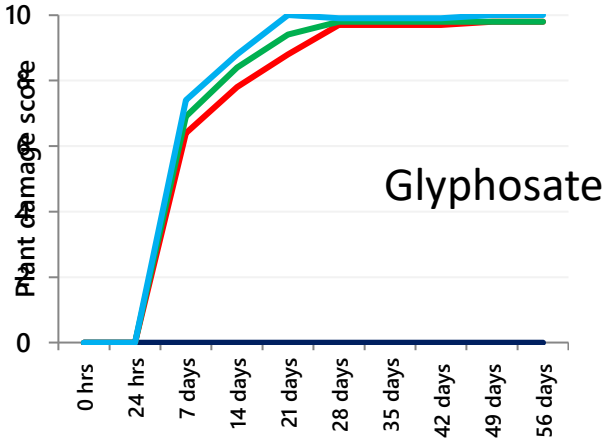


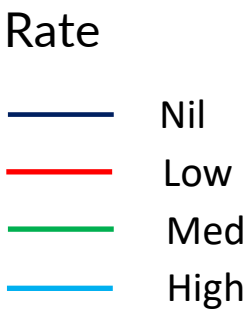
EOs impact on CNG seedlings











Impact of Pine oil on CNG seedling plants

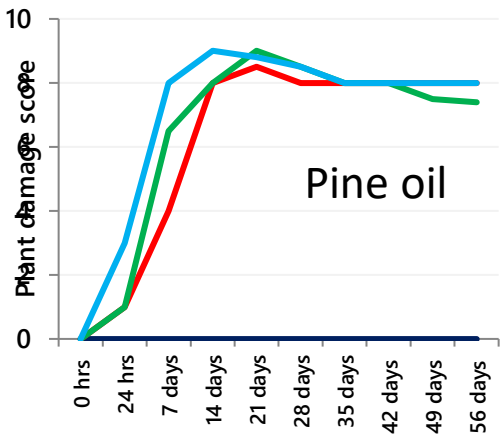
Impact of Nonanoic acid on CNG seedling plants

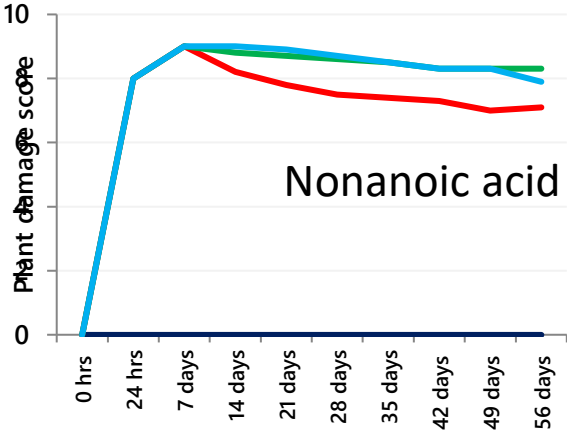
0 hrs

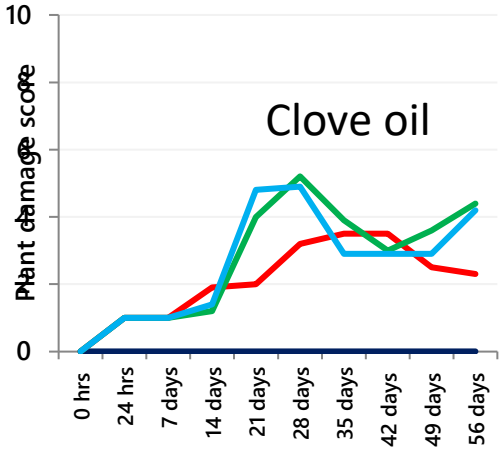
7 days

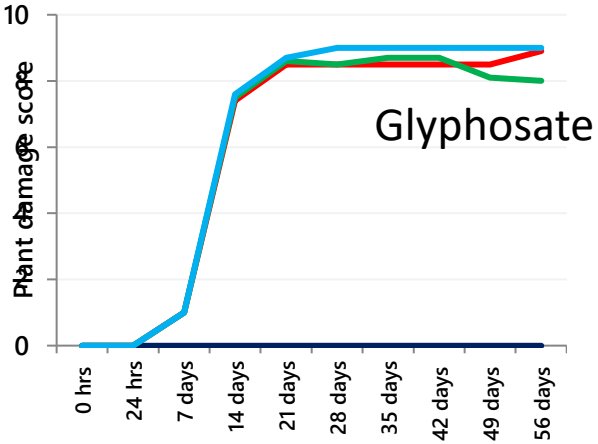
56 days

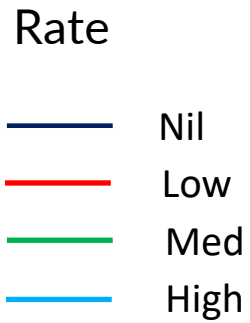
EOs impact on mature CNG plants











Impact of Pine oil on CNG, tall fescue and white clover mature plants

0 hrs | 24 hrs | 7 days | 35 days | 56 days

Impact of Nonanoic acid on mature CNG plants

Impact of Clove oil on mature CNG plants

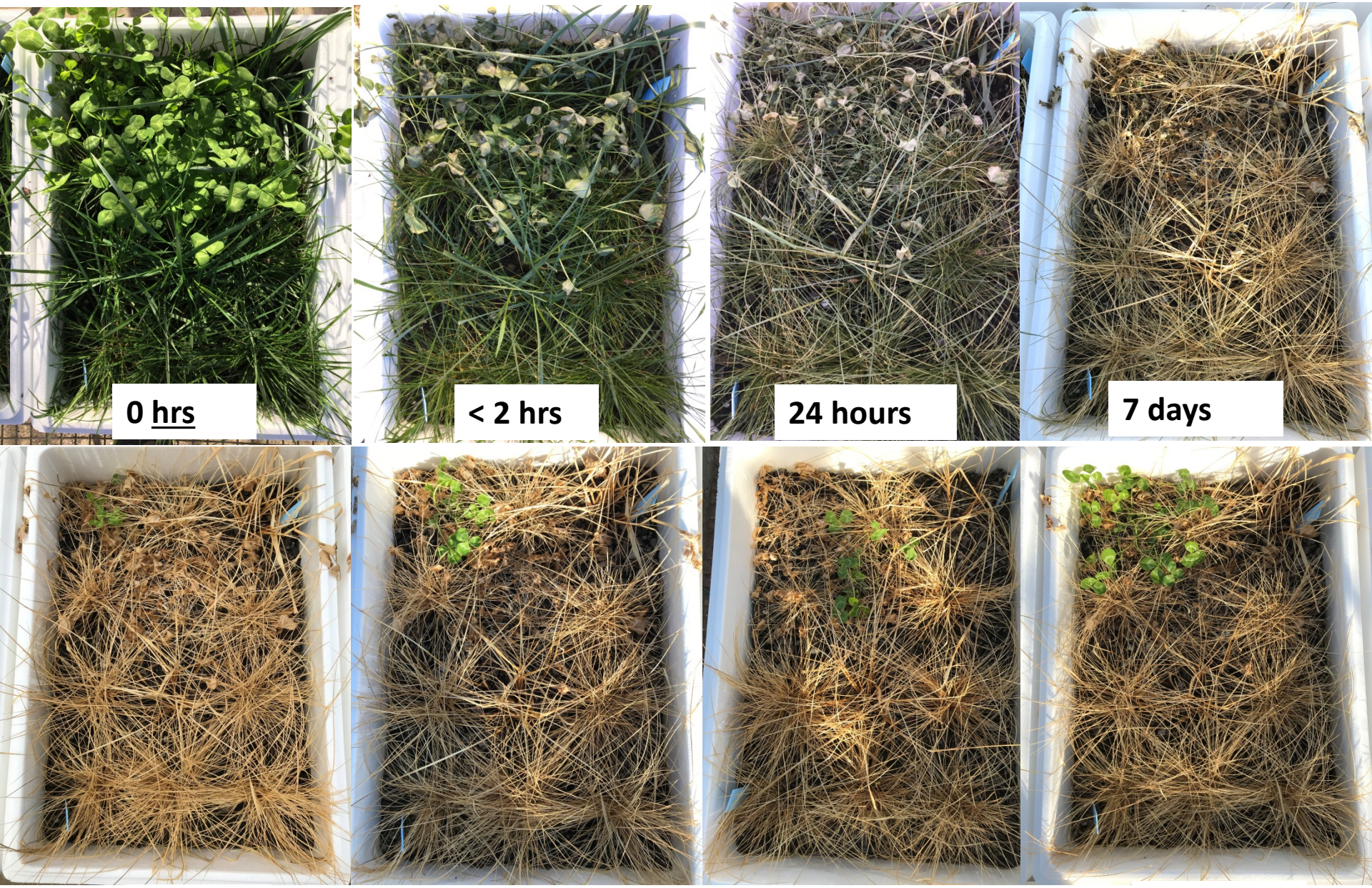
0 hrs

24 hrs

7 days

56 days

Impact of Pine oil on CNG, tall fescue, white clover swards



Key findings to date

- Plant damage within 3 hrs of application for all essential oils
- Peak damage for CNG - 7-20 days after application
- Some plant recovery (new green leaf) by day 50
- Glyphosate - peak damage at 28 days, minimal recovery
- Treatment effects on other species similar to CNG

Pot experiments signpost the potential role of essential oils for CNG management, BUT requires validation in the field on broad scale to determine effectiveness and cost benefits

4. Invasive Grasses Demonstration sites

Demonstration of BMP on-farm to facilitate adoption

- Serrated tussock (near Orange)
- Chilean needle grass (near Tamworth)
- African lovegrass (near Cooma)

We need hosts for 21 adoption sites across the state

Invasive Grasses – BPM Adoption Sites

- Adoption sites needed for:
  - Serrated tussock;
  - Chilean needle grass; and
  - African lovegrass.

- 7 sites for each species across NSW.

- Pastures/Weeds staff working on this until May 2023.

- Participatory/co-design with land managers.

- Host field visits (to spread the message).

Acknowledgements

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Local producers for allowing access to their land for surveying, collecting soil, plant and seed for both the seedbank and essential oil projects.

Guyra MLA Producer Demonstration site for input into the project aims and design.