SOIL ACIDITY IN THE MALKERNS AREA (*CONTINUED*)

Liming Material

- Dolomitic lime (contains Mg and Ca)
- Calcitic lime (contains Ca)
- Calcium silicate (contains Ca and Si)

For more information growers are advised to contact their respective Extension Officers or SSATS.

By Justice Mabuza (Extension Officer—Malkerns) & Njabulo Dlamini (Crops Agronomist)

APHIDS INVASION

An infestation of aphids was reported by Tambankulu at the end of October. Following this report, SSATS contacted other growers and extension officers throughout the industry to ascertain how wide spread this problem was in the industry. The only grower who responded and confirmed this problem was RSSC. Other smallholder growers at Malkerns and Big Bend confirmed having encountered aphids in their fields during a P&D training session held on the 19th to 21st November 2013. The report by Tambankulu, and confirmation by RSSC and smallholder growers at Malkerns and Big Bend gives the indication that this problem is wide spread.

The infestation of aphids is an add-on on already existing biosecurity threats facing the industry, i.e. thrips since 2005, African rust 2009, locusts 2011 and the constant threat of *Chilo*. The question is, what has changed? A good guess would be 'climate changed'.

Symptoms of aphids attack

Spread of Aphids

Active nymph movement is the primary cause of dispersal within and between fields. Wind also plays a major role in the spread of aphids. Ants are another mode of spread. Ants are attracted to the honeydew excretion and help in spreading the nymphal stages of the aphids from one field to another. The transportation of infested cane and planting of setts with infested leaves will also spread aphids.

Management

Various management practices could help curb aphids infestation and damage.

- Keep field surroundings clean and in particular remove alternate hosts like *Cynodon dactylon* to prevent breeding of the aphids.
- Do not use infested seed material when planting.
- Do not exceed nitrogen fertilizer application.
- Movement of infested seed material, green leaves or trash from infested areas should be avoided.
- Crops under shaded areas should be inspected at least once a week when aphid infestation has been spotted on some parts of the farm.
- Finally Bandit applied in the furrow at planting would control aphids including the new product, Allice applied on the foliage.

Growers are still expected to inspect their fields for aphid problems and report to SSATS and their Extension Officers.

By Duma Zwane (Crop Protection & Extension Officer)

Aphids in sugarcane

Aphid Damage of Sugarcane

The species most likely involved is *Melanaphis sacchari.* Aphids attack sugarcane in large numbers and are usually found on the lower surface of the leaves. They usually stay on the leaf on which they landed feeding by sucking until that leaf is almost dead before moving on. This is the reason why at inception they are found only in one leaf per plant as was the case at Tambankulu.

The sucking of the leaves leads to stunted growth and the aphids' waxy secretion results in yellowing of the leaves. When looking at the cane crop from outside the field, the yellowing of the leaves could be mistaken for nitrogen deficiency. It is only when one goes into the field that it becomes apparent that every yellow leaf has plenty of aphids on the lower surface. Copious amount of honey dew excreted covers the entire surface of the leaves leading to growth of sooty mould, which ultimately inhibits photosynthesis.

SWAZILAND SUGAR ASSOCIATION TECHNICAL SERVICES

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Soil acidity

"Soil acid conditions also impact negatively on soil biological activity."

Aphids

"Aphids attack sugarcane in large numbers and are usually found on the lower surface of the leaves."

ENHANCE SUCROSE YIELD BY CHEMICAL RIPENERS

Planning

It is hoped that with the early season ripening period drawing closer growers have finalised their ripening programme. Those applying ripeners by means of fixed-wing aircrafts have already signed agreements with reputable service providers, stating in clear terms their requirements and expectations.

Growers using knapsacks and hand-held spraying rigs/booms must have adequately serviced their equipment and correct nozzles sourced from reliable suppliers. Equipment calibration is a must, and needs to be done early enough to accommodate any need for changes or further repairs arising from the exercise. Growers have to put a good system or practice in place to periodically check working condition of spraying equipment.

Training of all operators is very important, and they must never be allowed to proceed with spraying without the necessary protective equipment. It is critical for growers to provide all the necessary mixing equipment such as graduated cylinders/beakers and designated mixing containers. Clean water must be used at all times. Chemical containers must be triple rinsed and punctured as per standard procedure before storage. Measuring and mixing equipment to be thoroughly washed after every spraying event. Thus operators must be made aware of all these.

The demand for ripening products might rise as the season begins. Growers are therefore advised to check with suppliers the availability of ripening chemicals. In some organizations, the processing of a purchase order can be a cumbersome task, and growers are familiar with their own situations thus this must be taken into consideration when planning to buy the required chemical. REMEMBER: In farming, nothing should ever be left to chance, planning and preparation are essential.

Why Apply Chemical Ripeners?

In simple terms, the accumulation of sucrose (natural ripening) in cane stalks is dependent on the prevailing environmental conditions at which the crop is growing at any given point in time. Conditions such as warm temperatures, adequate soil moisture and longer day length favour vegetative growth and they do not promote the natural ripening of sugarcane. These conditions normally occur at the beginning (early) and towards the end of the crushing season (late). To counter the effect of such conditions, chemical ripeners are used. Chemical ripeners produce best results in vigorously growing and high yielding crops that have been optimally fertilised and carefully managed from crop start to harvest.

Once environmental conditions that favour natural ripening kick-in, the value of ripener applications decreases substantially. These conditions include drought stress, nutrient stress, low temperatures and shortening of day length. Applying ripeners on an already matured crop is not recommended. Another important factor that affects the efficacy of chemical ripeners is varietal differences. It is very well established that varieties respond differently to chemical ripeners.

Benefits of Chemical Ripeners

The active compounds in the chemicals are absorbed through the leaves and cause chemical suppression of new leaf or stalk tissues. Although chemical ripeners may reduce photosynthetic rates (expressed on a leaf area basis), it is known that the chemical suppression of new stalk and leaf growth is far greater, therefore lowering the sink demand for sucrose. In simple terms, this allows energy that would have ordinarily been used for vegetative growth to be diverted to the storage of sucrose. This therefore accelerates sucrose storage within the stalk, which in turn improves juice purity and sucrose content. At the

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ENHANCE SUCROSE YIELD BY CHEMICAL RIPENERS (*CONTINUED*)

same time the fibre content is also often reduced. Ideally, a good chemical ripener should enhance sucrose yields in a rapid, persistent, consistent and economic way without damaging the sugarcane crop and the following ratoon crop. Research indicates that a sucrose yield response of 0.1 to 0.3 MTs/ha is sufficient to cover the cost of the chemical and its application. In addition, indirect benefits from chemical ripening include better burns, easier topping, less extraneous material sent to the mill and reduced wear and tear on post-harvest equipment.

Chemical ripeners

Currently, there are two registered chemicals that are used in the industry for ripening purposes namely, Ethephon (*2-chloroethyl phosphonic acid*) and Fusilade Forte or Volley (*fluazifop-p-butyl*). These ripeners can be used as either a single treatment or a combination (piggy-back or tandem) treatment depending on the cane variety.

1. Ethephon

Ethephon is a highly effective chemical ripener when applied to immature sugarcane in summer/autumn (January-May) to crops with juice purities of less than 75 %. It reduces the size of new leaves by 40% to 50%. This then means the plant needs less sucrose for leaf growth and can store more sucrose. The ripener has little effect on stalk elongation as it mainly works on the leaves, producing short, stubby leaves at the top of the stalk. In short, ethephon when used for ripening and applied at recommended rate does not reduce cane yields.

Application rate

When applied alone, a rate of 1.5 l/ha is recommended. However, if an anti-evaporant such as Li700 is used, the rate can be reduced to 1.35 litres/ha.

Time of application

Ethephon should be applied not less than 10 weeks and not more 20 weeks before harvesting. The longer periods are used provided low temperatures are expected to set in and affect the efficacy of the chemical. Otherwise the warmer the temperatures, the quicker the response to ethephon and the shorter the spray to harvest interval. Spraying in May can only proceed provided the temperatures are warmer.

2. Fusilade Forte (or Volley)

The difference between Fusilade Forte and Volley lies on the concentration of the active ingredient (ai) in each. Fusilade Forte has 150 g/l ai while volley contains 125 g/l ai. Fusilade is a herbicide that is also used to eradicate sugarcane and as a grass killer. At very low concentrations it is a highly effective chemical ripener. Once taken up by the leaves, it is metabolised to a more active form, which targets the stalk's apical growth point, where it gradually terminates stalk elongation. Although it frequently kills the leaf spindle, it doesn't affect mature leaves. These remain green, functional and keep on producing sucrose for storage, provided the correct recommended application rate is used.

Application rates

The application rates for sugarcane ripening with Fusilade Forte are 0.200 to 0.225 l/ha for ground spraying and 0.225 to 0.250 l/ha for aerial spraying. Ongoing field trials indicate that Volley may be used at conservative rates of 0.250 to 0.275 l/ha for ground spraying and 0.275 l/ha to 0.300 l/ha for aerial spraying. In comparison, Fusilade Forte appears to perform better than Volley (although this is still being verified).

Time of application

For early season ripening, Fusilade Forte can be applied any time between late February and May, depending on the scheduled harvest date. The latest date for spraying will vary with weather conditions and crop growth. If winter is early, spraying may stop at the end of April but in a warmer year it can continue to the end of May. The optimum spray to harvest interval is 6 to 8 weeks. Fusilade Forte restricts cane growth and harvesting must take place within the recommended time period, or cane and sucrose responses may be reduced, or lost completely. Fusilade Forte should be applied when the juice purity is below 85%.

Combination Treatment

Varieties that respond favourably to ethephon and Fusilade Forte individually tend to respond even better to a combination treatment of both chemicals applied 4 to 6 weeks apart. Accordingly, this treatment is recommended for varieties NCo376, N19, N23, N26 and N36. N25 responds positively only to Fusilade Forte application.

Crop Condition at Spraying

Best ripener results are obtained when crops:

- Are immature and vigorously growing with the potential to continue active growth for at least a further 3 to 4 weeks.
- Have at least 8 green leaves per stalk.
- Show no signs of moisture and nutrient stress.
- Are free of pests and disease problems.
- Are less than 25% flowering & not lodged.
- Have less than 75% juice purity for ethephon application and less than 85% for Fusilade application.

Moisture stress should be avoided for at least 3 to 4 weeks after application of ripeners to obtain best results. Normal drying off procedures can then be followed.

For more information, Growers are advised to contact their respective Extension Officers or SSATS.

By Njabulo Dlamini (Crops Agronomist)

SOIL ACIDITY IN THE MALKERNS AREA

Background

Soil science literature indicates that the ideal pH for optimum sugarcane production is 5.5 to 6.5. However, a majority of the soils in the Malkerns area have pH values way below this range, some having pH values as low as 4.0. Malkerns growers have been sensitized to take soil samples for testing not only to get fertilizer recommendations, but also to establish the status of their soils regarding soil pH and liming needs. No matter how good a sugar cane crop is managed, but if soil acidity issues are ignored, good yields may not be realized.

Effect of soil acidity

On very acid conditions, Aluminium (Al) and Manganese (Mn) contained in clay particles become more soluble, making them toxic to plant roots and therefore limiting root growth. This may drastically reduce yields through the restriction of water and nutrient uptake.

Soil acid conditions also impact negatively on soil biological activity. Evidence of this is the slow break-down of surface applied organic matter such as trash on acid soils. Furthermore, most beneficial earthworm species are sensitive to soil acidity.

Soil analysis results

The issue of soil acidity is so serious in the Malkerns area such that soil samples from one of the farms had to be taken to SASRI for topsoil and subsoil acidity analysis among other things. These samples were taken from 3 fields scheduled for ploughing-out. Table 1 below shows the pH values for the soil samples. It is clear from the table that acidification was more severe on the topsoil (where majority of cane roots are found) compared to subsoil.

Table 1: Topsoil and subsoil pH values (CaCl) in a Malkerns farm.

	0 - 20 cm	20 - 40 cm	40 - 60 cm	60 - 80 cm
Field 1	4.38	4.60	5.11	5.22
Field 2	4.49	4.56	4.81	4.66
Field 3	4.45	4.64	4.91	5.31

Fields 1 and 3 were recommended for lime (dolomitic) application as a result of acid saturation (exchangeable acidity [Al + H]/ total cations) being greater than 20% and Calcium (Ca) levels below the 300 mg/L threshold within the topsoil.

Table 2 below shows the exchangeable cations (Ca and Mg) concentration within the soil profile in the same fields. The table indicates that the Ca concentration trend assumed a downward-facing curve (⌒) as one samples down the profile. The table also shows that Mg content increased with increasing soil depth. This is a clear consequence of continuous mining of these elements by successive crops without any means of replenishing the soil.

Table 2: Ca and Mg values down the soil profile in a Malkerns farm.

	0 - 20 cm	20 - 40 cm	40 - 60 cm	60 - 80 cm
Field 1 (mg/L)				
Ca	299	337	362	347
Mg	96	121	126	160
Field 2 (mg/L)				
Ca	587	743	395	306
Mg	110	122	133	133
Field 3 (mg/L)				
Ca	216	267	379	339
Mg	79	101	131	145

Soil analysis results of these fields disclosed silicon (Si) levels below the threshold value of 15 mg/L (Table 3). This confirms literature reports that silicon availability decreases with decreasing soil pH. Several research findings have demonstrated that silicon (although not an essential plant nutrient) plays a pivotal role in enhancing plants defence mechanism against pests such eldana. Table 3 shows that silicon content decreased with increase in soil depth on this farm.

Table 3: Silicon soil results for a Malkerns farm.

	0 - 20 cm	20 - 40 cm	40 - 60 cm	60 - 80 cm
Field 1	13	7	4	3
Field 2	10	7	5	4
Field 3	8	6	3	2

Soil pH and nutrient availability

- Soil pH influences nutrient availability:
- In soils with low pH, the supplies of Calcium, Magnesium and Potassium are often very low for plant growth.
- Low soil pH reduces the availability of soil phosphorus reserves.
- Low soil pH diminishes the solubility of molybdenum.

Correction of soil acidity

The cost effective way of addressing soil acidity is liming. Noteworthy is that gypsum is also used to correct subsoil acidity due to its mobility in the soil. For proper recommendations on the type of material and application rates, growers are encouraged to take soil samples and send them to SASRI, FAS laboratory.

Benefits of liming

- Eliminates toxicity of Al and Mn.
- Promotes better rooting thus improving moisture and nutrients uptake.
- Supplies Ca and Mg for plant growth.
- Improves nitrogen supply from legumes and soil organic matter.
- Can be used to supply silicon
- Stimulates soil fauna (e.g. earth worms).

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