SWAZILAND SUGAR ASSOCIATION TECHNICAL SERVICES

EXTENSION NEWSLETTER

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Contact SSA Technical Services for further advice on ripeners. Tel 383 8998.

Ripeners for N25

SSA trials have repeatedly shown that N25 does not respond reliably to ethephon either alone or in combination with Fusilade Super under common dry-off conditions. Ethephon is therefore not recommended for ripening N25. Use Fusilade Super only at a rate of 0.35 l/ha.

CHEMICAL RIPENER RECOMMENDATIONS

As we wrap up the 2003 harvest season, it is time to turn our thoughts to the 2004 ripening campaign. Early season ripener recommendations for our main varieties are summarized below. During the past year, SSATS has conducted trials with Gallant Super and has summarised past results to confirm recommendations for N25. Results of both exercises are included in this article.

Varieties

Varieties differ in their response to chemical ripeners. Experiments are conducted annually to refine recommendations for the newer varieties, and up to date information can be obtained from SSA Technical Services. Current recommendations for approved varieties are given in Table 1 overleaf.

Ripeners

Ethephon and Fusilade Super are the two chemicals used to ripen sugarcane in Swaziland. Ethephon releases the plant hormone ethylene that acts as a growth retardant but has no permanent effect on the growing point of the plant. Fusilade Super is a non-hormonal ripener that causes permanent damage to the growing point of the plant. Application rates and timing of application for Ethephon and Fusilade Super are described in detail below.

Ethephon

Ethephon (sold as Ethrel, Ethephon, Ripenit or Ethapon) is used for ripening sugarcane early and mid season only. It is suitable for NCo376, N19 and N23, especially when followed by treatment with Fusilade Super (see below). It is not suitable for N14 or N25 under common commercial conditions.

Side effects When used for ripening, ethephon does not reduce cane yields. This is an advantage when the date of harvest may vary due to unavoidable factors, such as changes in rates of cane delivery to the mill. Ethephon application causes yellowing and premature senescence of the lower leaves. The symptoms are more severe the greater the moisture stress at the time of application but usually have little effect on yield.

Application rates When applied alone a rate of 1.5 l/ha ethephon (product) is recommended. If an anti-evaporant, such as Downrite, is added to aerial spray mixtures the rate can be reduced to 1.35 l/ha.

Timing of application Ethephon should be applied between 10 and 20 weeks before harvest, depending on the time of year and whether treatment is to be combined with Fusilade application (see below). As a general rule, ethephon works fastest in the higher temperatures of February/March and slowest towards mid-winter. Spray to harvest intervals are increased in winter to give the chemical more time to take effect. Spraying usually stops in May, depending on weather conditions. If a follow-up treatment of Fusilade Super is to be applied, the spray to harvest interval for Ethephon should not exceed 17 weeks. For N19, the spray to harvest interval should not exceed 12 weeks, whether or not Fusilade is to be applied. Contact SSA Technical Services for a full schedule of spray to harvest intervals or look in the Swaziland Sugarcane Production Manual (pages 101 and 103).

Fusilade Super

Fusilade Super is normally used as a herbicide in other crops but at low rates it can be used to ripen sugarcane, both early and late season. All of the varieties currently used in Swaziland respond to Fusilade although some respond better with minor variations in application rate or timing (see below). Ripening responses of varieties NCo376, N19 and N23 can be improved by applying Fusilade to crops that have already been treated with ethephon.

Side effects Fusilade restricts cane growth and harvesting must take place within the recommended time period. Otherwise sucrose yield responses will be either reduced or lost completely. Young sugarcane is particularly sensitive to Fusilade and severe damage will occur if the chemical drifts onto young crops adjacent to the field being treated.

Application rates

NCo376, N19, N23:	0.35 - 0.45 litres / ha
N14:	0.45 - 0.6 litres / ha
N25:	0.35 litres / ha

For all varieties apart from N25, the higher rate should be used when the date of harvest can be guaranteed and when a good burn is desired. The lower rate affects growth less and should be used when harvest dates are likely to be delayed. Agral 90 is recommended as a wetter/sticker at a rate of 4ml to every 10 litres of spray mixture.

Timing of application Early season spray to harvest intervals in a normal year range from 6 to 8 weeks for a crop harvested in early April. As the winter approaches and temperatures fall, treatments require longer to work and spray to harvest intervals for a crop harvested in early August are

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normally 11 to 12 weeks. For variety N19, the spray to harvest interval should not exceed 10 weeks, while for N14 the standard spray to harvest interval should be increased by one to two weeks. Contact SSA Technical Services for a full schedule of spray to harvest intervals or consult the Swaziland Sugarcane Production Manual.

Combination Ripener Treatment

While varieties NCo376, N19 and N23 respond favourably to ethephon and Fusilade Super individually, they tend to respond even better to a combination treatment of both chemicals applied 4 to 6 weeks apart. The terms Piggy Back and Tandem are also used to describe the combination treatment.

There should always be at least four weeks between Ethrel and Fusilade application dates. Ethephon can be applied earlier on N19 when the combination treatment is used because the ripening response is maintained for longer. A full schedule of spray to harvest intervals for the combination treatment is available from SSA Technical Services. Alternatively, look in the Swaziland Sugarcane Production Manual (page 102).

Gallant Super

Gallant Super has a similar mode of action to Fusilade Super and was registered as a ripener for sugarcane in South Africa in 1998. SSA trials in 2003 indicated that at registered application rates, Gallant is not as effective as Fusilade (see Extension Newsletter 3rd Quarter 2003). More trials are scheduled for 2004 to investigate higher application rates.

Crop condition

Cane should be immature, growing vigorously and be free of moisture or nutrient stress at the time of application. The potential for vigorous growth should prevail for at least 3 to 4 weeks after application. If these conditions cannot be met there will be little or no benefit from applying ripeners. The best measure of maturity is the juice purity of the cane, and when available this can be used as a reliable criterion for ripener application. For best results juice purity should be less than 75 % for Ethrel application and less than 85 % for Fusilade application. The following tips can also be used:

- If there are less than 8 green leaves per stalk, the cane is likely to be under stress and should not be sprayed.
- Lodged or flowered cane will not respond well to ripeners.
- Long top internodes are a sign of vigorous growth and a promising response to ripeners.
- Check that there are no signs of nutrient deficiency or pest and disease problems before spraying.
- Ensure that irrigation scheduling for the field to be sprayed is up to date. Moisture stress should be avoided for at least 3 – 4 weeks after the application of ripeners to obtain the best results. Normal drying off procedures can then be followed, according to the soil type and its moisture holding capacity.

Selection of fields

The selection of fields for chemical ripener application should be based primarily on the harvesting schedule, which is determined by the grower's harvest estimates and his commitments for cane delivery to the mill. The variety of sugarcane grown in each field determines which chemical ripener treatment should be used and when it should be applied. Before ripener application the field should be thoroughly inspected to ensure that the crop is in a suitable condition to respond. If conditions are poor, the field should not be sprayed.

Application methods

Ripeners are most commonly applied by air, which is a method well-suited to the large, regularly shaped fields common in the industry. There are crop sprayers and air fields available in all mill areas. Smaller fields and lower cane delivery rates are better suited to knapsack sprayers, provided calibration is carried out carefully in advance. This is especially important for non-hormonal ripeners and growers should contact SSA Technical Services for advice on equipment and labour needs before using this method (tel 383 8998). Because ethephon does not destroy the growing point of the stem, spray to harvest intervals are more flexible and adjoining small fields due for harvest over a period of three to four weeks can be grouped together for a single application date, making aerial application more feasible.

Burning and topping ripened cane

Ripened cane will have smaller green tops than unripened cane and will usually burn better as a result. The combined effects of ripeners are greater in the younger (top) portions of the stalk than in the older (bottom) portions of the stalk. To get the full benefit of ripeners, treated cane should be topped higher than untreated cane. Do not attempt to use the aircraft to top standing cane (Figure 1).

Variety	Ripener		
	Ethephon	Fusilade	Combination
NCo376	Y	Y	YY
N14	N	Y	N
N19	Y	Y	YY
N23	Y	Y	YY
N25	N	Y	N

Y	Recommended
YY	Highly recommended
N	Not recommended

Table 1: Ripener recommendations by variety. See text for application rates.

Figure 1: Do not attempt to use the aircraft to top standing cane.

When to Apply Gypsum

Soil salinity or sodicity refers to the build up of salts in the root zone, which can have a negative effect on soil structure and crop growth. Problems with salts are associated with poor quality irrigation water, over-irrigation, inadequate drainage or inherent soil properties. Signs of salinity often develop as patches of poor growth or visible salt deposits in old watercourses or bottomlands. With continued over-irrigation and poor drainage, the patches grow until large field areas are affected. There are three types of saline or sodic soils:

Saline soils contain high concentrations of magnesium (Mg) and calcium (Ca) and lower concentrations of sodium (Na). Soil pH is less than 8.4. Soil structure is not affected, but white crusts of salt appear on the soil surface or the sides of open drains. Leaf edges and tips often appear "burnt".

Sodic soils have a high concentration of sodium, a pH higher than 8.4 and poor structure because of the swelling effect of sodium on the clay minerals. Damp oily surfaces devoid of vegetation are typical of sodic conditions.

Saline-sodic soils contain high concentrations of sodium and are therefore also poorly structured. However, pH is less than 8.4 and their appearance and properties are similar to those of saline soils except that they tend to be more prone to waterlogging.

Prevention of salinity and sodicity

When faced with the risk of saline or sodic conditions occurring, it is important to realise that **prevention is much cheaper than cure**.

The build up of salinity and sodicity can be prevented with careful management of drainage and irrigation (see Page 4). When developing new land, use old watercourses as natural drainage lines and avoid cropping them, especially where salt accumulation is already evident.

Irrigation should be scheduled properly and applied efficiently. Irrigation water should not contain a high proportion of Na, or have a pH greater than 8.4, or sodic soil conditions are likely to develop over time. Water quality can be determined by most agricultural laboratories – contact SSA Technical Services for more details.

The salinity or sodicity hazard of different soil types varies according to their physical properties. The build up of saline or sodic conditions can be avoided by favouring the development of soils with a low salinity/sodicity hazard. Details are given in the Swaziland Sugarcane Production Manual (Chapter 3). Even where the salinity hazard is moderate, adequate drainage is essential to permit effective leaching of salts from the soil. Good drainage will also ensure that water does not move into the area from up the slope. Although the installation and maintenance of drains is expensive, it is essential to sustainable irrigated agriculture.

Reclamation of saline and sodic soils

The reclamation of salt-affected soils always involves leaching excess salts through the soil profile with heavy applications of water. Good drainage is therefore essential to any reclamation programme.

Saline soils can be reclaimed by leaching out the excess salts with heavy applications of good quality water. Gypsum is not required because sodium concentrations are not excessive and soil structure is not affected.

Figures 2 & 3: Spreading and incorporating gypsum at Nsoko.

Sodic soils can be reclaimed by applying gypsum, which effectively replaces the sodium in the soil with calcium, leading to improved soil structure and permeability (see below). However, the process depends on good drainage and deep incorporation of the gypsum to overcome the slow permeability of the soil.

Saline-sodic soils are reclaimed in the same way as sodic soils.

Gypsum

Gypsum application rates depend on how much sodium there is in the soil, and are based on soil analysis. Where salinity/sodicity is suspected, soil samples should be taken from depths of 0-30 cm, 30-60cm and 60-90cm. Samples should be submitted to SSA Technical Services directly or through the area extension officer, and they will be sent to either FAS or Mhlume laboratory for testing for gypsum requirements.

Application rates may vary from 5 t/ha on saline-sodic soils to 20 t/ha on sodic soils. Once sodicity levels have been reduced, additional applications of gypsum may be required to prevent recurring accumulation of sodium salts. Wherever possible, the gypsum should be applied evenly over the soil surface before replanting and incorporated to a depth of at least 30cm (**Figures 2 and 3**). Application should be followed by irrigation with good quality water to leach the calcium into the soil profile, where it will replace the harmful sodium. Contact SSA Technical Services for further details.

DRAINAGE: IS IT A PROBLEM?

Look for the following symptoms to tell if an area requires drainage: poor crop growth; appearance of a high water table; growth of sedges or watergrasses; and the accumulation of salts on the surface. Once some of these indicators have been seen, get a topographic map of the area, note the soil types and irrigation system predominant in the affected fields, and check your irrigation scheduling and weather records. Contact your Extension Officer should you need assistance in carrying out the following process:

1 Maps

A topographic map on a scale of between 1:50 000 and 1:100 000 showing contour lines of the land surface is an indispensable tool in producing drainage surveys. The map should show all topographic and physiographic features relevant to drainage; channels, canals, roads, paths and tracks; rivers, streams and natural drainage channels; cultivated land, waste land and natural vegetation.

The topography of the area assists in siting observation points, main canals, collector ditches, and field laterals and determining the maximum length of the field laterals. Surface drainage difficulties can be expected in slopes less than 0.1%, more particularly if they are less than 0.05 %. Problem areas that are a source of the drainage problem and possible correction measures can be identified.

A soils map based on a systematic soil survey is essential. The soil map defines areas suitable for sugarcane production. Special attention should be given to the upper root zone (to 0.8 m), its workability, water holding capacity and erodibility. The soil's infiltration rate should be known. Factors to be studied in the lower root zone (0.8 to 1.2m) are the effective soil depth, subsurface drainage properties, and soil hydraulic conductivities.

Soil surveys will enable the areas with salt affected soils to be delineated, but the cause of the salinization still has to be found. Soil stratification and hydraulic conductivity to 1.5m should be investigated.

Z, H, D, K, C, V and L set soils are prone to drainage problems, as well as some of the heavier T set soils. Other susceptible soils, though not found in abundance in the sugar industry are O, P, J and G-sets.

If your fields consist of these soils or have pockets of them, then drainage problems will ocur. The land should be leveled carefully to avoid unevenness before planting and irrigation must be managed carefully.

2 Irrigation Method

The method of irrigation will determine to a large extent the need for drainage, whether it is furrow, drip, sprinkler or center pivot. An estimate of water losses should be made to provide rough figures on water excesses or deficits. Data should be periodically collected on the performance of the irrigation system, to determine the future need for drainage. On new projects, generally the irrigation efficiencies are too often overestimated meaning that in most cases drainage requirements are underestimated. Surface ponding in furrow irrigation should be avoided. For pressurized systems, leaks, pipe bursts and overpressure should be minimized at all cost. The need for drainage in sugarcane is a direct indication of over irrigation, sometimes not in the same area but in adjacent areas.

3 Irrigation Scheduling

Over-irrigation is a result of poor irrigation scheduling. If a grower fails to properly schedule his irrigation, he will be forced to install a drainage system. Signs of a drainage problem are: depressions with a high water table, increases in salinity and or sodicity (see Page 3), a ponded surface, growth of algae on the surface and stunted cane growth (Figure 4).

4 Climate

Climate has a major impact on the environment and is often responsible for variations in soils, water, and the growth of sugarcane. It is a decisive factor in determining the type of drainage system to be applied. Growing regions of Swaziland are climatically different and local rainfall and temperature data should be collected.

5 Hydrology

The hydrology of the area, i.e. the surface water and the groundwater behaviour, should be considered together. Hydrology is characterized by high variability of rainfall, intermittent and sometimes short-lived river flow, high evaporation rates, soil moisture processes and groundwater salinity changes.

Your Extension Officer may contact the Irrigation Engineer at SSA to produce a drainage system based on recently published Tehnical Services guidelines. For further information contact us on 383 8998.

Figure 4: An area of poor drainage with a surface drain installed to remove water. Note the poor cane growth, invasion of weeds and white salts on the soil surface

CHRISTMAS

SSA offices in Mbabane, Simunye and Big Bend will be closed for the Christmas period between 22nd December 2003 and 5th January 2004. Mike Clowes (tel. 6028581), Jabulani Sifundza (tel. 6028576) or Duncan Butler (tel. 6172425) can be contacted during this period in case of an emergency. We wish all our readers and their families a happy Christmas and a prosperous and peaceful New Year .