

## **DETAILS**

Project number	M111/15
Project title	Monitoring of agrochemicals registered on maize
Project manager	E Hugo
Co-worker(s)	Internal MM van der Walt
	External None
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### **Quality of active ingredients in agro-chemicals registered on maize in South Africa**

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#### **Final abstract**

When registered concentrations of active ingredients (*a.i.*) in agro-chemicals as specified on product labels deviate, huge economic losses could be experienced by users of these products and irreparable damage could be done to the integrity of those products and the manufacturing company. This study was conducted to monitor the compliance of agro-chemical formulations to registered formulations as published on the labels and registered according to the conditions of the fertilizer, farm feeds, agricultural remedies and stock remedies Act 36 (1947). Products of all the agro-chemical companies in South Africa could be nominated by the relevant parties involved, in collaboration with commercial farmers as members of Grain SA. Act 36 of 1947 prescribes permissible deviations in the active ingredient contents for all agro-chemical product formulations. The ARC-Grain Crops Institute, in collaboration with Grain SA and CropLife SA (AVCASA and ACDASA), compiled a protocol (Attached) with regard to the annual sampling of agro-chemical products and the reporting of these analyses. Results covered in this study included agro-chemicals tested from 2008 - 2011.

## **Introduction**

The project was requested by Grain South Africa (Grain SA) during 1999 and since then it was co-funded by the Maize Trust. ARC-GCI nominated Grain SA and CropLife SA as collaborators. Large claims had been lodged by farmers who were not satisfied with the performance of certain agrochemicals. These claims amounted to millions of rands. The Registrar did not and still does not have the means or resources to monitor compliance to formulations or rates of agrochemicals as these products are delivered on farms. Irregularities with the active substance of final products often went unnoticed. Due to economic pressure and complaints from farmers and Grain SA, the ARC-GCI was approached during 1999 to investigate compliance with formulations. The protocol for sampling and analysis of agrochemical products was annually revised jointly by ARC-GCI, Grain SA and CropLife SA. CropLife SA subsequently supplied a protocol for the sampling and analysis of agrochemical products to all its members. Sampling and analysis of crop protection agro-chemical products were done annually by the ARC-GCI from October to February according to the accepted protocol. At the beginning of this project up to 75 % of the relevant agrochemical products were either under- or over-formulated. The watchdog role that this project provides emanated in a significant decrease in products that did not comply with the set standards (from 75% in 1999 to 0% in 2011). The protocol for sampling and analysis of agrochemical products was annually revised jointly by ARC-GCI, Grain SA and CropLife SA.

## Materials and methods

(Protocol for the monitoring of agro-chemicals)

### General

- This is a project of ARC-GCI, requested by Grain SA and funded by the Maize Trust. The ARC-GCI nominated the following collaborators; Grain South Africa and CropLife SA. In the rest of the document, the term role players will refer to ARC-GCI, Grain South Africa and CropLife SA
- ARC-GCI will, in consultation with Grain South Africa and CropLife, decide annually on the number of products to be sampled for quality control analysis purposes. This will be determined by available funds to conduct tests.
- Products will be nominated by the Production/Input Working group of GSA and Members of CropLife.
- Product(s) of selected active ingredients will be selected from registration holder(s) of such active ingredients in consultation with the above mentioned role players and analysed. This will include products from both CropLife SA members and non-members.
- The president and vice-president of CropLife SA will determine per nominated product, which physical characteristics (active ingredient, adjuvants etc.) need to be tested.
- Cost related to sampling and analysis will be for the account of the ARC-GCI (funded by the Maize Trust).
- All registration holders/manufacturers will supply the product(s) **free of charge** for analytical purposes and agree to collect remaining product(s) from the accredited laboratory **at their own expense**.
- Between October and February, **but within a week after nomination**, selected products will be either
  - a. directly delivered by the nominated company to the SABS for analysis **or**
  - b. randomly drawn by the ARC-GCI at sales depots (throughout grain producing regions) nominated by registration holders.
- Only products with a manufacturing date of 2 years or less will be sampled.

### Sampling procedures:

- Products will either be directly delivered by the nominated company to the SABS for analysis or be collected at sales depots and delivered by the ARC-GCI to SABS in

the original sealed container of the registration holder/manufacturer and the following information will be clearly legible on the product label:

- Batch number
- Date of manufacture
- Registered trade name
- Registration holder name and contact details
- Registration number (L. No.)

If the abovementioned information is not clearly legible the product will not be used for sampling purposes but will be reported as described.

- Where products are delivered to the SABS for analysis, SABS must provide both company and ARC-GCI with written proof of reception and confirm that products comply with the sampling procedure.
- Samples will be analysed by SABS as an independent accredited laboratory for active ingredient content. If the laboratory observes any irregularities or peculiarities *vis-à-vis* a particular formulation SABS will also report such observations.
- Samples for analysis will be taken from the sealed containers by a responsible and qualified technician in the employ of the accredited laboratory (SABS).
- Containers of liquid formulations will be well shaken by the means of a suitable mechanical device for  $\pm 3$  minutes prior to sample being taken.
- SABS will provide reports on analysed samples within 4 weeks after they received the product.
- The laboratory will hold the remaining product for safekeeping in the original container under controlled environmental conditions until the result of the analyses are known and accepted by the parties concerned.
- The sample for analysis will be stored and the analytic process conducted in compliance with good laboratory practice (GLP).

**Sampling preparation and analysis:**

- The registration holder will, upon receipt of a written request from the ARC, supply the analytical method if it is not available at the accredited laboratory. The analytical method remains the property of the registration holder and may only be used with his

permission and will not be divulged or supplied to a third party without the written consent of the registration holder.

**Report procedure:**

- Act 36 of 1947 prescribes permissible deviations in the active ingredient contents for all agro-chemical product formulations.
- If the result of the analysed sample should fall outside the prescribed legal parameters the following procedure will be followed:
- In the presence of the ARC-GCI, the SABS will seal, code and sign off the sample. ARC-GCI will collect the sealed sample from SABS and will take it to a second accredited laboratory.
- If the second laboratory agrees with the analysis of SABS , the ARC-GCI will communicate details of the sample analysis with the registration holder, who will then be given the opportunity to verify the information and/or to comment on the information within 15 working days.
- If the second laboratory differs with the analysis of the SABS, the laboratory will seal, code and sign off the sample to the ARC-GCI. ARC-GCI will collect the sealed sample from the laboratory and will take it to a third accredited lab.
- If two of the laboratories agree that the sample falls outside the prescribed legal parameters, the ARC-GCI will communicate details of the sample analysis with the registration holder, who will then be given the opportunity to verify the information and/or to comment on the information within **15 working days**.
- No information will be communicated externally. However, the Executive Director of CropLife SA and GSA will be informed confidentially of the first finding of the SABS that a potential problem may exist. The information is confidential and CropLife and GSA are not allowed to communicate this information to their members.
- After this procedure has been completed and the parties concerned have reached consensus regarding the results, the Executive Director of CropLife SA will be informed and may take steps and act as they deem fit.
- Products that do not comply with specifications will be re-tested the next season.
- ARC-GCI will release an article (for publication) on the results each year. Before publication, the article will be distributed to all the role players for comments and approval. It will not be appropriate to publish annual results of individual companies since the small number of samples taken is not statistically representative of any company's performance.

## **Results and discussion**

- 2008/09 In total 31 products representing 36 active ingredients were analysed of which eight did not comply with acceptable registered deviations. Four of the agro-chemicals analysed were underformulated and four were overformulated. Where mixtures were analysed, only one of the active ingredients did not comply.
- 2009/10 Twenty six products representing 36 active ingredients were analysed of which one did not comply with acceptable registered deviations. This agro-chemical was underformulated and none were overformulated.
- 2010/11 A total of 11 products were tested, representing 17 active ingredients. All the agro-chemicals tested complied within the standard deviation specifications.

**Conclusion**

During 1999, 75 % of active ingredients deviated from the product label. Only 42 % did not comply in 2008/09 season and improved to 2 % during the 2009/10 season. All products tested in 2010/11 complied with the relevant product labels. The monitoring of agrochemicals has, therefore, proven to be worth the effort resulting in greater compliance of formulation specifications.

Table 1 Active ingredients of herbicides from various agro-chemical companies that have been tested since 2008 for deviations in formulations

<b>Active ingredient(s) per season tested</b>		
<b>2008/09</b>	<b>2009/10</b>	<b>2010/11</b>
<b>Herbicides</b>	<b>Herbicides</b>	<b>Herbicides</b>
acetochlor 700g/l	2,4-D amine 480 g/l	2,4-D amine 480g/l
acetochlor 750g/l	acetochlor 700 g/l	acetochlor 700g/l
acetochlor 840g/l	acetochlor 840 g/l	acetochlor 750g/l
acetochlor 960g/l	acetochlor 250 g/l / atrazine 225 g/l / terbuthylazine 225g/l	acetochlor 900g/l
atrazine 500g/l	atrazine 500g/l	atrazine 600g/l
atrazine 900g/l	atrazine 248.6 g/l / s-metolachlor 102,8g/l terbuthylazine 248.6 g/l	atrazine 300g/l / terbuthylazine 300g/l
acetochlor 250g/l / atrazine 225g/l / terbuthylazine 225g/l	acetochlor 225g/l atrazine 225g/l terbuthylazine 225g/l	chlorimuron-ethyl 250g/kg
atrazine 300g/l / terbuthylazine 300g/l	atrazine 300g/l / terbuthylazine 300g/l	chlorimuron-ethyl 500g/kg
atrazine 291g/l / sulcotrione 125g/l	atrazine 300g/l / sulcotrione 125g/l	flumetsulam 800g/kg
glyphosate 360g/l	glyphosate 360 g/l	glyphosate- isopropylamine 360g/l
glyphosate-trimesium 480g/l	glyphosate 500 g/kg	
glyphosate- isopropylamine 360g/l	mesotrione 480 g/l	mesotrione 25g/l s-metolachlor 250g/l glyphosate 250g/l
glyphosate 540g/l	metolachlor 800 g/l	metribuszin 480g/l
mesotrione 480g/l	metolachlor 960 g/l	s-metolachlor 102.8g/l terbuthylazine 497.2g/l
metolochlor 800g/l	s-metolachlor 960 g/l	propaquizafop 100 g/l
	paraquat 200g/l	terbuthylazine 500g/l
	propaquizafop 100 g/l	mesotrione 26,8 g/l s-metolachlor 208,5 g/l atrazine 208,5 g/l

Table 2 Active ingredients of insecticides and fungicides from various agro-chemical companies that have been tested since 2008 for deviations in formulations

<b>Active ingredient(s) per season tested</b>		
<b>2008/09</b>	<b>2009/10</b>	<b>2010/11</b>
<b>Insecticides</b>	<b>Insecticides</b>	<b>Insecticides</b>
cypermethrin 200g/l	cypermethrin 200 g/l	carbofuran 100g/kg
chlorpyrifos 450g/l / cypermethrin 5g/l	chlorpyrifos 450g/l / cypermethrin 50 g/l	esfenvalerate 200g/l
deltamethrin 25g/l	lambda-cyhalothrin 50g/l	imidachloprid 600g/l
lambda-cyhalothrin 50 g/l		lambda-cyhalothrin 50 g/l
		<b>Fungicides</b>
		azoxystrobin 200g/l difenconazole 125g/l
		flusilazole 250g/l / carbendazim 125 g/l
		pyroclostrobin 62.5g/l / epoxiconazole 62.5g/l

Table 3 Final results of active ingredients of agro-chemicals analysed by the SABS during 2011

Chemical Companies	Reg nr L	Agro-chemical product trade name	Active ingredient	Batch	Active ingredient (SABS)	Acceptable deviation (%)	Analysed deviation (%)	LAB Order nr	LAB Report ref	Acceptable or not (N)
Bayer Crop Science	L 871	Curaterr 10 GR	carbofuran 100 g/kg ai	0567258/1214	105	6%	4.76%	69007	2416/E1049PC	A
BASF	L8048	Abacus	Pyraclostrobin 62,5 g/l ai	4814184	59.2	10%	-5.28%	67804	2416/E1012PC	A
			Epoxckonazole 62,5 g/l ai	4814184	58.9	10%	-5.76%	67804	2416/E1012PC	A
Dow Agro Sciences	L 6180	Broadstrike 800 WG	Flumetsulam 800g/kg	YF10161803	807	2.50%	0.87%	68294	2416/E1029PC	A
Monsanto	L 7703	Harness Extra EC	Acetochlor 960 g/l ai		966.00%	2.50%	0.62%	67807	2416/E1008PC	A
Makhteshim – Agan SA	L 7578	Lamdex 5 EC	Lambda-cyhalothrin 50 g/l ai	9.110171P.D.2011	48.8	10%	2.46%	68342	2416/E1033PC	A
	L 5393	Glyphogan 360 SL	Glyphosate 360 g/l ai	GH20110503	367	5%	1.91%	68293	2416/E1032PC	A
			isopropylamine salt 480g/lai	May-11	495	5%	3%	68293	2416/E1032PC	A
Philagro SA	L 3245	Sumi Alpha 200 EC	Esfenvaleraat 200 g/l ai	3174 1 2010 11	207	6%	3%	67803	2416/E1017PC	A
Syngenta	L 7897	Amistar top	Azoxystrobin 200g/l ai	GRA1A282B	202	6%	1%	67806	2416/E1024PC	A
			difenconazole 125 g/l ai		128	6%	2.40%			A
	L 8327	Camix Plus	Mesotrione 26,8 g/l ai	SBR03002 10/10	28.3	10%	5.3	67805	2416/E1021PC	A
			Atrazine 208,5 g/l ai		199.20%	6%	4.66%			A
			S-metolachlor 208,5 g/l ai		212.9	6%	2.06%			A
	L 8415	Halex GT	Mesotrione 25 g/l ai	SBR0K002 11/10	24.3	10%	2.88%	67802	2416/E1022PC	A
			Glyphosate 250 g/l ai		254	5%	1.57%			A
			S-metolachlor 250 g/l ai		256	5%	2.34%			A
	L 3752	Karate	Lambda-cyhalothrin 50 g/l ai	SBR1C001 03/11	51	10%	1.90%	67808	2416/E1023PC	A
	L 6221	Sorgomil Gold 600 SC	S-metolachlor 102,8 g/l ai	SBR1A001 01/11	98	6%	4.89%	67809	2416/E10220PC	A
Terbutylazine 497,2 g/l ai				489	5%	1.67%			A	

## Reference list (Publications published)

### Popular publications

SAAYMAN-DU TOIT, A.E.J., 2007 Riglyne vir gebruik en keuse van onkruidodders. *SA Coop*, December 2007.

SAAYMAN-DU TOIT, A.E.J., 2007 Voorskrifte vir effektiewe keuse van onkruidodders. *SA Grain*, December 2007

SAAYMAN-DU TOIT, A.E.J., 2007 Monitoring compliance to agro-chemical formulations *SA Grain/SA Graan*, December 2007

SMIT, E., SAAYMAN-DU TOIT, A.E. J. & VAN DER WALT, M.M., 2008 Onkruidbeheer in bewaringslandbou praktyke. *SA Grain/SA Graan*, September 2008.

M.M. VAN DER WALT & A.E.J. SAAYMAN-DU TOIT. 2008. Monitoring of Agro-chemicals. *SA Grain/SA Graan*, September 2008.

ELBÉ SMIT, A.E.J SAAYMAN-DU TOIT & M.M. VAN DER WALT, 2008. Conservation agriculture: Implications on weed control . *Farmers Weekly*, November 2008.

SAAYMAN-DU TOIT, A.E.J., SMIT, E., VAN DER WALT, M.M. & VAN DER WALT, J., 2007. Simptome van onkruidodder-skade in mielies. *Pula Imvula*, Januarie 2007

SAAYMAN-DU TOIT, A.E.J., SMIT, E., VAN DER WALT, M.M. & VAN DER WALT, J., 2007. Simptome van onkruidodderskade in mielies. *SA Grain/SA Graan*, Volume 9 no. 9. September 2007.

ELBÉ SMIT, A.E.J. SAAYMAN-DU TOIT & M.M. VAN DER WALT, 2009. Conservation Agriculture: Controlling weeds. *Farming SA*, February 2009.

M.M. VAN DER WALT & A.E.J. SAAYMAN-DU TOIT, 2010. Monitoring of Agro-chemicals. *SA Grain/SA Graan*, September 2010

M.M. VAN DER WALT, A.E.J. SAAYMAN-DU TOIT & E. HUGO, 2010. Etiket. *Landbouweekblad*, Augustus 2010.

ELBÉ HUGO, MARLENE VAN DER WALT & JEANETTA DU TOIT, 2012. Uitslag van die kwaliteit van landbou-chemiese middels wat geregistreer is op mielies in Suid-Afrika. *SA Grain/SA Graan*, Mei 2012.

#### Congress presentations

SAAYMAN-DU TOIT, A.E.J., 2007. Involvement of ARC-GCI in research and technology transfer to address challenges of the smallholder farmers in Southern Africa. Agricultural and Poverty Alleviation Summit of the Southern District Council, Potchefstroom, 2 - 3 October 2007.

SMIT, E., SAAYMAN-DU TOIT, A.E.J. & VAN HEERDEN, R., 2008. The use of Chlorophyll A fluorescence to quantify herbicide damage in maize. Combined Congress 2008. Rhodes University, Grahamstad. 22 - 24 January 2008.

VAN DER WALT, M.M., HUGO, E. & SAAYMAN-DU TOIT, A.E.J., 2012. Quality of active ingredients in agro-chemicals registered on maize in South Africa. Combined Congress 16 - 19 January 2012, Northwest University, Potchefstroom.

#### Radio and TV Broadcasts

A.E.J. SAAYMAN-DU TOIT, 2008. Control of *Digitaria Sanguinalis*. *RSG-Landbou* (Hennie Maas). January 2008.

M.M. VAN DER WALT, 2009. Tydige, korrekte toediening van Landbou chemikalieë . *RSG-Landbou* (Hennie Maas). April 2009.

E. SMIT & M.M. VAN DER WALT, 2009. Living Land, *SABC 2*, Augustus 2009. Onkruidwetenskap as 'n beroep.

E. HUGO & M.M. VAN DER WALT, 2012. *RSG-Landbouradio*. 2 Mei 2012 . Verslag oor die monitering van landbou-chemikalieë die afgelope seisoen.