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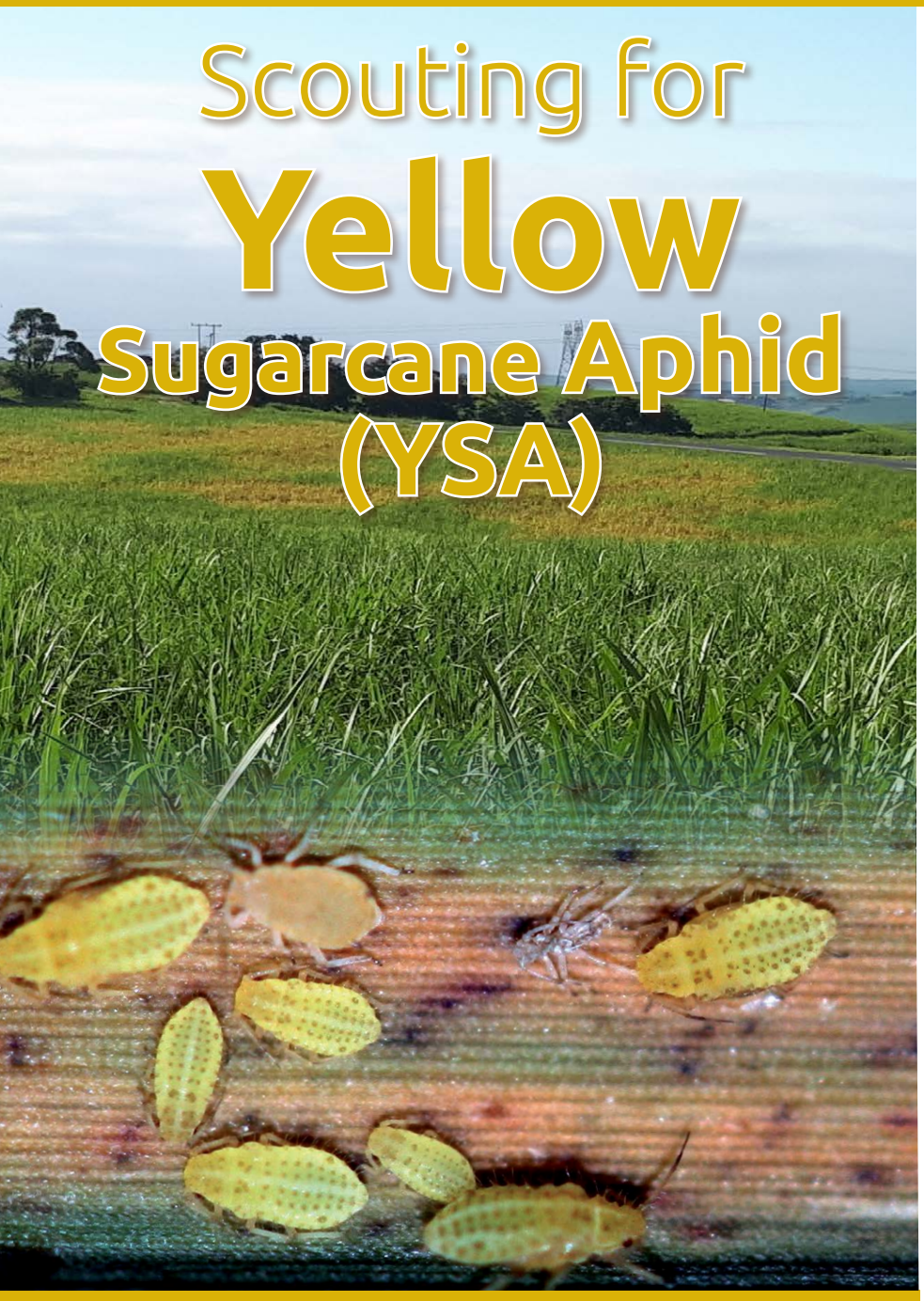
Scouting for Yellow Sugarcane Aphid (YSA)



With the onset of Spring, temperatures are expected to rise to mid to high 20s ºC. Coupled with low humidity, these will be the optimal weather conditions for YSA outbreaks. Growers therefore need to be on high alert for this pest, especially on fields with susceptible varieties between 2-7 months of age (page 6). Scouting for this pest must begin before visible symptoms appear. The article on page 10 outlines an interim scouting method for early YSA detection.

In this issue...

Minimising nitrogen losses

While nitrogen is essential for growth and sucrose production, it can be prone to losses in the soil. Without proper management, nitrogen use efficiency is reduced resulting in the grower incurring more costs to reapply nitrogen to the soil *(page 7).*

Compaction

Identifying and managing compaction is key to reducing significant yield losses as well as understand its role in yield decline. One of the most common causes of this phenomenon is infield traffic *(page 13).*

YSA and mosaic

Aphids are the most common vector (an organism that is able to spread disease) of plant viruses. In this article, scientists investigate whether YSA can spread the sugarcane mosaic virus *(page 6).*

SASRI
SOUTH AFRICAN SUGARCANE RESEARCH INSTITUTE

Unlocking the potential of sugarcane

Director's Message

Why Quality Seedcane and Varieties are Important

Recent discussions with representatives from a sugar industry in Africa highlighted the fundamental importance of variety choice and seedcane quality as key factors for a sustainable and healthy sugarcane industry. We learned from our visitors that their industry is beset with two main problems: a pest and a disease, namely eldana and mosaic.

The basis for these two problems resides in the lack of controls associated with the seedcane that is used, exacerbated by poor choice and management of varieties. Their seedcane undergoes no inspections or certification and the variety choice is quite limited. We all know that seedcane that has not been certified or approved for planting is a sure way to ensure that any mosaic and eldana that is prevalent in a crop will continue to spread to all new plantings. Without the development of a comprehensive seedcane strategy with strict quality standards, these problems will persist, and even those varieties that show some tolerance to eldana for example, will succumb under such consistent and increasing pressure.

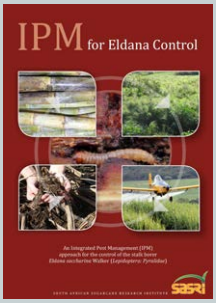
Carolyn Baker

The South African industry's foresight in supporting a variety development programme that amongst other traits, selects varieties for enhanced pest and disease tolerance, provides all our growers with a robust basis for combatting such problems. This, together with adherence to well-developed and defined pest and disease regulations, has been instrumental in promoting sustainable sugarcane cultivation.

Value of Eldana IPM

Biological systems are constantly evolving. For this reason, development of novel approaches to managing potential threats to our sugarcane remains a necessary and ongoing focus at SASRI. Application of the outcomes of the research programme and their implementation in the field, signals their usefulness. Assessing this value is important to us and is an important reason for SASRI conducting an annual review of selected research programmes.

This year, in early July, SASRI hosted two external expert reviewers who evaluated the R&D associated with our eldana integrated pest management (IPM) research. The strategic intent of this research is to reduce the negative impacts of eldana on yields through the development and facilitation of subsequent adoption of eldana IPM guidelines and new technologies. It was pleasing to hear from the reviewers that the work associated with plant resistance, stress management, habitat management, agrochemicals, monitoring and knowledge exchange was deemed to be appropriate.



In particular, the well-planned and executed IPM approach that has been adopted was identified as being key to recent successes in limiting eldana in some regions. This approach is clearly described in the *IPM for Eldana Control* manual available on the SASRI website, together with a wealth of other information on sugarcane farming (www.sasri.org.za/publications).

Topical TIPS

Rowan Stranack (Extension & Biosecurity Manager)

Carry-over cane

- Flowering has been extensive this year across the industry with the exception of the Midlands region. Heavily flowered cane should have been milled by now. It is also important that cane with **>20%** flowered stalks is **not** carried over. Be on the lookout for delayed flowering, particularly in the variety N12, where flowers often emerge in late spring. One can check for this by slicing open the top of the cane stalk to reveal the apical meristem, and see if the flower has formed (see photo on the left). It is advisable to carry out these checks early enough so that fields for carry-over can be changed if possible.

- In most parts of the industry the winter has been very dry and the crop has undergone varying degrees of water stress. Even if there are good spring rains, the current period of stress is likely to have a lasting effect. Eldana numbers are already on the increase in some areas and carry-over decisions will need to consider this, in addition to the degree of stress and the extent of flowering that has occurred. If in doubt, consult your SASRI Extension Specialist for assistance with any final harvesting or carry-over decisions.

- In eldana-prone areas your insecticide spray programme on carry-over cane should be well under way. Even in parts of the Irrigated North there could be carry-over cane and here too, cane should be sprayed preventatively if it meets the criteria. Apart from other sprays earlier in the season, the late moth peak over the period September to November is critical to target with diamide chemistries. Cane that is above the local hazard level for carry-over may not be carried over and must be harvested this season.

- In summary, this season the decision of which fields to carry over is **critical** due to water stress, flowering and eldana. Therefore, prioritise scouting and surveys to guide spraying in order to prevent unnecessary yield losses next year. Your local Biosecurity Officer or SASRI Extension Specialist can help interpret scouting or survey results and advise accordingly.

Diseases

- Spring and summer are when important systemic diseases such as smut and mosaic become visible. Plan a regular roguing programme and continue this throughout the summer season. It's important to start roguing when the cane is young in order to be able to easily see these diseases. This winter has been particularly warm and dry, therefore smut is likely to be evident in young ratoons from very early in spring. Focus on your intermediate and susceptible varieties.
- Fields with either RSD or high levels of other systemic diseases such as smut and mosaic that have been eradicated **must** be long fallowed to ensure all traces of the previous crop are gone. This could take up to a year, during which time regular inspections are required, but which also provides opportunity for either a green manure or cash crops to be grown.

Area	Smut intermediate and susceptible varieties
Irrigated North	N14, N19, N25, N36, N41
Rainfed	N50, N52, N54, N58 N59, N60, N61, N62

Weeds

- The timing of herbicide application is **critical**. In particular, catching grasses when they are very small, before they have tillered, is priority if you want to avoid problems later on in summer. Ensure that you have sufficient spray capacity to get around the farm in a couple of weeks. Investing in additional spray capacity is well worth it, and minimises the risk of flushes of weeds recurring throughout the summer.
- The creeping grass *Cynodon dactylon* is a major problem in many parts of the industry. If left unchecked, it will eventually expand and smother the cane, forcing an early replant.

Small patches in-field and encroachments from the field edges must be controlled. Hand-hoeing of this grass is a waste of time and money. Repeated sprays of glyphosate are the only effective means of control at this stage. Growers sometimes place marker flags in patches of Cynodon within fields so that they can return to the same areas to spot-spray. If Cynodon is out of control, fields may need to be replanted and longer term imazypr-based herbicide treatments requiring a longer fallow period could be necessary. Consult your SASRI Extension Specialist for advice on the procedure to be followed.

Nutrition

- On sandy soils and those prone to periodic water logging, split applications of nitrogen fertiliser is essential. Whilst often challenging to do, considering that under average conditions less than 60% of N applied makes it into the plant, and under marginal conditions even less. See article on page 7.

- Leaf samples can be taken from November onwards. The efficiency of nutrient uptake is best measured by leaf samples, enabling either top-up applications to be made or revised applications the following season.

- In irrigated regions, take subsoil samples in poor performing fields to check for possible salinity-sodicity problems.

Crop eradication

- Chemical minimum tillage remains the safest and cheapest method of crop eradication. Wherever possible, this method must be used. Remember, minimum tillage is obligatory on erodible soils.

- Before applying glyphosate to replant fields first make sure there has been adequate growth and all tillers have emerged. This will avoid costly and time-consuming roguing of unwanted cane regrowth.

- Plan to incorporate an appropriate green manure crop if fallowing over the summer period.

Consult your SASRI Extension Specialist, Green Manuring manual (www.sasri.org.za/publications) or advisor to select and source an appropriate crop.

- If not already planned, start deciding about fields to be re-established next season. Plan to sample these fields early especially if these fields are likely to require lime and gypsum. This will ensure products are ordered in time to allow for application and incorporation of lime and gypsum **at least 6 weeks before** planting. This is especially relevant where a nematicide is required at planting.

Yellow sugarcane aphid

- Levels of this somewhat elusive and potentially damaging pest declined over winter this year but in all likelihood populations will increase again in spring. The treatment of outbreaks of YSA needs to be considered very carefully and you are encouraged to consult your SASRI Extension Specialist or Biosecurity Officer for advice. See article on page 6.

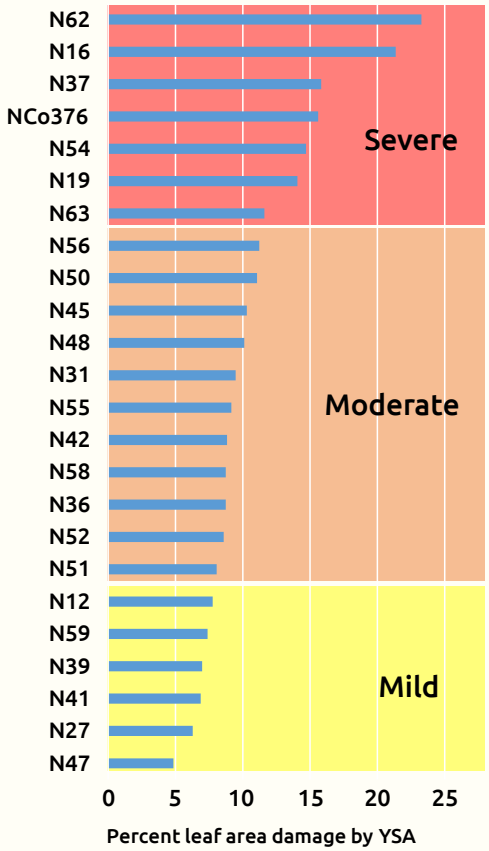
Latest YSA variety ratings!

Malcolm Keeping (Senior Emtomologist)

In order to update the variety ratings for yellow sugarcane aphid (YSA) susceptibility, combined YSA leaf damage data from past and current variety trials in rainfed regions were analysed and are represented in the graphic (right). As limited data were available for irrigated varieties and for rainfed varieties that are infrequently included in trials, these varieties were excluded from the analysis. However, as work in this area is still in progress, data on these varieties, especially the more recently released ones, will be accumulated over the coming seasons. This will allow damage ratings for as many varieties as possible to be updated on an annual basis.

Categories assigned to the updated ratings are "mild", "moderate" or "severe" and reflect YSA percent leaf area damaged as an indicator of relative susceptibility to YSA.

Growers should be especially vigilant and carry out frequent scouting if they have fields with varieties included in the severe category, where the risk of YSA infestation and damage is likely to be high. However, regular scouting as described on page 10, should be conducted in fields of any variety where infestations have been a recurrent event.



Does **YSA** spread **mosaic** and **yellow leaf** in **sugarcane?**

Carla Kistan (Assistant Research Officer) and Sharon McFarlane (Pathologist)

Besides causing damage and yield loss in crops through feeding, some insect pests cause indirect damage by spreading diseases. Aphids are the most common vector (an organism that is able to spread disease) of plant viruses.

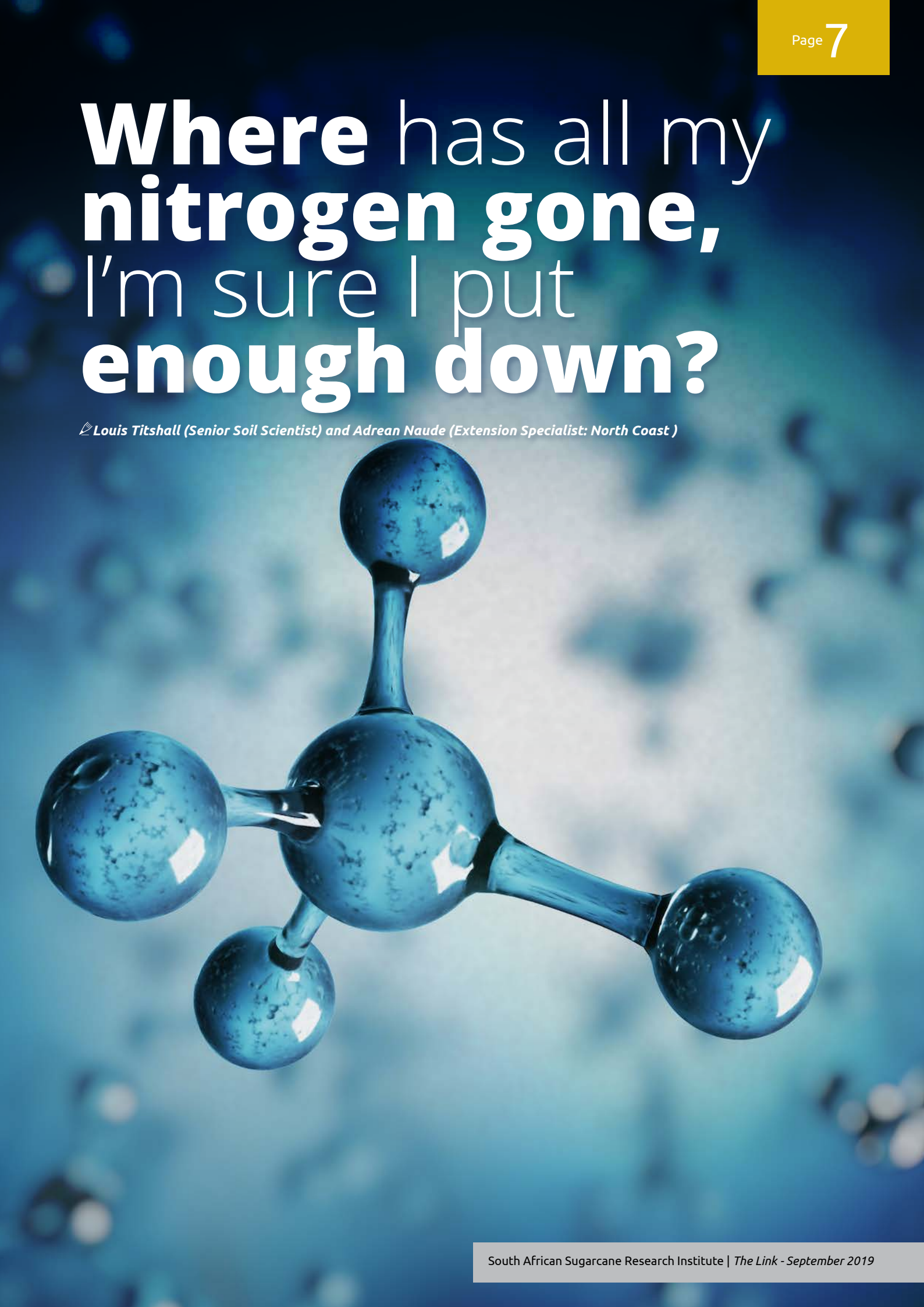
In our industry, the corn leaf aphid is the most common and efficient vector of *Sugarcane mosaic virus* which causes mosaic, a disease that can result in losses of up to 30% in susceptible varieties.

With the recent incursion of yellow sugarcane aphid (YSA – *Sipha flava*), it was important to determine whether this aphid is also a vector of mosaic. In repeated experiments conducted at SASRI, YSA **did not** spread mosaic from infected to healthy plants. Annual disease surveys conducted throughout our industry have also indicated that mosaic levels have not increased since the YSA incursion, despite the presence of high aphid populations in many fields. The severe leaf damage caused by YSA feeding is thought to inhibit the spread of viruses by this aphid in sugarcane.

These results were confirmed in similar experiments conducted in Ecuador recently. Furthermore, research in Hawaii has shown that YSA does not transmit the virus that causes yellow leaf, a disease that is widespread in our industry. The most common vector in this case is the sugarcane aphid, *Melanaphis sacchari*.

Where has all my **nitrogen gone,** I'm sure I put **enough down?**

Louis Titshall (Senior Soil Scientist) and Adrean Naude (Extension Specialist: North Coast)



Nitrogen is an essential nutrient that promotes vigorous growth and sucrose production. However, nitrogen can undergo many transformations in the soil and is very prone to losses. If these losses are not properly managed it will lower the nitrogen use efficiency of the crop as it requires that you need to apply more N (at extra expense) to compensate. This article highlights key N loss pathways and some management approaches to monitor and reduces those losses. The key processes in the nitrogen cycle of a typical sugarcane production system are shown in Figure 1.

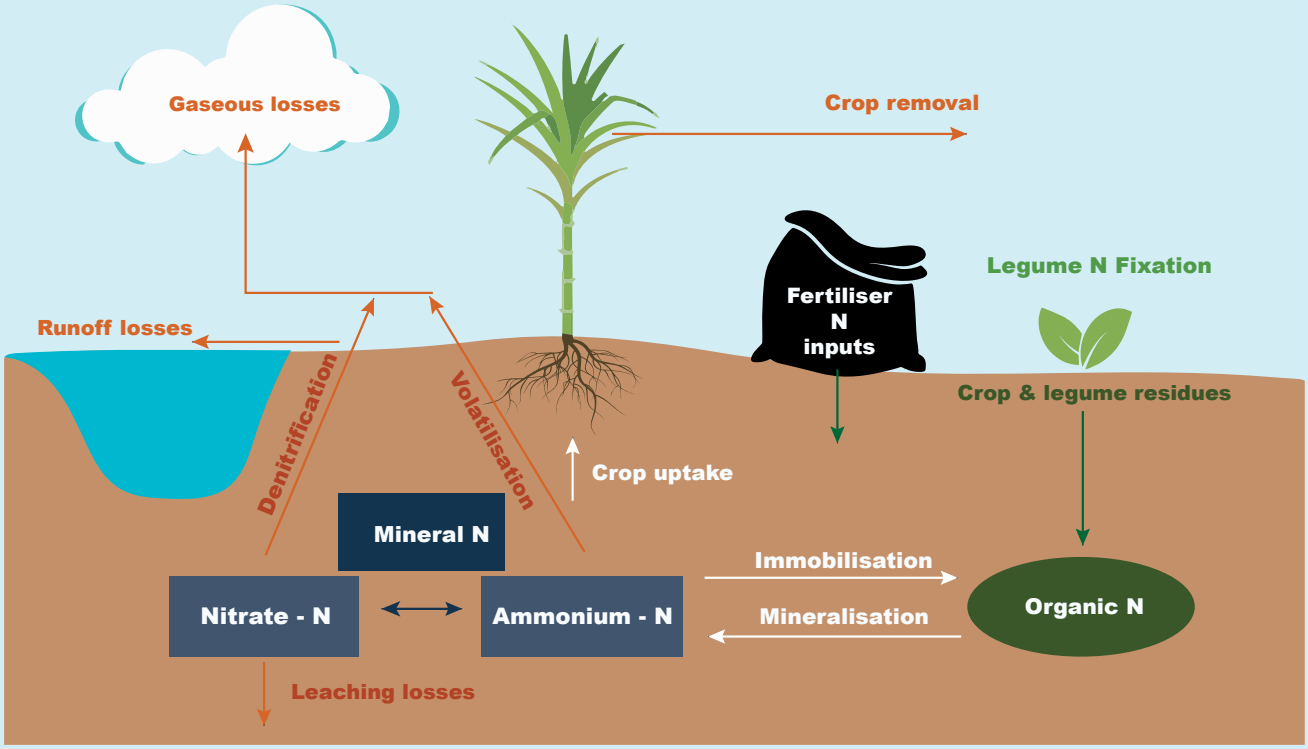


Figure 1. Generalised schematic of N transformations and loss pathways in a typical sugarcane production system.
(adapted from Australian Sugarcane Nutrition Manual 2018)

Nitrogen can be lost in several ways namely; gaseous, leaching and erosion/run-off losses. Gaseous losses are usually associated with ammonia volatilisation (mostly from use of urea) or denitrification (mostly from nitrate-N forms). Ammonia volatilisation occurs under alkaline (pH>7) soil conditions, where ammonia gas is lost to the atmosphere. Denitrification occurs in saturated and poorly drained soils and leads to the conversion of nitrate to nitrous and nitrogen gas. These gases can also be lost to the atmosphere. Leaching losses are usually associated with nitrate leaching from freely draining soil profiles, especially in sandy soils. Erosion and run-off losses are associated with excessive water flow over the soil surface, where applied N can either be dissolved in solution or be lost with soil removal. Leaching and run-off losses are often linked to pollution of dams and rivers. **Table 1** provides some general guidelines to consider to lower the risk of N losses by these processes.

Another consideration is the lock-up and release of N by soil microbes. In soils with high carbon, N availability may be reduced due to lock-up as organic microbial biomass. However, when the microbes die, they will release this N back into the soil. While this N is considered stable and not prone to losses, if the lock-up occurs during periods of high crop demand there may be negative impacts on uptake. On plant cycles, lower N recommendations are given, as the soil disturbance associated with preparing the soil for plant can result in substantial release of N held in organic matter. Planting **legume green manure** crops is also a useful strategy to increase soil N as these plants can convert N gas in the atmosphere to organic N that releases when the green manure is returned to the soil.

Leaf sampling is essential for proper nitrogen management. A leaf sample will also help guide adjustments to the split N application rate. Contact the FAS Agricultural Laboratory for more information on how to submit leaf samples. An alternative method to assess crop response is the use of an N-monitor plot. In small areas of a field, extra N is applied over and above the recommended rate. A positive response indicates that there may be benefit in applying additional N, while no response suggest adequate supply.

For further information and guidance on best practice for N contact your regional Extension Specialist.

Table 1: General strategies and considerations to reduce the risk of N losses.

Loss pathway	Strategies to reduce losses
Ammonia volatilisation	• Consider using nitrate and non-urea based N fertilisers (particularly on sandy soils) or using slow release or urease inhibitor treated urea fertiliser. • Apply N during increased crop demand and when the root system is able to take-up N (preferably when sugarcane is 30 – 50 cm tall as leaves can also absorb ammonia gas). • Split applications improve use by the crop. • Apply with adequate rainfall or irrigation. Attempt to apply N soon before rainfall (or irrigate with >20 mm water). • Avoid applying urea in hot, dry, windy conditions. • Do not surface-apply and leave urea lying on soil or mulch blanket without incorporation (or leaching by rainfall/irrigation of >20 mm). • Do not apply urea to slightly moist soil (as it will react but not leach into soil). • Avoid placing urea in narrow bands or uncovered furrows, rather apply in broad bands over rows or broadcast (either with incorporation or adequate rainfall to get it into the soil).
Nitrate denitrification	• Consider using nitrification inhibitor treated N-fertiliser (to keep N as ammonium form that is more reactive with soil particles). • Split applications improve use by the crop and apply N during high crop demand. • Do not apply N to saturated or ponded soils and avoid applying fertiliser to compacted traffic rows where drainage is poorer than row areas (rather broadcast over row area between traffic lines). • Improve field drainage by developing proper field waterflow and drainage control structures and adopting practices that promote infiltration (green manuring, mulching). • In poorly draining fields, consider planting ridges/mounds with fertiliser applied on ridges.
Leaching	• Consider using ammonium fertiliser forms. • Consider slow release and nitrification inhibitor N fertilisers which can slow rate of leaching. • Apply N during high crop demand and split application, particularly on sandy soils, when root system is able to take up N. • Avoid excessive rates in single application if high rainfall is forecast (or control irrigation rates), particularly on freely draining soils.
Runoff/erosion	• Control run-off from fields by promoting infiltration (soil mulch, proper contours and terrace design, green manuring and organic matter applications). Keep the soil covered, particularly on steeper slopes. • Control excess water flow onto fields to prevent run-off. • Keep grassed headways and roadways to intercept/slow overland flows. • Avoid applying N if excess rainfall is expected or control irrigation rates to avoid run-off.

Scouting for early detection of **aphid presence**

Stuart Rutherford (Principal Scientist: Integrated Pest Management)

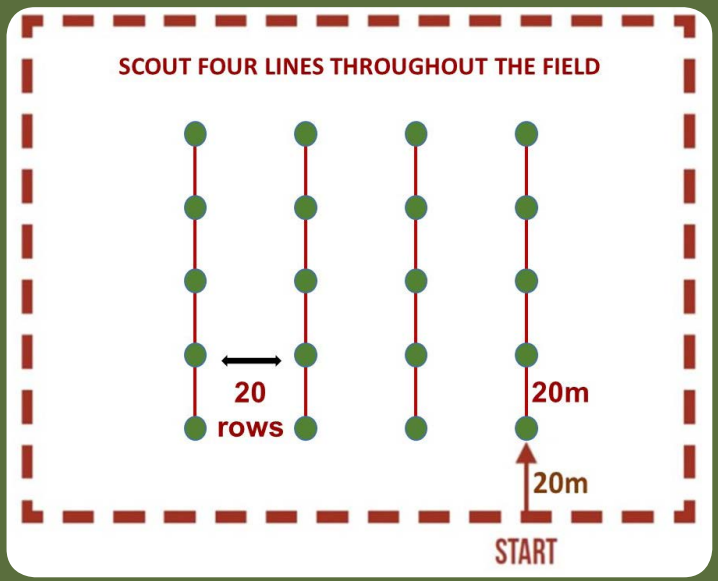
Temperature (optimally mid to high 20s ^{0}C) and low humidity are prime drivers of yellow sugarcane aphid (YSA) outbreaks. Under warm, dry weather conditions in spring, natural enemies are slower to develop and lag behind the aphid. These conditions can also periodically occur during winter.

Select at least two fields for scouting on a farm. These fields should include one that the aphid has first infested in previous years ("early warning") and one considered to be at risk, e.g. a susceptible variety between 2-7 months of age. **Scouting must begin before visible symptoms appear.**

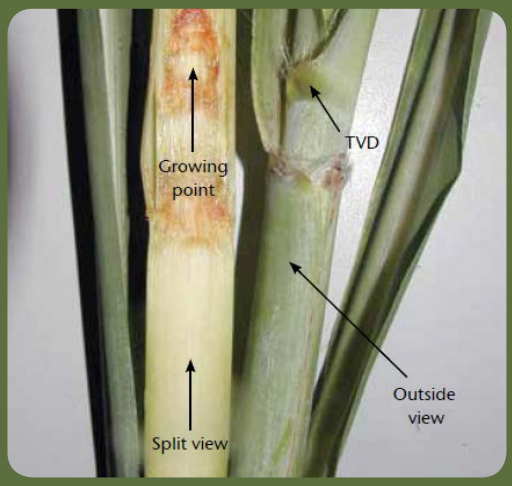
Example of an "early warning" field (where the aphid has repeatedly infested in spring of previous years). Damage symptoms only become visible (as above) when infestations are already intense and the aphid may already have dispersed from these patches.

Scout the fields at two-week intervals. Whilst walking through the fields, take note of any obvious aphid presence.

In the absence of obvious infestation, conduct a more intensive search on a total of 20 stalks from the field, chosen according to the grid pattern shown in the diagram. This is achieved by selecting five rows (at least 20 m apart) and then choosing four sampling points per row (also 20 m apart). At each of these points, intensively search one stalk from the stool.



Inspect all live leaves below and including the TVD leaf. Record presence or absence of the aphid for the stalk as a whole.



*The **TVD leaf** is the uppermost fully expanded leaf that has* a vis*ible dewlap or distinct collar.*

Pace approximately 20 metres to the next stool and repeat.

Scouting to determine the need for remedial action

Once aphid presence has been detected, it is important to determine whether the initial infestation is developing into one likely to cause excessive damage. Factors, that may limit infestations from becoming damaging, include varietal resistance, optimal plant nutrition, reduced plant stress and the presence of natural enemies. Reduced aphid population growth rate allows natural enemies to keep up in terms of their own population growth, further limiting aphid infestation intensity.

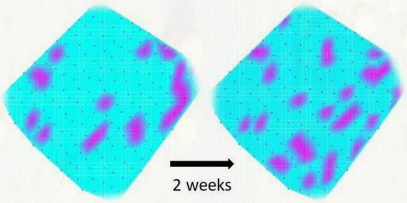
This scouting method requires the determination of percent leaves infested at weekly intervals.

At each of 20 sampled stalks, number of leaves searched and number of leaves infested are recorded. A leaf is infested whenever there is at least an adult aphid and its young together. Note the presence or absence of natural enemies on each leaf as this should influence control decisions.

Calculate the % of YSA infested leaves.

Some general rules developed in Colombia could be applied to guide control decisions:

- If **less than 15%** of leaves are infested then **no control** is recommended.
- If **greater than 30%** of leaves are infested then **control** is recommended taking into account abundance of natural enemies.
- If **between 15 and 30%** of leaves are infested make a second evaluation 7 days later.
- If the infestation has **declined** and/or natural enemies are abundant, then **no control** is recommended.
- If the infestation has **increased** and natural enemies are absent or sparse, then **control** is recommended.
- If the infestation has not changed then make an additional evaluation 7 days later.



This 'heat' map demonstrates aphid movement in infested fields. Aphid infestations are patchy and once a field is infested, aphids move to new patches and other fields. Movement probably depends on population density (overcrowding), predator build-up, and plant decline as a source of nutrition.

Chemical control options

1. Pre-emptive control options – Apply Bandito® GR in furrow or after spring rains in ratoons.
2. Post-infestation – Select a registered foliar insecticide taking into account toxicity to natural enemies.

Seek advice from your local Extension Specialist or Biosecurity Officer.

Field hygiene

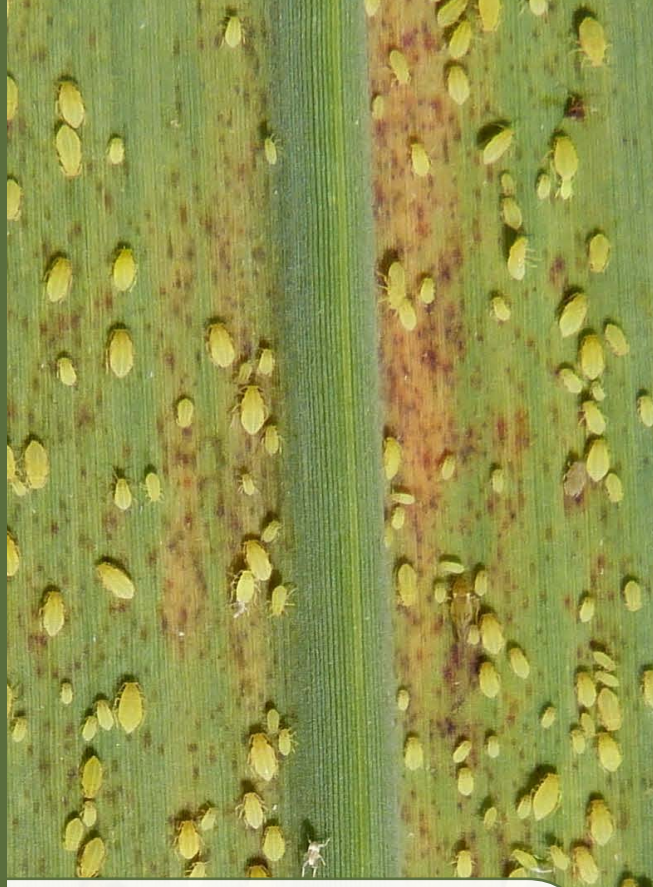
Make sure that scouting staff are mindful of YSA adhering to their clothing during scouting practices, especially if populations are high. The aphid could easily spread to uninfested fields as a result of it being unintentionally carried there on people's clothing. If possible, use disposable clothing or urge staff to cover their clothing in material that can be removed and safely disposed of or contained and washed, after scouting an infested field.

YSA appears to induce early leaf senescence

The apparent preference of YSA for lower leaves suggests that this aphid benefits from leaf senescence. During senescence of older leaves, nutrients particularly nitrogen in the form of amino acids, are recycled to younger plant parts via the phloem. Aphid development benefits from the nutritional enrichment of phloem sap. Once numbers build up sufficiently the aphid itself seems to be able to induce premature leaf senescence through weight of numbers. Environmental conditions, which cause mild plant stress, can also accelerate leaf senescence.

Factors that may pre-dispose fields or patches within fields to early infestation.

- Potassium and phosphorus deficiencies.
- Mild water stress (e.g. due to sub-soil acidity).
- Excess nitrogen.
- Planting susceptible varieties.
- Localised temperature effects, particularly increased night minimums (linked to aspect, slope and the formation of temperature inversions) may promote localised infestations.



What is leaf senescence?

This is the deteriorative changes that occur in the leaf and constitutes the final stage of leaf development – similar to ageing. In terms of the life stages of the plant, this is a critical process for the plant's fitness as it indicates nutrient relocation within the plant and increasing plant maturity.

What is phloem?

Phloem is the part of the plant's vascular tissue responsible for the transport of sugars and other molecules such as the amino acid building blocks of proteins.

IDENTIFYING AND ADDRESSING SOIL COMPACTION

Rian van Antwerpen (Senior Soil Scientist) and Neil Miles (ex-Senior Soil Scientist)

Compaction is one of the most common soil-related limitations in agriculture and can be a serious yield-limiting factor in crop production. Since compaction is below-ground and thus not visible, its role in yield decline often goes unnoticed.

Soils are compacted by several external forces of which the most common is infield traffic. Importantly, soil compaction should be distinguished from stool damage, which is caused by traffic driving directly over the cane stools. While compaction can be alleviated, damage to stools permanently lowers crop production potential.

Soil types

Soils vary in their susceptibility to compaction. Soils with higher sand and silt contents are more vulnerable to being compacted than loam and clay soils. In addition, higher levels of organic matter render soil less compactable; thus, humic soils and soils treated with fresh organic matter are less prone to compaction.

Causes

Farm management practices that promote compaction include the following:

- **Intensive tillage**. Tillage may temporarily loosen the soil; however, in the long-term regular tillage depletes soil organic matter making the soil more prone to compaction. In addition, implements such as the mouldboard plough and disk harrow compact the soil beneath their working depth resulting in the development of plough pans (Figure 1).
- **Wheel traffic**. The wheels of vehicles used to harvest crops, pull implements and apply fertilisers, lime and other products are the biggest causes of soil compaction (Figure 1). The image in Figure 2 clearly shows the detrimental effects of tillage and wheel traffic on soil structure and porosity.

Importantly, soils are most susceptible to being compacted when they are wet. Unfortunately, timing of farming operations, such as harvesting and fertilising, often render it difficult to exclude machines from soils when wet.

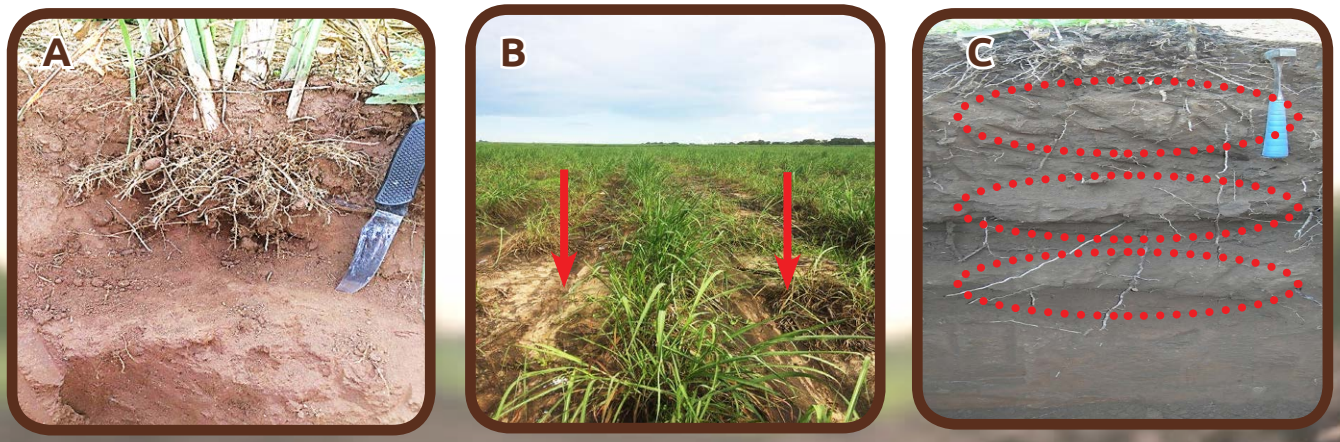


Figure 1. (A) Plough pan at a depth of approximately 30 cm in a sugarcane field. (B) Evidence of the effects of compaction and stool damage by heavy wheel traffic on the growth of ratoon cane with the centre row unaffected; rows on either side damaged and compacted by tractor and trailer wheels. (C) A soil profile with three compacted layers.

Figure 2: The effect of tillage and wheel traffic on topsoil structure and porosity under long-term sugarcane monoculture (left), compared to an adjacent permanent grassed area (right)

Effects of compaction

Detrimental impacts of compaction on soil health and plant growth are due largely to the decrease in the proportions of macro-pores in compacted soils. Effects associated with this include the following:

1. Root penetration into deeper soil layers is restricted.
2. Water infiltration and water-holding capacity of soils are reduced.
3. Nutrient uptake by roots is poor in compacted soils.

Identifying compaction in the field

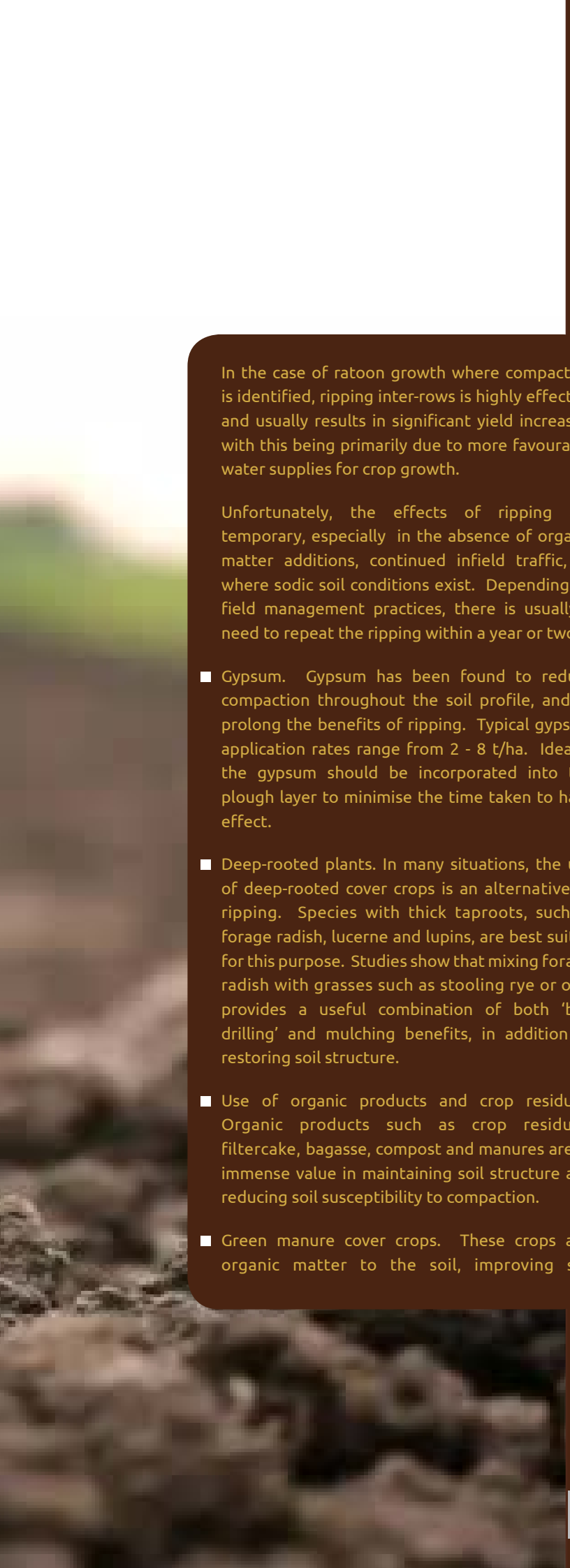
Compacted layers may be identified in three ways:

1. Use of a **penetrometer** or a steel probe. Notice the degree of difficulty in pushing it into the soil.
2. Examining the profiles in **soil pits** for compacted layers (Figure 1 C).
3. **Sending samples** of clods from the profile to the soil physics laboratory at SASRI for comments on the severity of the compacted layer.

Correcting soil compaction

Where compacted layers are identified, corrective action must be undertaken immediately as it reduces root distribution, often leading to yield losses. In the short-term, this usually involves ripping; however, a number of options that complement ripping are also available:

- Ripping. Chisel ploughs (rippers) effectively fracture compacted layers, allowing roots to penetrate to depth. For row crops, ripping under the row before planting has been shown to be highly effective in compacted soils.



In the case of ratoon growth where compaction is identified, ripping inter-rows is highly effective and usually results in significant yield increases, with this being primarily due to more favourable water supplies for crop growth.

Unfortunately, the effects of ripping are temporary, especially in the absence of organic matter additions, continued infield traffic, or where sodic soil conditions exist. Depending on field management practices, there is usually a need to repeat the ripping within a year or two.

- Gypsum. Gypsum has been found to reduce compaction throughout the soil profile, and to prolong the benefits of ripping. Typical gypsum application rates range from 2 - 8 t/ha. Ideally, the gypsum should be incorporated into the plough layer to minimise the time taken to have effect.
- Deep-rooted plants. In many situations, the use of deep-rooted cover crops is an alternative to ripping. Species with thick taproots, such as forage radish, lucerne and lupins, are best suited for this purpose. Studies show that mixing forage radish with grasses such as stooling rye or oats provides a useful combination of both 'bio-drilling' and mulching benefits, in addition to restoring soil structure.
- Use of organic products and crop residues. Organic products such as crop residues, filtercake, bagasse, compost and manures are of immense value in maintaining soil structure and reducing soil susceptibility to compaction.
- Green manure cover crops. These crops add organic matter to the soil, improving soil structure and reducing the compactability of soils. Grasses such as oats, wheat, barley and stooling rye, have dense ramified root systems that have beneficial effects on soil structure.
- Earthworms. Frequently overlooked is the valuable role of earthworms in combating soil compaction, particularly under no-till cropping and 'green-cane' harvesting. When soil acidity problems are addressed through liming, and residues are maintained on the surface as a food supply, earthworms thrive and their burrows promote water infiltration, aeration and provide channels for root growth and extension.

Prevention of soil compaction

The following are important strategies for avoiding the development of compacted layers in fields:

- Controlled traffic is first prize! Restrict all wheel traffic to previously designated lanes, thereby keeping 70% or more of the field free from compaction.
- Limit tillage operations and passes of heavy equipment over fields, and use wide flotation tyres wherever possible.
- Do not allow soils to be trafficked when wet.
- Avoid tilling soil when wet.
- Keep the surface protected with residue at all times. This will prevent the formation of crusts and favour the proliferation of the all-important earthworms.

WEATHER

Phillemon Sithole *(Agrometeorologist)*

Review

Winter (May to August) rainfall for 2019 was well below average across the industry, with an industry average of 30% of the long term mean for that period (Fig. 1). The severity of the dry winter conditions was similar to what was experienced during the 2010 and 1992 droughts especially for the rainfed KwaZulu-Natal regions.

Irrigation water supply, however, was generally stable except for supplies from the Goedertrouw dam in Zululand which remained severely restricted.

Outlook

The El Niño-Southern Oscillation (ENSO) is currently in a neutral state and is expected to remain in this state through the 2019/20 summer season. This will have little impact on rainfall over eastern South Africa. The *South African Weather Service, European Centre for Medium-Range Weather Forecasts* and *International Research Institute for Climate and Society* all predict normal rainfall during the spring and early summer months (September to November) with increased chances of above average rainfall from mid-summer (November 2019 to January 2020) especially for the rainfed parts of the industry.

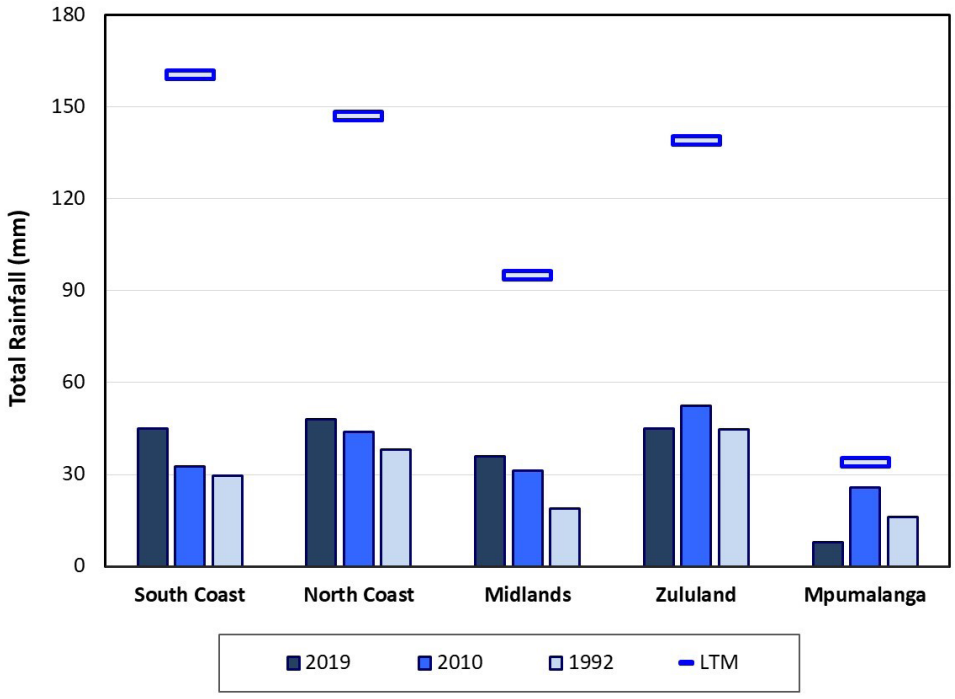


Figure 1: Regional average total rainfall for winter (May to August) 2019 compared to past drought years (2010 and 1992) and the long term mean (LTM) for the same period.

Please visit the SASRI weather web http://portal.sasa.org.za/weatherweb/ for links to up-to- date seasonal climate forecasts and also for the latest rainfall and other weather data.

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