Sugar Research Australia

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Booklet

Nutgrass management in sugarcane

Introduction

Nutgrass is a significant weed problem in most sugarcane production regions.

Trials both in NSW and Queensland have shown that significant yield losses will occur if nutgrass is poorly managed.

Description

Nutgrass (*Cyperus rotundus*) is a perennial sedge with creeping rhizomes that produce many tubers (or nuts). Each tuber is capable of producing a new plant and large networks of inter-connected tubers develop. In ideal growing conditions a single tuber can produce an additional 100 tubers in 90 days. In trials carried out in NSW, about 90 per cent of the tubers were found at 0-15 cm depth.

Photo 1: A nutgrass network of shoots and tubers.

Economic guidelines

Trials in Central Queensland and NSW have shown that it is highly economic to control nutgrass in cane. In Central Queensland uncontrolled nutgrass caused significant income losses:

- In dryland crops: $650/ha income loss after 4 weeks competition to $1535/ha after 12 weeks competition.
- In irrigated crops: $500/ha income loss after 4 weeks competition and $868/ha after 12 weeks competition.

This indicates that even where nutgrass is patchy growers could outlay $60 to $120/ha for nutgrass control and still obtain a substantial net benefit.

Trials in NSW showed that total control of nutgrass resulted in dollar benefits up to$350-$450/ha. Trials evaluating 'one-off' herbicide treatments for nutgrass have also shown net benefits of around $200-$400/ha after allowing for herbicide costs.

Nutgrass competes aggressively with cane

Nutgrass reduces the soil moisture and nutrients available to the cane crop. In moderate to heavy infestations nutgrass tops can take up around 25 to 45 kg nitrogen/ha that would otherwise be available to the cane. Similarly nutgrass tops can take up around 45 to 50 kg potassium/ha (equivalent to the potassium applied in many planting mixes).

A thick sward of nutgrass can remove the equivalent of 11 to 12 mm rain from the cultivated layer in 4 to 8 days.

In plant cane

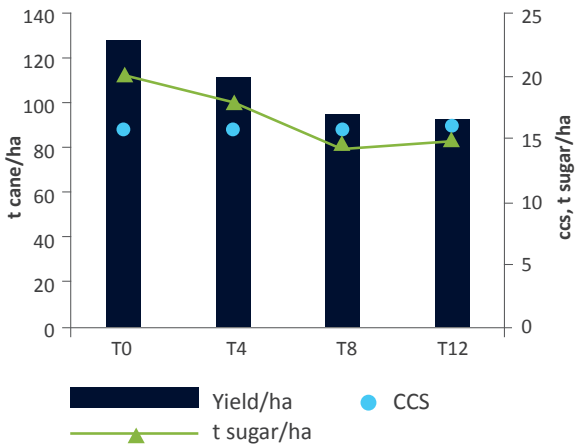
In Central Queensland trials in non-irrigated cane, yield losses of up to 25 per cent were measured. Nutgrass competes for water and nutrients and can reduce cane emergence and growth even before emergence of nutgrass shoots.

In trials in irrigated cane, cane yield losses up to 18 per cent were measured. In irrigated crops nutgrass competes mainly for nutrients.

Trials in NSW showed cane yield losses of around 30 per cent in plant cane where nutgrass was allowed to grow without any control. Allowing the nutgrass to grow uncontrolled for 4 to 8 weeks after planting also resulted in a reduction in cane growth.

Allelopathic compounds present in nutgrass could also contribute to yield losses.

Figure 1: Delaying nutgrass control for 4 to 12 weeks after planting significantly reduced cane yield (non-irrigated trial in Central Queensland).



T0 – full control (nutgrass controlled in fallow and follow up treatments in plant cane).

T4 - nutgrass controlled after it competes with cane for 4 weeks (nutgrass not controlled in fallow).

T8 - nutgrass controlled after it competes with cane for 8 weeks (nutgrass not controlled in fallow).

T12 - nutgrass controlled after it competes with cane for 12 weeks (nutgrass not controlled in fallow).

Photo 2: Full nutgrass control removed any competitive effects.

Photo 3: Delaying control for 4 weeks after planting resulted in significant yield loss.

Photo 4: Delaying treatment for 8 weeks after planting resulted in even higher yield losses.

Photo 5: Uncontrolled nutgrass for 12 weeks after planting.

In ratoon cane

NSW trials showed variable impacts on cane yield depending on environmental factors . In some cases up to 30 per cent cane yield loss was measured.

Management

To effectively reduce the number of underground tubers, repeated treatments are necessary. No single 'one-off' treatment will control nutgrass. **Control nutgrass in fallow before planting and follow up treatments in plant cane.**

Bare fallow before planting

Glyphosate is very effective in killing both the nutgrass plant and linked underground tubers. It prevents the plant from producing new viable tubers. Any glyphosate formulation is effective as long as the product reaches the target. Nutgrass has narrow leaves so correct nozzle choice and setup is important to ensure coverage.

Glyphosate will translocate down to the root and tuber network and kills all the connected tubers. Any tuber network that has not emerged will not be affected. Repeat applications may be necessary to target later flushes.

Photo 6: Nutgrass sprayed with glyphosate in fallow.

Legume fallow

The use of a legume fallow like soybean provides additional opportunities for an integrated approach to nutgrass control.

- Use glyphosate before and after the soybean crop to reduce tuber viability.
- Use imazethapyr (e.g. Spinnaker®, Skipper®) in the soybean crop.

Tillage in plant cane

In dry conditions, tillage in plant cane is effective. Tubers are killed when exposed to very dry soil and are brought to the surface after their roots are cut. Several tillings will be necessary to disconnect and exhaust the energy of the tubers.

Mechanical cultivation is an effective control strategy only if conditions remain dry after the tubers are brought to the surface. Studies in NSW suggest that about 90 per cent of the tubers are in the 0-15 cm depth. However, cultivation to 30 cm is likely to be required to effectively control nutgrass.

Photo 7: Nutgrass tilled after planting cane.

Tillage does not work well in combination with systemic herbicides as the tuber network is broken up, preventing the herbicide translocating from one tuber to the next.

In wetter conditions, tillage will not work as new shoots will still grow from tubers.

In minimum tillage systems, cultivation is not an option and herbicides are required.

Shading

Shading may provide some control after canopy closure but large yield losses will occur if nothing is done to control nutgrass in the period before canopy closure.

Herbicides for plant and ratoon cane

Pre-emergent herbicides

Imazapic (e.g. Flame®) applied before or after nutgrass emergence will dramatically reduce nutgrass emergence as well as the emergence of other weeds. Imazapic will also prevent nutgrass from producing many new viable tubers. Better results will be obtained without adding paraquat.

Imazapic does not work well on every soil type. The Flame® label states 'efficacy can be limited when applied onto soils with pH <5 and/or with high concentration of iron and /or aluminium'. However research pot trials suggest it is effective in acidic soil with moderate organic matter (OM) and Cation Exchange Capacity (CEC) and is less effective in soils with high CEC. Imazapic is prone to leaching at neutral pH. It needs to be incorporated to be really effective. Incorporation by irrigation to the root area is the most effective. Imazapic works well when applied on trash blanket and incorporated by irrigation.

Post emergent herbicides

Apart from glyphosate, haloxysulfuron-methyl (e.g. Sempra®, Nut-Buster) at 90 and 130 g/ha is the most effective herbicide that dramatically reduces production of tubers and their viability.

Hero® (ethoxysulfuron) and Krismat® (ametryn plus trifloxysulfuron) also reduce the production of tubers and their viability but results are more variable than Sempra®.

These herbicides often have poor visual symptoms after application which may lead growers to think that they are not effective. However this is not the case and the competitive effect of nutgrass is being reduced even though the nutgrass plant may take some time to die.

Photo 8: Sempra® symptoms on nutgrass in plant cane.

Despite strong symptoms on nutgrass foliage, research has proven that other products such as 2, 4-D, paraquat or MSMA do not provide any suitable reduction in tubers and do not reduce their viability. Research trials even suggest an application of 2, 4-D limits the absorption of a second herbicide application; reducing the overall kill.

For long term reduction of your nutgrass infestation, herbicides like glyphosate, Flame®, Sempra®, Hero® or Krismat® must be used.

Best results are achieved when nutgrass is actively growing. Avoid spraying when nutgrass is stressed.

Table 1: Herbicides active ingredients registered to control nutgrass in sugarcane farming systems *(continued overleaf)*.

Active and concentration	Product example	Group	Rate/ha	Stage of crop cycle	Comments
Imazethapyr	Spinnaker® Skipper®	B	140 g	Soy bean break crop	If applying post-emergent add non-ionic surfactant at 200 mL/100 L or Hasten or Kwickin at 500 mL/100 L. For post-emergent, apply to actively growing weeds in 2-4 leaf stage.
Glyphosate 450 g/L	Roundup CT®	M	2.4 L	Fallow from plough out to soybean or cane planting	Registered only in fallow. A second application will control the following flush of nutgrass.
Glyphosate (potassium salt) 570 g/L	Roundup® Attack™ Roundup Ultra® Max	M	1.2-5 L	Fallow from plough out to soybean or cane planting Plant and ratoon cane used with shields	In cane crops with spray shields. Do not apply more than 3 times or more than 11.4 L/ha per crop.
Glyphosate (dual salts) 540 g/L	Weedmaster® Argo®	M	1.1-4.7 L	Fallow from plough out to soybean or cane planting Plant and ratoon cane used with shields	In cane crops with spray shields. Do not apply more than 3 times or more than 12 L/ha per crop.

Active and concentration	Product example	Group	Rate/ha	Stage of crop cycle	Comments
Glyphosate (potassium salt) 540 g/	Glyphosate 540 K	M	1.2-5 L	Fallow from plough out to soybean or cane planting Plant and ratoon cane used with shields	In cane crops with spray shields. Do not apply more than 3 times or more than 12 L/ha per crop.
Imazapic 240 g/L	Flame® Impose®	B	300-400 mL	Plant and ratoon cane	Registered for pre-emergence broadleaf and grass control in cane. Can be used pre and early post emergence of nutgrass.
Ethoxysulfuron 600 g/kg	Hero®	B	250 g	Plant and ratoon cane	Do not apply more than once a year or other group B herbicide to a crop in one season. Apply only directed spray.
Ametryn 731.5 g/L Trifloxysulfuron 18.5 g/L	Krismat®	C B	1.5-2 kg	Plant and ratoon cane	Do not apply more than 2 applications a year or other group B herbicide to a crop in one season. Don't plant crops other than cane for 24 months after application.
Haloxysulfuron-methyl 750 g/kg	Sempra® Nut-Buster	B	65-130 g	Plant and ratoon cane	Do not apply more than 200 g/ha a year or other group B herbicide to a crop in one season.
2,4-D 577 g/L Ioxynil 100 g/L	Actril®DS	C I	1.0 – 1.5 L plus Diuron at label rates	Plant and ratoon cane	Only provides 3 to 4 weeks suppression. Two applications are required. Note diuron usage restrictions on product labels.

To reduce the likelihood of herbicide resistance, do not over apply group B herbicides within a year. Mechanical cultivation may also be effective in fallow, plant cane and non-trash ratoons.

References

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