

Weed management imperatives for sugarcane production in South Africa

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Harmful or noxious weeds are plants that interfere with crop growth and development to the extent that unacceptable yield loss ensues. The main plant growth factor which weeds compete for with crops in a water-stressed country such as ours, is soil moisture. The extent to which weed-to-crop competition occurs is determined by the amount of water available – if enough water is available to satisfy the needs of all interacting plants there can be no competition, but competition commences as soon as the amount of plant-available water drops below the level that can satisfy the need of all interacting plants.

In a growing season such as the current one in which the worst drought since the 1960's is being experienced in all parts of the summer rainfall region, in particular in key areas for sugarcane production, avoidance of weed competition with crops for soil moisture is all the more critical. Under drought conditions it simply cannot be afforded to have weeds present in a crop because competition for soil moisture is a given, and besides, weeds are generally better “designed” than crops to compete successfully for water. All the weeds mentioned below as representing a serious threat in sugarcane production are examples of plants that are exceedingly well-equipped to compete successfully with sugarcane, to the serious detriment of the crop.

Thirty two herbicides are currently registered for weed control in sugarcane in South Africa. More herbicide products are registered than the number of active ingredients (32) involved because off-patent herbicide products can be manufactured and registered as generic products by more than one company, and various mixtures of active ingredients are registered as ready-formulated products. In addition, tank mixtures of specific products are also registered for use.

The South African sugarcane industry is in the fortunate position that a relatively high number of herbicides are available for use because it provides the means to effectively deal with a wide range of weed species occurring across diverse soil types and climatic conditions.

Of the 32 registered active ingredients (herbicides), 5 control mainly grass weeds, 7 are specialist broadleaf (dicotyledonous plant) herbicides, 19 control both grass and broadleaf weeds, and 1 controls sedges, specifically yellow and purple nutsedge. Control of the broadest weed spectrum represented by the combination of grasses, broadleaf weeds and sedges are possible with the following 5 herbicides amongst the afore-mentioned 32, namely: amicarbazone, flazasulfuron, glufosinate, glyphosate and MSMA.

Twelve different mechanisms of action are represented by the 32 herbicides used in sugarcane. This means that about 50% of the total number (25) of mechanisms of action available worldwide are available for weed control in SA sugarcane production. This places the industry in a highly desirable position to put in place effective strategies for avoidance of herbicide resistance, because diversity in herbicide mechanism of action is key to prevention of the evolution of herbicide resistance in weeds.

Of the 12 mechanisms of action represented in the SA sugarcane herbicide portfolio, only a single mechanism of action is not implicated in weeds having evolved resistance at international level, namely that of “long-chain fatty acid inhibition” by the acetamide herbicide group which includes the herbicides alachlor, acetochlor, metolachlor, etc. To date, despite

certain of those weeds also occurring in sugarcane production areas of South Africa, no proven resistance case has thus far been reported locally. Of the weeds that have developed resistance in other countries to certain of the herbicides registered in SA, the following are rated as highly damaging to sugarcane:

(1) Grass species – *Sorghum bicolor* (common wild sorghum), *Sorghum halepense* (Johnson grass), *Digitaria* spp (finger grasses), *Cynodon dactylon* (couch grass), *Paspalum* spp (paspalum).

(2) Broadleaf species – *Ambrosia artimisiifolia* (common ragweed), *Commelina benghalensis* (wandering jew), *Physalis viscosa* (sticky gooseberry), *Ageratum conyzoides* (billy-goat weed), *Chenopodium album* (white goosefoot), *Conyza bonariensis* (flax-leaf fleabane), *Datura stramonium* (thorn apple), *Xanthium strumarium* (cocklebur), *Euphorbia heterophylla* (painted euphorbia), *Parthenium hysterophorus* (famine weed), *Ipomoea* spp (e.g. morning glory).

Other highly competitive grasses in sugarcane are: *Cynodon nlemfuensis* (giant stargrass), *Panicum maximum* (Guinea grass), *Panicum schinzii* (sweet buffalo grass), *Panicum subalbidum* (elbow buffalo grass). Highly competitive sedges are *Cyperus esculentus* (yellow nutsedge) and *Cyperus rotundus* (purple nutsedge).

Because many of the above-mentioned (point 1 and 2) important weeds in SA sugarcane have been associated with herbicide resistance in other parts of the world, and because the same herbicides are used locally in the crop, cases of “hard-to-control” weeds should be closely scrutinised with regards the possibility that herbicide resistance already exists or is in the process of evolution. Such cases can be made known to the author who is project leader for the South African Herbicide Resistance Initiative (SAHRI) based at the University of Pretoria – <http://www.up.ac.za/sahri>

Golden rules for managing herbicide resistance

- 1. Keep weed numbers low – reduce the “1 in 1,000,000” chance that an individual weed plant in a population could, in a natural way, evolve herbicide resistance;**
- 2. Prevent weed seed production because resistance is genetically inherited and is spread through seed;**
- 3. Do not rely on a single herbicide, or a single mechanism-of-action; Employ more than one herbicide mechanism-of-action – is achieved with formulated herbicide mixtures and tank-mixtures;**
- 4. Avoid under- and over-dosing since both promote resistance;**
- 5. Integrate different weed control methods where applicable.**

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