



EXTENSION NEWSLETTER

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CHEMICAL RIPENING - WHY & HOW

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Chemical ripeners issue

The 2003 harvest is nearly upon us and growers should be preparing their ripener programmes for early to mid season harvested cane. The following tips should help get the most out of chemical ripeners.

What is ripening?

Ripening is the process that occurs when sugars produced by photosynthesis are deposited in the cane stalk instead of being used to produce new plant tissue. Any factor that reduces the growth rate of expanding internodes without reducing the amount of light intercepted by foliage will induce ripening. In Swaziland, natural ripening occurs when low temperatures restrict growth in winter, and to a certain extent by drying off.

Why ripen?

The quality of cane harvested before and after the natural period of ripening can be improved substantially by using chemical ripeners that cause the plant to store sugars at a time when growth is still vigorous. Provided the chemicals do not restrict growth too much, the increase in cane quality can be translated into an increase in sucrose yield. Chemical ripeners are recommended at application rates and spray to harvest intervals that give the best net increase in sucrose yield over unripened sugarcane. Provided the chemicals are applied correctly, the grower benefits from lower transport and cutting costs per ton of sugar, while the mill benefits from improved sucrose extraction from high quality cane. The overall benefits of high quality cane are reflected in the calculation of sucrose prices (see page 3).

Which chemicals do I use?

There are two types of chemical ripener: hormonal and non-hormonal. Ethephon releases the plant hormone ethylene that acts as a growth retardant but has no permanent effect on the growing point of the plant. This hormonal action tends to ripen only the young portion of the stalk. Ethephon takes longer to act than the non-hormonal ripeners, cannot be used on all varieties and is recommended only for early to mid season. The non-hormonal ripeners (Fusilade Super and Gallant Super) are herbicides that cause permanent damage to the growing point of the plant and so mimic the natural ripening process, causing an increase in sucrose content throughout the stalk. Fusilade Super is the better known of the two non-hormonal ripeners and can be used on all varieties grown in Swaziland for both early and late season harvest. However, because its effect on the growing point is permanent, it is important not

to exceed the recommended spray to harvest interval. Application rates and timing of application for Ethephon, Fusilade Super and Gallant Super are described in detail on page 2 (see "A Guide to Chemical Ripeners").

Which fields do I spray?

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 (see page 2). 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.

Which cane is suitable for ripening?

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 three to four 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 check list should also be used:

1. If there are less than 8 green leaves per stalk, the cane is likely to be under stress and should not be sprayed.
2. Lodged or flowered cane will not respond well to ripeners.
3. Long top internodes are a sign of vigorous growth and a promising response to ripeners.
4. Check that there are no signs of nutrient deficiency or pest and disease problems before spraying.
5. Ensure that irrigation scheduling for the field to be sprayed is up to date, and that dry-off does not start immediately after application.

How do I apply ripeners?

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, pro-

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vided 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.

A GUIDE TO CHEMICAL RIPENERS

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.

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 (page 101).

Fusilade Super

Fusilade Super is 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 product per hectare
N14: 0.45 - 0.6 litres product per hectare
N25: 0.35 litres product per hectare

For all varieties except N25, the higher rate should be used when the date of harvest is certain and when a good burn is desired. The lower rate affects growth less and should be used when harvest dates may be delayed. Because application rates are so low, Agral 90 is recommended as a wetter/sticker at a rate of 4 - 6ml to every 10 litres of spray mixture. Downrite can also be used, both to aid spreading and to reduce drift.

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 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 (page 102).

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 103).

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. With the exception of registration trials it is largely untested and its efficacy on NCo376, N23 and N25 will be assessed by SSA in 2003. The label indicates that NCo376, N19 and N14 respond to Gallant Super but the reaction of N14 is to be confirmed by SASEX.

Application rates

NCo376 & N19: 0.15 - 0.165 litres product per hectare
N14: 0.20 - 0.22 litres product per hectare
The higher rate is recommended for aerial application while the lower rate is recommended for application by ground rig. No additives are required.

Timing of application Gallant Super is for early season ripening only and should not be applied later than May. Because the mode of action of Gallant Super is similar to that of Fusilade Super, spray to harvest intervals are likely to be the same. This will be confirmed in the SSA trial programme this year.

SUCROSE PRICES - HOW THEY WORK

Sucrose prices are the “bottom line” for all of us, and we are frequently asked how they are calculated. The process is fostered by staff at SSA’s Head Office in Mbabane so our Financial Director produced this article for the Newsletter:

The sucrose system

The sucrose system is based on sucrose recovery, which is dependent on the quality of the cane delivered to the mill. This is determined initially by sucrose (measured as pol% cane from the sample taken when cane is delivered to the mill as per industry guidelines). Mill recovery is reduced by fibre, non-pol and by undesirable products formed in stale or deteriorating cane. These factors are under the direct control of the grower and are influenced by time of year, variety, dry-off, use of chemical ripeners (see [pages 1 and 2](#)), topping height and effectiveness of burn and the burn to mill delay.

The final quantity of sucrose extracted from the cane is also determined by the overall performance of the mill.

Division of proceeds

The sales of both molasses and sugar in its various forms and to the various markets, with allowances for costs incurred, are then distributed back to millers and growers. Distribution of sales proceeds is divided on the broad principle of division of proceeds between millers and growers on a periodically reviewed ratio, which at present is 32.3 % of proceeds to the miller and 66.7 % to the grower. Distribution of the sales proceeds division of proceeds between millers and growers is regulated by the Swaziland Sugar Industry Agreement (SSIA).

The Swaziland Sugar Industry Agreement

The SSIA is binding on all millers, growers and millers-cum-planters in terms of the Sugar Act of 1967. The SSIA states that all sugar and molasses produced by millers, and all refined sugar produced by refiners, be marketed and sold by the SSA. The SSIA provides all the information on the obligations of the grower and seller, which forms the basis of a contract between

the two parties on the basis of policies contained in the Sugar Act.

Sugar and sucrose price calculations

The price payable by the SSA to each miller for all sugar and molasses manufactured and sold to the SSA during a milling season is expressed as a price per tonne of 96 degrees pol equivalent sugar. The price is arrived at by first dividing the total sugar proceeds accruing in each year, less all costs and industry obligations, by the aggregate tonnage of 96 degrees pol equivalent sugar sold to the SSA during the year, and second, by adding thereto, for each mill, the mill net price of molasses per tonne of 96 degrees pol equivalent sugar.

The price paid to growers, for cane sold and delivered by them to mills during a milling season, is expressed as a basis industry price per tonne of sucrose contained in the cane delivered before division of proceeds (DOP). The final price realized then takes into account DOP paid to growers and is currently 67.7% of the basic price.) This percentage of the sugar price is then converted to a price per tonne of sucrose by applying the annual sucrose to 96 degrees pol sugar ratio.

Refer to the example for the calculation of both the sugar and sucrose prices ([Figure 1](#)).

Annual price fluctuations

There are many factors that influence the prices each year such as the weather, the size of the crop, quality of the cane and sugar, mill recoveries, demand for sugar, selling prices, foreign exchange rates, interest rates, inflation, exports to preferential and world markets, etc.

Supplementary payouts

It must be appreciated that the initial prices received are estimated on the basis of market conditions and the final price is only realized after final sales and costs have been made and unaccountable losses determined. Supplementary payouts are therefore made after the initial basic payout.



1.	Net proceeds of all sugar sold by SSA*	366,000,000
2.	Net proceeds of all molasses sold by SSA*	5,400,000
3.	Tonnes sugar produced by Mill X	155,000
4.	96 degree pol equivalent sugar	167,000
5.	Tonnes sucrose produced by Mill X growers	175,000
6.	Annual 96 degree pol equivalent sugar to sucrose ratio	1.069
7.	Average price per tonne of 96 pol equivalent sugar	2192.16
8.	Mill net price for molasses per tonne of 96 pol equivalent sugar	32.34
9.	Sugar price per tonne of 96 pol equivalent sugar	2224.50
	Paid to millers (32.3 %)	718.51
	Payable to growers (67.7 %)	1505.99
10.	Sucrose price paid to Mill X growers	1408.74
	* Sales from one mill only (“Mill X”)	

Figure 1: Calculation of sugar and sucrose prices for one year’s production from a mill in Swaziland (“Mill X”). The final sucrose price paid to growers will vary among mills only on the basis of differences in molasses sales made by each mill.

2003/2004 SEASON OUTLOOK

First estimates of production for the 2003/04 milling season are required by the Sugar Association during early February. As during the run-up to past seasons Technical Services has been monitoring weather conditions during spring and summer and how they are likely to impact on the coming crop.

Our crop has completed three quarters of its crucial summer growing period and the potential yield platform for the coming season is becoming clearer. Good growing conditions during early and mid summer have ensured that potential yields for the

2003/04 season are likely to be above long term mean (LTM) for the first time in seven years.

Results of the CANEGRO simulations for Ubombo (representing the South) and Simunye (the North) are presented below. Actual weather data between April 2002 and January 2003 were combined with generated data-sets matching the mid-to-long-term climate forecast to represent the remainder of the 2003/04 cutting season. Results are presented as cumulative probability functions (**Figure 2**) and as season comparisons (**Figures 3 and 4**). The probability functions give the reader an estimate of the range in potential cane yield depending on the scenario used. At Simunye potential cane yields are estimated to be between 134 ($y = 0$) and 150 ($y = 1$) t/ha/an, whereas at Ubombo potential yields are forecasted to range between 138 and 152 t/ha/an.

For comparative purposes potential cane yields for the past 21 seasons (LTM) were simulated using historical weather data at each of the two sites (**Figures 3 and 4**). These figures allow the reader to judge the relative potential of the coming season. At Simunye potential yields at the 50% probability level were forecast to be higher than the LTM for the first time in eight years. (142.5 vs a LTM of 141 t/ha/an), whereas at Ubombo this the first year in seven (145 vs a LTM of 142 t/ha/an).

However, bear in mind that times of good crop growth are inevitably hot and dry and adequate irrigation is required to realise the full potential of these conditions.

Provisos and assumptions

These estimates have tried to take into account what we know about past and future weather conditions, however our confidence is low for crops harvested mid-late season.

Potential yield estimates have been based at the 50% probability level but yields could be lower or higher.

Commercial yields are usually 20-30% below potential yields.

Cane yield calculations do not take into account cane sucrose content, which may not follow the same seasonal trend.

This exercise takes no account of crop age and all yields are expressed on an annual basis.

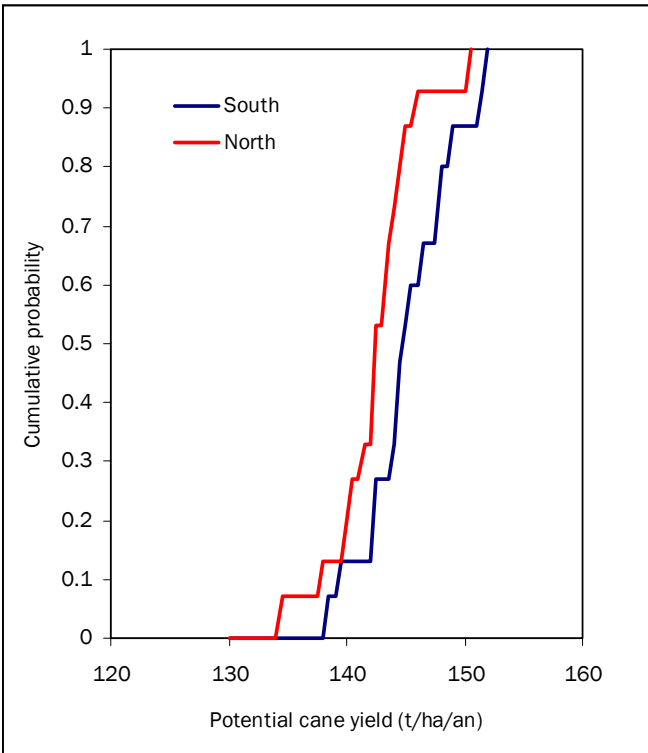


Figure 2: Cumulative probability functions for the North (Simunye) and the South (Ubombo) for the 2003/04 season

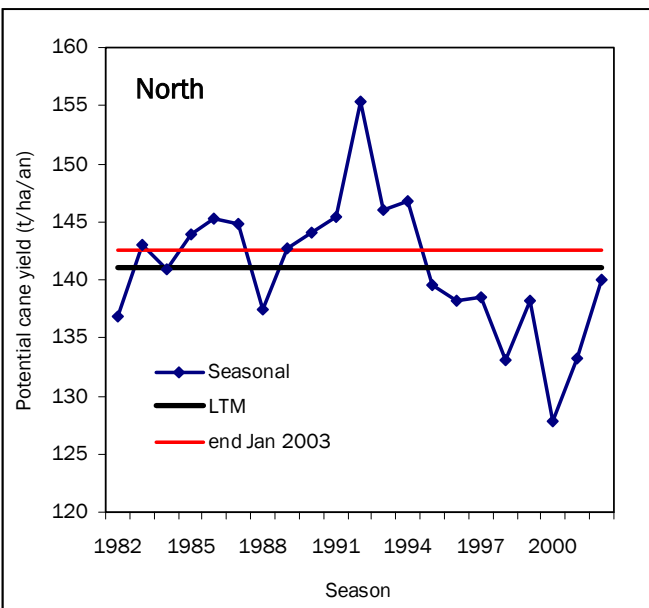


Figure 3: 2003/04 potential yield at the 50% probability vs seasonal yield for the period 1982 - 2002 (Northern region)

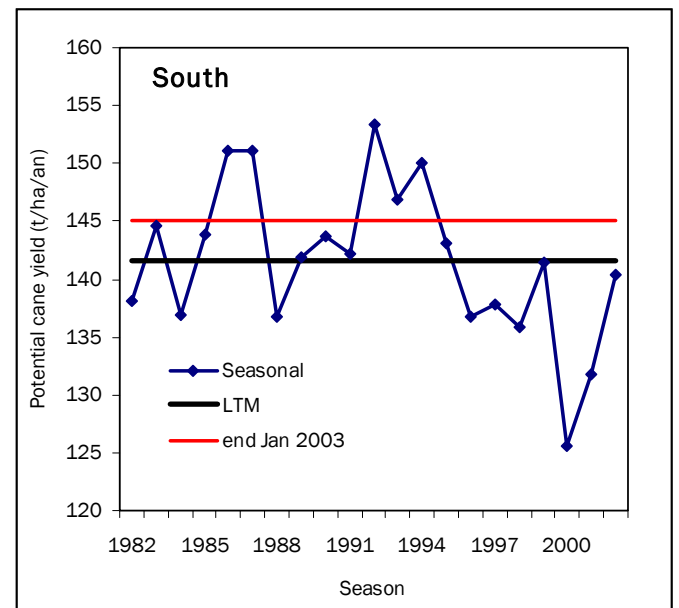


Figure 4: 2003/04 potential yield at the 50% probability vs seasonal yield for the period 1982 - 2002 (Southern region)