SWAZILAND SUGAR ASSOCIATION TECHNICAL SERVICES

EXTENSION NEWSLETTER

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LIMITED WATER—SOMISO

INSIDE THIS ISSUE:

See inside for focus on herbicides

Latest water news

- Parliament passed the new water act in April 2003.
- Robert Thabede has been appointed as SSA's Water Resources Adviser. Growers can contact him on 4048138 to discuss implications of the new act.

Our summer (especially the latter half) was characterized by good growing conditions and very poor rainfall both in the Lowveld and in our river catchments. In the Lowveld rainfall during March was the lowest on record and no substantial rain has fallen since late February. Flows in all the major river systems are currently at levels only expected at the end of the dry season, not the start. Growers now face winter relying on stored water and/or vastly reduced river flows and should be questioning how best to manage this limited resource to maximum advantage.

Irrigation Management Options

Limited water management options can broadly be categorized as one of two strategies:

1 Reduction in irrigable area ie cane area is abandoned and limited water is concentrated on fields where the largest advantage is realized. This is a drastic step and should only be undertaken as a last resort. The long term reduction in yield and cost of re-establishing droughted fields is enormous and has long term implications.

2 Spreading limited water ie there is a conscious decision to use water to the best advantage of the entire operation and avoid abandoning some fields in favour of others.

Option 2 offers the best strategy as we move into winter when evaporative demand and crop growth are greatly reduced. Also, our harvest season has begun, offering opportunities to reduce water application both on the crop to be harvested this season and on the ratooning crop post-harvest.

Pre-Harvest: Increase dry-off period. SSATS's recommendation of 2 x TAM should be increased to 3 x TAM. This may well increase the dry-off period in winter to 10 -12 weeks, with implications on your ripening programme because ripeners are only effective when applied to actively growing cane. Increasing dry-off to this level may reduce cane yield, but will have less of an effect on sucrose yield.

Post-Harvest: Large water savings are possible during this early post-harvest stage without impacting severely on the yield in the following season. The canopy of the ratooning crop develops slowly during winter and does not require large volumes of water to get the crop well established. A first irrigation will be required shortly after harvest. The soil will have been well depleted during dry-off and the crop will require an initial irrigation to ensure rapid tillering. It is practice on some estates to fill the profile immediately after harvest by scheduling a "back-to-back" irrigation event. Hold off this 2nd irrigation event to coincide with other agronomic activities such as fertilization and weed control. Delay application of the 3rd irrigation event for between 10 and 12 weeks for crops harvested between April and June or 6 - 8 weeks for crops harvested between July and August. Coincide the 3rd/4th irrigation event with the beginning of spring (mid September) when the crop begins to develop rapidly. This kind of approach has been successfully tested experimentally both here and in Zimbabwe. The so called growth stage or Ellis scheduling system was used extensively at IYSIS during the early 1990's. In Table 1 the CANEGRO crop model was used to simulate monthly the number of irrigation events required for a normal and water-saving winter strategy in the Lowveld assuming an average soil (TAM = 100 mm) and an irrigation system applying a 48 mm net application. On average a 30% saving in water was achieved with negligible effect on final yield.

Other Considerations

Split N applications for crops harvested during early to mid-winter. The second split can be timed to coincide with the 3rd/4th irrigation in spring.

Stress will increase during spring especially if rain is delayed. Pest and disease levels will increase as a result and growers should ensure that roguing operations are well managed and timeous.

In overhead systems, check pipes and valves for leaks and in furrow irrigated fields ensure that lead streams are well matched to command areas in order to reduce run-off losses.

(a) Normal winter strategy

Harvest month	Month of Year 4	5	6	7	8	9	10	11	12	Total
Apr	2	1	1	1	2	2	2	2	2	15
May		2	1	1	1	2	2	2	2	13
Jun			2	1	1	1	2	2	2	11
Jul				2	1	1	2	2	2	10
Aug					2	1	2	2	2	8
Sep						2	1	2	2	7
Oct							2	1	2	5

(b) Water-saving winter strategy

Harvest month	Month of Year 4	5	6	7	8	9	10	11	12	Total	% Saving
Apr	1	1			1	1	1	2	2	9	39
May		1	1			1	1	2	2	8	41
Jun			1	1			1	2	2	7	35
Jul				1	1		1	2	2	7	29
Aug					1	1	1	2	2	7	16
Sep						1	1	1	2	5	27
Oct							1	1	1	3	39
											32

Table 1: Winter irrigation strategies

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WEED CONTROL IN SUGARCANE

The 2003-2004 milling season commenced in early April at all three sugar factories in Swaziland, heralding the start of in-field operations for the next crop. One of the first operations to receive attention in newly established ratoons and plant cane is weed control.

Weed control is an extremely important operation in sugarcane production. Depending on the types of weed present, yield reductions of over 50 % can occur if weed control is overlooked. Weeds compete directly with sugarcane for light, water and nutrients, affecting germination of the crop, delaying development of canopy and ultimately reducing yield and quality of the harvested crop. Weeds can also harbour insect pests and diseases, or may themselves excrete plant toxins into the soil, depending on the species.

Weeds can be controlled in a number of ways, usually involving a combination of the following approaches:

- **Prevention** – keeping field boundaries and irrigation canals free of weeds that could spread into the field by producing seeds, runners or tubers
- **Physical** – exploiting growing conditions to allow the sugarcane to compete effectively with the weeds. The best example of this is encouraging rapid, uniform canopy development so that the weed population is shaded out as soon as possible
- **Mechanical** – hand weeding, hand hoeing, or using tractor drawn cultivators, depending on labour costs, availability of machinery and stage of crop
- **Chemical** – herbicides

This issue of the Extension Newsletter will concentrate on chemical weed control, but it is important that weed control programmes should be fully integrated between chemical, mechanical, physical and preventative measures.

CLASSIFICATION OF WEEDS AND HERBICIDES

Selection, timing and method of application of herbicides depends on the type and age of weeds present. Weeds are classified according to their life cycle as annuals (plants that live for one year only and set seed in that year), biennials (plants that live for two years, setting seed in the second year) and perennials (plants that live for more than three years and set seed every year).

In each of these categories there are **broadleaf weeds** (eg Blackjacks), **grasses** (eg Guinea grass) and **sedges** (eg yellow nutsedge). The life stage of these weeds also has an important bearing on choice of herbicide, depending on the mode of action of the chemical. Herbicides are often referred to in terms of the life stage of the weed against which they are most effective, as follows:

- **Pre-emergence** – herbicides that are normally root, shoot or seed absorbed and are applied to bare soil before the weeds emerge. Examples are alachlor (translocated from the shoots) and atrazine (translocated from the roots). These are usually applied immediately after planting or harvest, or after inter-row cultivation, but require moist soil conditions, a fine soil tilth and an even soil surface for best results. Since application occurs before the weeds have emerged, it is important to know the weed spectrum in advance in order to select the right herbicide.

- **Post-emergence** – herbicides that are sprayed onto emerged weeds and are usually absorbed by the foliage, working on contact or by translocation. Examples are paraquat (contact) and metribuzin (translocated). Some root-absorbed herbicides such as diuron also have post-emergence activity. It should be noted that most weeds are more susceptible to herbicides when young and that the latest growth stage at which they should be treated varies with weed type. In most cases, good coverage is essential and post-emergence herbicides should be applied in a high volume of water. The sugarcane will normally be growing actively when most weeds are at the post-emergent stage, and the herbicide spray may have to be directed away from the cane foliage depending on its phytotoxicity. If in doubt, read the label on the herbicide packaging (see Read the label and N25 and herbicides).

A common approach to targeting mixed populations of weeds is to use a combination of herbicides that are applied when most of the weeds are about to or have just emerged (pre- to early post- emergence – see Herbicide cocktails for sugarcane). This provides the opportunity to treat weeds when they are most vulnerable to herbicides with different modes of action in a single application.

A guide to identifying weed growth stages is given in Table 2.

READ THE LABEL

The most important instructions on handling, application rates, use, storage and disposal are included on the product label that is attached to every herbicide container sold. Always read the label carefully and follow instructions to the last detail.

HERBICIDES FOR N25

In SASEX phytotoxicity trials, variety N25 has been shown to be sensitive to spray mixtures of Metribuzin plus Diuron and Velpar plus Diuron. Growers should avoid using these chemicals on N25. See Table 3 for alternatives.

Growth stage	Grasses	Sedges	Broadleaf weeds
Pre – emergence	No emergence	No emergence	No emergence
Early post - emergence	1 to 2 leaves	1 to 4 leaves	0 to 30 mm
Post – emergence	2 to 4 leaves pre tillering	Pre to early flowering	< 100 mm or pre flowering
Late post - emergence	Tillering	Flowered	> 100 mm or post flowering

Table 2: Definition of weed development stages

Herbicide Mixes for Sugarcane

The susceptibility of the crop to weed infestation and associated losses depends on the rate at which it reaches full canopy, and this can have a major influence on the choice of herbicides to use. A fast growing crop will reach canopy sooner than a slow growing crop, and will therefore be less sensitive to competition from weeds.

The rate of crop development depends on temperature and radiation, and on ratoon stage. A crop cut in summer will reach canopy faster than a crop cut in winter, just as a ratoon crop will develop faster than a plant crop. Herbicides can be selected according to the desired duration of control (residual period), which depends on the anticipated development rate of the crop. A winter cut field requires a herbicide with long-term residual activity because it will take longer to reach canopy than a summer cut crop. Likewise, products with short-term residual activity are more suitable for a summer cut crop.

Depending on the growth stage of the weeds, herbicide combinations ("cocktails") are made to suit the situation. For a pre-emergent weed situation an Atrazine or Diuron plus Paraquat base is normally recommended. A medium- (Acetachlor) or long- (Tebuthiuron) residual pre-emergent herbicide would then be added to this base depending on the time of the season. Early post-emergent weed situations are most commonly targeted and require post emergent herbicides to be mixed with the pre-emergent herbicide of choice. A commonly used cocktail in Swaziland for this purpose is the Ametryne and Actril mixture. Tebuthiuron or Acetachlor is added to this cocktail to provide the required residual action pre-emergently in the soil, while Ametryne controls the majority of post-emergent problem grasses and Actril controls the broadleaves.

If possible one should always apply the "treat the seed not the weed" philosophy, as the cost of a purely pre-emergent herbicide cocktail is less than a post-emergent one and usually more effective. Pre-emergent herbicides should be sprayed onto a damp pre-irrigated soil surface so the chemical can be absorbed into the top 10cm of soil, the layer in which the majority of the weed seeds would germinate.

Two of the most problematic weeds experienced in the Swaziland sugar industry are nutsedges (*Cyperus* species) and the perennial creeping grasses (*Cynodon* species). These weeds should be treated separately as they will not respond to the initial grass and broadleaf cocktails. The two recognized sprays for nutsedge are as follows

1)MSMA spray applied twice a season when there is sufficient leaf area to spray

2)Servian /complement spray applied at 10 % flowering.

For *Cynodon*, directed sprays of Paraquat or Glyphosate are recommended although care should be taken to avoid spraying leaves of actively growing sugarcane.

Table 3 (overleaf) lists the main herbicides available in Swaziland and gives details of target weed groups and application rates. Note that the dosage rate of soil-applied herbicides varies on the basis of soil clay content. These products are available through the two major suppliers in Swaziland, Swaziland Agricultural Supplies and Farm Chemicals. Ian McLeod (SAS) and Diccon Robinson (Farm Chemicals) made valuable contributions to the details given in this newsletter and can be contacted for further advice.

Application Methods

The two most common methods of herbicide application in Swaziland are by tractor-mounted boom sprayer and by hand-operated knapsack sprayer. Each method has advantages and disadvantages:

Boom sprayers can cover a large area in a relatively short space of time, have low labour requirements and easily controllable output rates, and can be used for either full cover spraying or directed spraying by manipulating nozzle types and positions (see Choice of Nozzle). However, they are not well suited to small fields, well grown cane or excessively wet soil conditions.

Knapsack sprayers can be used where field or soil conditions interfere with tractor operations. They can also be used in well-grown cane (using directed sprays if necessary) and are useful for spot spraying. As with boom sprayers, application patterns can be altered by changing nozzle types and positions (see Choice of Nozzle). However, their use is labour intensive and output rates and forward speeds are hard to control uniformly.

For chemical weed control to be effective, herbicides must be applied as accurately and evenly as possible. This is especially true for pre-emergence herbicides which have little lateral movement in the soil. **Spray equipment should be accurately calibrated** and forward speed, nozzle height and pressure should be kept constant once calibration is complete. All sprayers should be operated at the pressure prescribed by the manufacturer for the nozzle type being used. Boom sprayers have a pressure regulator and a gauge, while most knapsacks can now be fitted with constant pressure devices. Instructions for calibration are available from agrochemical suppliers or from SSA Technical Services.

Choice of Nozzle

Whether spraying herbicides by boom sprayer or knapsack, there are two main patterns of application that depend on the nature of the herbicide being used. The required pattern determines the type of nozzle to choose.

Full cover spraying applies the spray mixture to the entire surface area and suits pre-emergence herbicides. To provide full cover, there is a degree of overlap between the output of adjacent nozzle positions. For this purpose, a flat fan or flood jet nozzle (eg a blue Albuz APM nozzle or a TK Spray Systems nozzle) would be recommended. The droplet size is usually large and uniform and therefore less prone to drift, and can provide a swath width of up to 1.5 meters. Flat fan nozzles are better suited to use on boom sprayers while flood jet nozzles are well suited to knapsack sprayers.

Directed spraying and spot spraying applies the spray mixture selectively, either to isolated plants or areas of weed infestation (spot spraying) or over the row or inter-row only (directed spray). In both cases early to late post-emergence weeds are usually the target. These requirements are best met by an even spray fan jet styled nozzle (eg the blue APE nozzle) or a flood jet nozzle positioned close to the ground (for inter-rows only). Cone jet nozzles are also suitable for post-emergence spot spraying where full cover of the leaf is necessary. Cone jets and even fan nozzles produce a narrow swath and finer droplet size more adept at post emergent weed spraying .

Nozzles should be replaced at least once a season due to wear from chemical abrasion. Ceramic or stainless steel tipped nozzles are more durable than plastic or brass, leading to better calibration and greater accuracy.

COMMON HERBICIDES FOR USE IN SUGARCANE

Group	Chemical active ingredient (a.i)	Some Product Names	Chemical. a.i. g/litre or kg.	Time of use	Product Rate/ha (range)
Broad leaf weeds	Atrazine	Atrazine	500	Pre	2.0-6.0
	2-methyl-4-chlorophenoxy-acetic acid	MCPA;Volcano MCPA	400	PeP	3.0-8.75
	2.4D/iso-octyl ester) / ioxynil	Actril; Voltril	600/100	Post	1.25-2.5
	Bromoxynil/ioxinil	Oxytril	200/200	Post	1.5
	2,4D/ dicamba (APM salts)	Spotaxe	240/80	Post	2.5
	Triclopyr	Garlon4; Triclon; Viroxe	480	Post	0.5% mix
	Arazine/sulcotrione	Galleon	300/125	PeP	1.6-3.6
	Bromoxanil/ terbuthylazine	Terbo	150/333	Post	2.0
Grasses	s-metolachlor	Falcon Gold	960	Pre	1.0-1.6
	Acetochlor	Har-i-cane; Harness;Volcano acetochlor	960 900	Pre Pre	1.9-2.8
	Alachlor	LassoMT; Alachlor384EC; LassoEC	480 384	Pre	4.0-4.8 5.0-6.0
	Isoxaflutole	Merlin	750	Pre	0.1-0.25
	Mono-sodium methane arsenate	MSMA	720	Post	3.0-6.0
	Fluaziflop-P-butyl	Fusilade Super	125	Post	6.0
Combination of Grasses and Broadleaf weeds	Sulfentrazone	Authority	750	Pre	1.2
	Diuron	Diuron	800	PP	1.0-2.5
	Ametryn	Ametryne 500 SC; Gesapax	500	PP	3.0-8.0
	Metribuzin	Metribuzin 480 SC; Sencor	480	PP	3.0
	Hexazinone	Hexazinone & Velpar; Hexazinone 750DF & Velpar DF	240 750	PP	1.0-3.0 0.3-1.0
	Diuron/sulcotrione	Impi	300/150	PeP	2.3-3.33
	Tebuthiuron	Lava; Tebusan	500	PeP	2-2.5
	Atrazine/cyanazine	Bladex Plus	167/333	PP	9.0
	Paraquat	Gramoxone; Paraquat	200	Post	1.0-3.0
	Glyphosate	Clear Out; Mamba; Roundup; Springbok	360	Post	6.0-8.0
	Glyphosate (trimesium)	Touchdown	480	Post	6.0
Sedges	EPTC	Eptam Super	720	Pre	3.0-7.0
	Sulfentrazone	Authority	750	Pre	1.2
	Halosulfuron	Servian	750	Post	0.05
	Mono-sodium methane arsenate	MSMA	720	Post	6.0
	Paraquat	Gramoxone; Paraquat SL	200	Post	1.5-3.0
	Glyphosate	Clear Out; Mamba; Roundup; Springbok	360	Post	6.0-8.0
	Glyphosate (trimesium)	Touchdown	480	Post	6.0
	Chlorimuron + metribuzin	Extreme Plus 750*	750	Pre	1.0

* Also pre-emergence control of broadleaves and some grasses

Table 3: Herbicides suitable for use in sugarcane. Abbreviations under "Time of Use" are as follows: Pre = Pre-emergent; PeP = Pre- to early post emergent; PP = Pre and Post emergent; Post = post emergent. **ALWAYS READ THE LABEL BEFORE USE.**