EVALUATE EFFICACY OF NEW HERBICIDE PRODUCTS AND A PRODUCT WITH POTENTIAL TO ACT AS A NEMATICIDE IN PINEAPPLE CROPS

Research Topic 4: Pest Management

Trial number: 04-WB-06

CONTENTS

INTRODUCTION

Pineapples are infested by a variety of pests. Those that affect pineapple crops include a wide range of insects, diseases, nematodes and weeds. Soil types, climatic factors, crop stages and crop management practices affect the intensity of pest infestations. An integrated approach comprising cultural, mechanical, biological and chemical measures are most commonly used in managing these pests. The primary goal to keep pest populations below economic threshold levels to avoid serious crop losses.

This report describes the evaluation of several different products for the management of weeds and nematodes. The lack of management options for these pests have been identified as key gaps for growers in the Australian pineapple in industry.

HYPOTHESIS

Demonstration site A - herbicide evaluation.
Experimental herbicides from the sugarcane industry and newly registered herbicides in the pineapple industry have potential as pre-emergent herbicides via pre-plant applications if their phytotoxic effects on pineapple are acceptable.

Demonstration site B – nematicide evaluation.
The fertiliser Agri-silica™ may have nematode control capabilities and other positive effects on the health of a pineapple crop when used as a pre-plant application

OBJECTIVE

To evaluate and screen new products with weed and nematode control capabilities.

METHOD

Apply various new herbicide products and a product with the potential to act as a nematicide to pineapple crops in the field at Littabella Pines, Yandaran and assess their efficacy and phytotoxic effects.

Demonstration site A - herbicide evaluation.
Demonstration site B – nematicide evaluation.

Location and grower

Demonstration site A herbicide evaluation and demonstration site B nematicide evaluation were undertaken in collaboration with Littabella Pines located in Yandaran Queensland. The farm owner John and Linda Steemson have been growing pineapples in the area since 2004 and farmed sugarcane and other small crops in the Yandaran for two generations.

DEMONSTRATION A - HERBICIDE EVALUATION

Dates

- August 2021 – trial planned, site selected, treatments applied and planted.
- September 2021 – weed populations counts
- November 2021 - weed populations counts

Crop details

The demonstration site was planted with the Smooth Cayenne pineapple variety and followed the same variety which was taken to ratoon crop harvest. The soil was a sandy loam, prepared to a fine tilth, no crop residue present and there was good soil moisture. Weather conditions at the time of application of treatments were ideal with temperatures ranging from 18 – 24°C.

Description

The pre-plant herbicide trial was established in August 2021 at the end of a six-month dry autumn and winter period. From October to November 2021 the site received 750mm rainfall which supported significant weed establishment and growth. The treatments were applied directly to the ground via a boomspray attached to a rotary hoe and incorporated immediately. The treatments were applied at the registered rate recommended by the chemical company representatives. The site was then bed formed and planted within 1 day of application.

Each treatment was one bed wide and 30 metres in length. A full weed count was conducted over the entire treatment area at one and three months after planting.

The demonstration included experimental herbicides from the sugarcane industry Amatron™ and Valor™, newly registered herbicides for the pineapple industry Sencor™ and Balance™, the industry standard herbicide of 800 g/kg Bromacil and control treatment (no herbicide). The herbicides were selected on their effectiveness as a pre-plant application for problem broadleaf and grass species in the pineapple industry such as bluetop and paspalum.

Each herbicide was applied as a pre-plant in a water volume equivalent to 500L/ha and incorporated into the ground using a rotary hoe. The rates used were recommended by the chemical company representatives and industry resellers.

Table 1. Herbicide rates

Tradename	Active Constituent	Application Rate
Control (nil)	NA	NA
Amatron™	Amicarbazone	500g / ha
Valor™	Flumioxazin	250g / ha
Sencor™	Metribuzin	160g / ha
Balance™	Isoxaflutole	125g / ha
Sencor™ / Balance™	Metribuzin/ Isoxaflutole	160g / ha + 125g / ha
Standard	Bromacil	4.4kg / ha

DEMONSTRATION B - NEMATICIDE EVALUATION

Dates

- May 2021 – trial planned, site selected, treatments applied and planted.
- March 2022 – nematode populations counts and plant health assessments
- November 2022 - nematode populations counts and plant health assessments.

Crop details

The demonstration site was planted with the smooth cayenne pineapple variety and followed a crop of 73-50 hybrid variety taken to plant crop harvest. The soil was a light sandy loam with low to moderate clay content, prepared to a fine tilth, no crop residue present and good soil moisture. Weather conditions at the time of application of treatments were cool ranging from 10 – 22°C in late autumn.

Description

The pre-plant evaluation trial of Agri-silica™ was established in May 2021 during a six-month dry period. Agri-silica™ was supplied in a granular formulation. The treatments were applied directly to the ground via a fertiliser spreader and incorporated immediately into the soil using a rotary hoe. Agri-silica™ was applied at a low, medium and high rate recommended by the Agripower representative. The site was then bed formed and planted over the following seven days. Each treatment was approximately 0.4 ha in size. The demonstration included a control treatment (no nematicide). No fumigation was applied to the site. Note – there are no registered nematicides in the pineapple industry apart from fumigants.

Table 2. Nematicide rates

Tradename	Active Constituent	Application Rate
Control (nil)	NA	NA
Agri-silica™ – low rate	26% soluble silicon 1.4% calcium 1.1% magnesium	400kg / ha
Agri-silica™ – medium rate		800kg / ha
Agri-silica™ – high rate		1200kg / ha

RESULTS

DEMONSTRATION A - HERBICIDE EVALUATION

The treatment area was planted In August 2021 and established well with the start of spring. Heavy rainfall began in October 2021 and weed populations established rapidly. The weed population one month after planting was low. Three months after planting weeds were well established and the effects of the various herbicides could be clearly observed (see Figures 1 and 2).

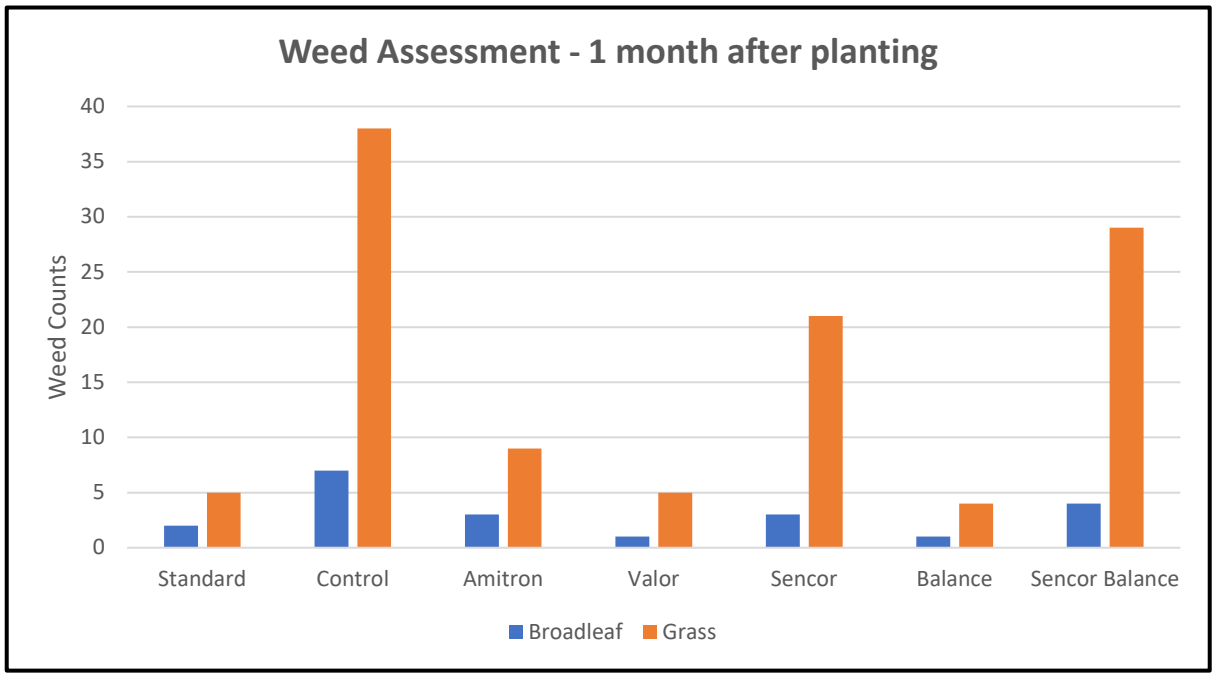

Figure 1: Weed assessment – one month after planting

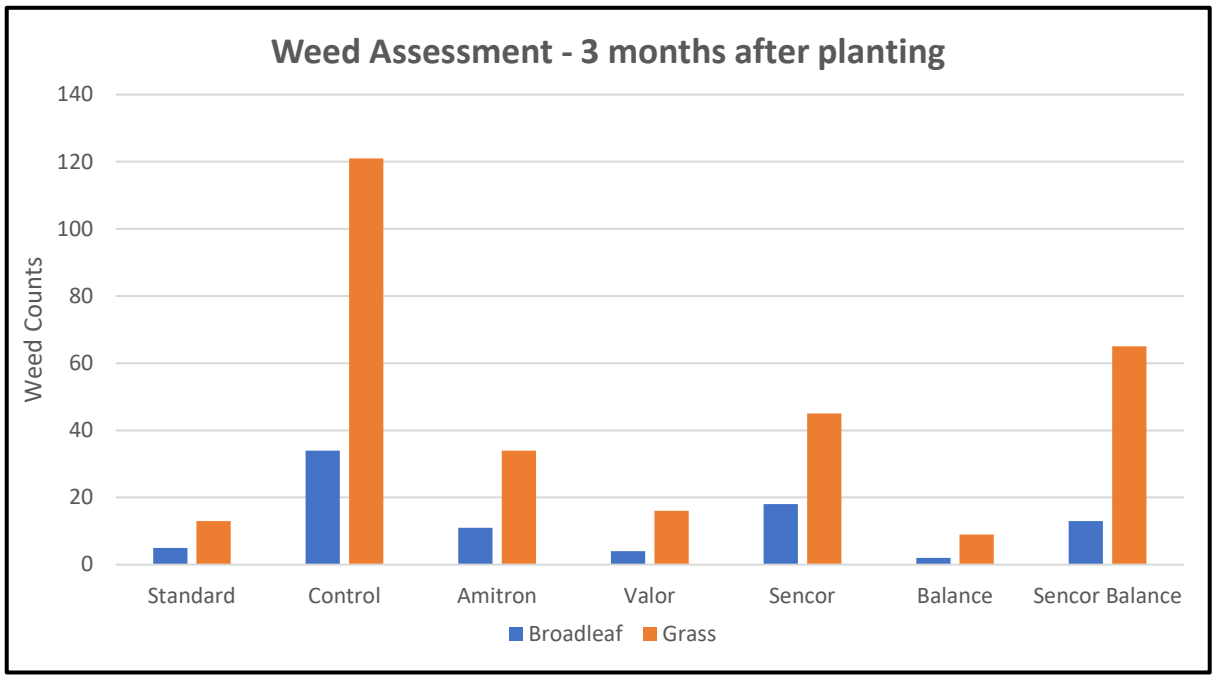

Figure 2: Weed assessment – three months after planting

Phytotoxicity ratings are a measure of the toxic effects to plants as a result of herbicide application, they range from one to ten, with one being the lowest and ten the highest. Phytotoxicity rating were taken at one and three months of age.

No phytotoxic effects were observed on the crop at one month after planting, but they were at three months (see Figures 3, 4 and 5).

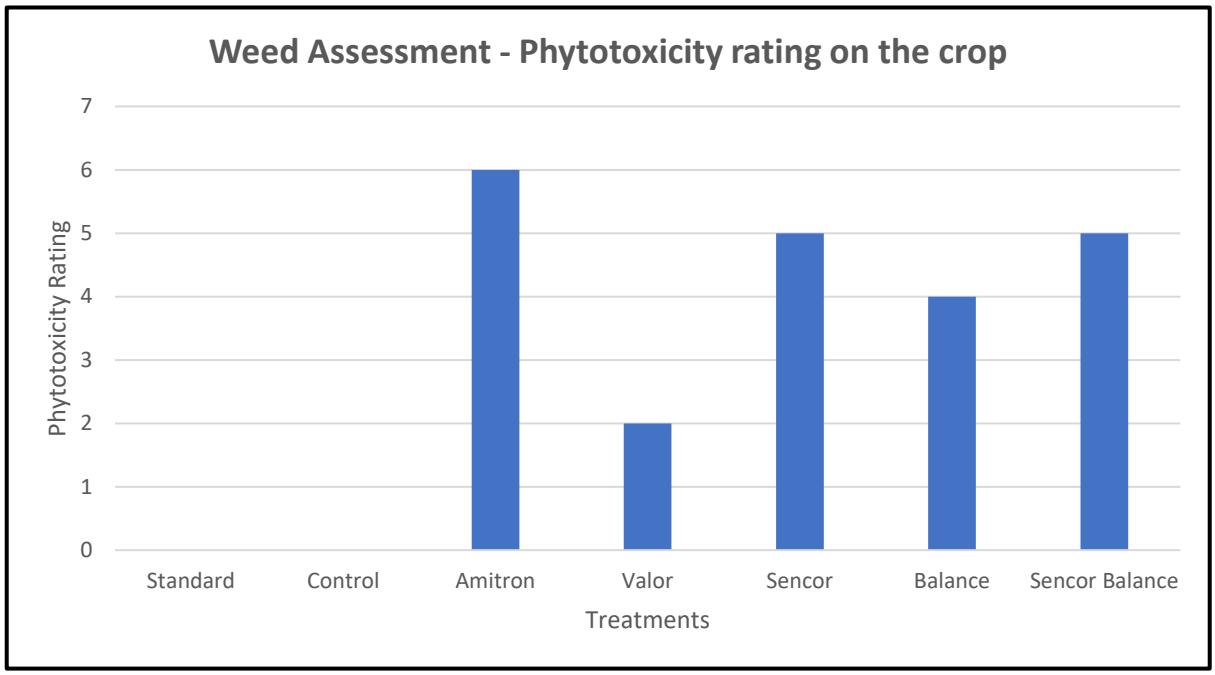

Figure 3: Weed assessment – phytotoxicity ratings three months after planting


Figures 4 and 5: Phytotoxic damage in Balance™ and Valor™ treatments (respectively).

			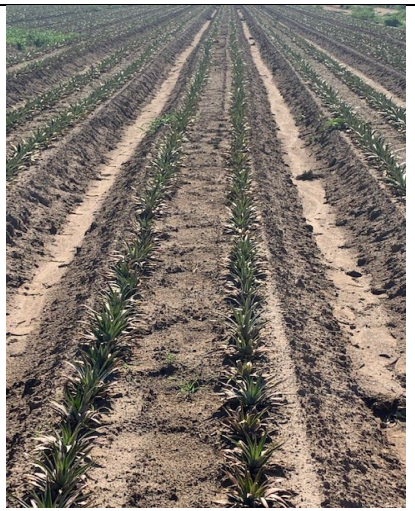
Control	Amatron™	Valor™	Sencor™
			
Balance™	Sencor™ / Balance™	Standard - Bromacil™	

Figure 6: Weed growth in each pre-plant treatment – one month after planting

		
Control	Amatron™	Valor™
		
Sencor™	Balance™	Sencor™ / Balance™

Figure 7: Weed growth in each pre-plant treatment – three months after planting

DEMONSTRATION B - NEMATICIDE EVALUATION

Ten months after planting the pineapple plants were well established and the effects of the first nematode peak in populations throughout the summer period (November 2021 – January 2022) could be determined by measurements and counts across the treatments, even though they were hard to distinguish visually. Results from assessments are presented in Figures 8 to 11. The biggest variations were in the root growth, root health and nematode counts. Nematode counts at 18 months showed major differences.

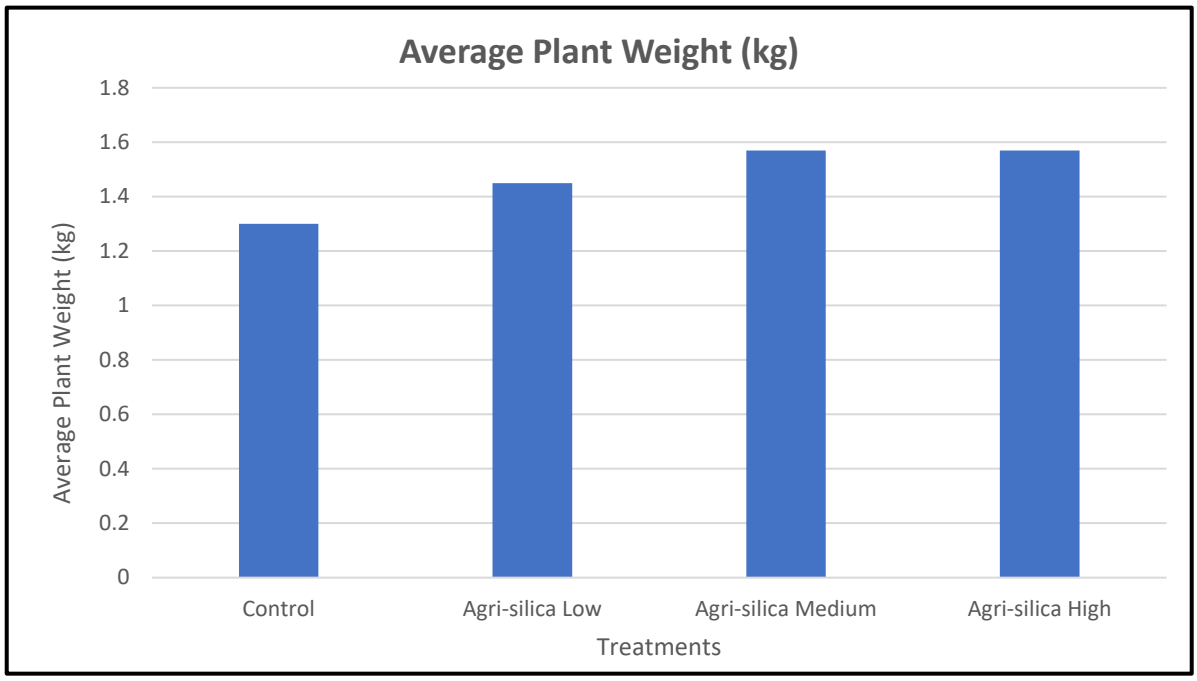

Figure 8: Average plant weight (kg) ten months after planting.

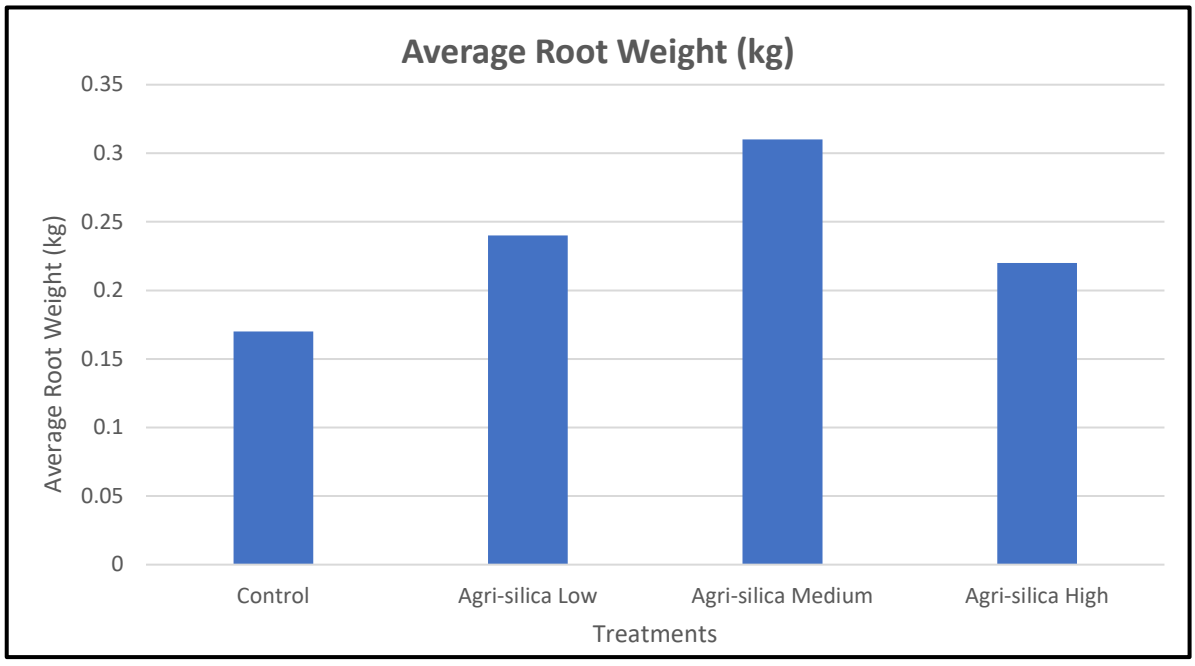

Figure 9: Average root weight (kg) ten months after planting.

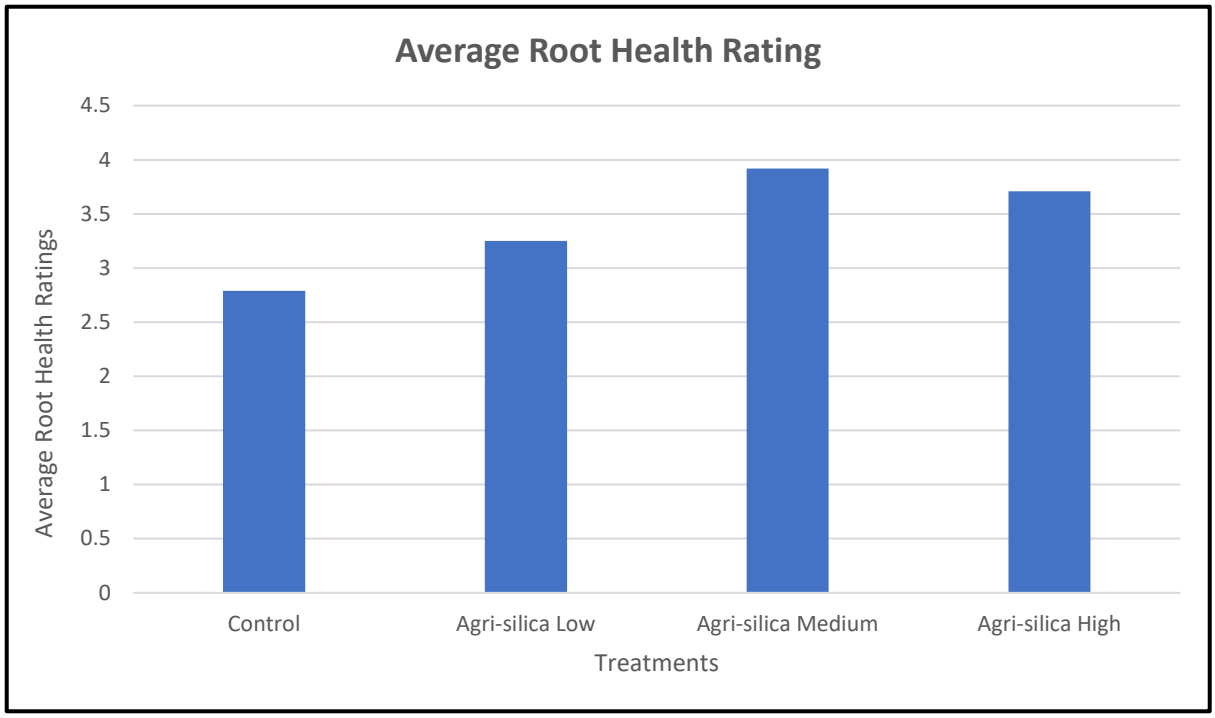

Figure 10: Average root health rating ten months after planting.

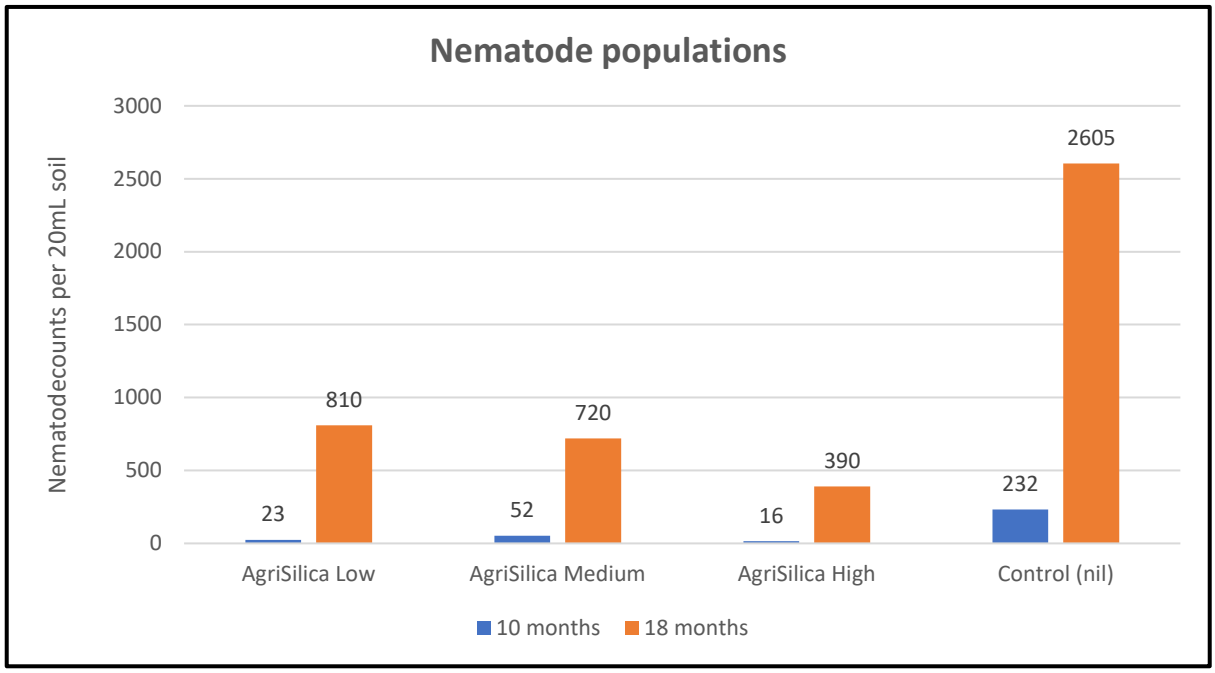

Figure 11: Nematode population counts ten and eighteen months after planting.

DISCUSSION

Demonstration site A

Weed populations on Littabella Pines are typically high with limited broadleaf species but high populations of grasses. Typically, the better performing herbicides have a broad range of weed control capability on grass and broadleaf species when used as a pre-plant application.

The results from this demonstration trial showed that experimental herbicide Valor™ and industry registered herbicide Balance™ provided good weed control for both broadleaf and grass species. When compared with the standard industry herbicide Bromacil™ both Valor™ and Balance™ produced equivalent weed control. However, crop phytotoxicity effects were observed in both Valor™ and Balance™. Valor™ with a low crop phytotoxicity rating and Balance™ with a low to moderate crop phytotoxicity rating. Crops in both treatments were able to grow out of phytotoxic damage which did not in any way limit growth.

It is important to recognise these results reflect a comparison of products and rates as a pre-plant incorporation into the soil prior to bed forming ONLY.

Demonstration site B

The results from this demonstration trial showed that Agri-silica™ provided good nematode control when used as a single pre-plant application incorporated into the soil.

Agripower researchers have outlined the effects of silica in the plant. Agri-silica™ is a fertiliser and its main element silicon is taken up by plants as monosilicic acid. Silicon is utilized by the plant to enhance cell wall strength by hardening layers of cells below the surface of the roots and leaves therefore limiting entry of pest and disease into the plant.

The reduction in nematode symptoms may be due to the effects of silica on limiting nematode penetration into the roots. Effect on the plants was better across all Agri-silica™ application rates when compared to the control treatment. Nematode populations on Littabella Pines are typically high and to achieve good nematode control ten and eighteen months after planting and spanning the summer nematode population peak is very promising.

ADOPTION AND IMPACT

Demonstration site A

In summary, there is potential for experimental herbicide Valor™ to become a useful herbicide in the management of weed populations in the pineapple industry. This will require further research and a collaborative effort from the chemical company and the relevant industry entity to gather the relevant data and support an application for a minor used permit to the APVMA. Until this process has been undertaken the industry will be unable to commercially use experimental herbicide Valor™.

Newly registered herbicide Balance™ in the pineapple industry has received many questions and reservations from growers pertaining to phytotoxic damage on the crop. Under the environmental and farming conditions at Littabella Pines the damage to the crop was minimal and did not affect plant growth. Application of Balance™ by growers in the pineapple industry should initially be limited to small scale trials to assess how it works on their farms and to learn how best to use it before any commercial applications are applied.

Demonstration site B

Currently, the only registered nematicides for the pineapple industry are soil fumigants. Soil fumigants are formulated as liquids which volatilise into a gas when released into the soil. The re-entry period after fumigation is 2 to 3 weeks to allow the fumigant to dissipate from the soil. Fumigants are designed to give a strong initial kill of the target pest with no residual control. Historically, the pineapple industry has had other nematicide products (e.g. Nemacur®) with the capacity to control nematodes post-planting but these products have been de-registered and are no longer available to the pineapple industry. In severely affected soils nematodes have the ability to re-establish their populations rapidly after fumigation. With no post plant control measures nematodes have been a major problem in the industry. Agri-silica™ has the potential to provide residual, long term control after planting and, in combination with fumigation, growers have a better chance of managing nematodes better.

CONCLUSIONS

Results from screening new pesticide products indicate the potential to replace, supplement or fill a gap in current pesticide needs to achieve better agronomic outcomes for industry. It is important to keep evaluating new products and work with chemical companies to make these products commercially available. This process will require both funding and time.

ACKNOWLEDGEMENTS

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