

EVALUATION OF HERBICIDE ACTIVITY OF GLYPHOSATE-BASED FORMULATIONS PROVIDED BY SO.IT.EM.

(test code E65-03, protocol E65-03; november 11th, 2003)

1. BASIC INFORMATION ABOUT THE RESEARCH

1.1 Title

Evaluation of herbicide activity of glyphosate-based formulations provided by SO.IT.EM.

1.2 Object of the research

Formulations provided by the sponsor (SO.IT.EM.), labelled as follows:

- Glyphosate std with D activator
- Glyphosate std with E activator

(For technical information about the formulations, see our [Note](#) at the end of the abstract)

4. OBJECTIVES

To evaluate the quickness and intensity of herbicide activity of the formulations provided by the sponsor. The research has been conducted in greenhouse: after the treatment the test organisms *Amaranthus retroflexus* (AMARE) and *Setaria viridis* (SETVI) have been constantly monitored with the purpose to gauge the quickness of herbicide activity and its final outcome in all the formulations.

5. EXPERIMENTAL PLAN

5.1 Greenhouse experimentation

5.1.1 Experimental plan

- *Amaranthus retroflexus*
 - 1st test: 3 + non-treated sample
 - 2nd test: 4
- *Setaria viridis*
 - 1st test: 3 + non-treated sample
 - 2nd test: 4

5.2 Experimental unity

Type and size: plastic jars (Ø 10 cm) adopted by Isagro Ricerca for greenhouse screenings.

Soil: classified as F soil by the USA Soil Survey standards.

Main characteristics of the soil used in the test:

Parameter	Value
Sand	40%
Silt	35%
Clay	25%
PH	8.2
Organic substance	4.9

5.3 Enviromental conditions

The test has been conducted in a controlled greenhouse enviroment. Thermo-hygometric conditions have been constantly monitored by an electronic device able to modify the opening angle of the greenhouse's upper windows according to both the outside climate and inside conditions. Here follow the average enviromental conditions typical of the greenhouse throughout the duration of the study:

Temperature: about 27°C in daytime, about 23°C in nighttime

Relative humidity: about 50% in daytime, about 60% in nighttime

Light intensity: approximately estimated 27000 lux

Light cycle: 16 hours of light, 8 hours of darkness

5.4 Irrigation

Jars have been watered starting the next day to the application. In the following days the soil has been kept moist.

5.5. Application of the formulations

Formulations: according to paragraph 1.2

Proportioning: each formulation (480g/L) has been tested in two different proportions (high-low)

- *Setaria viridis*: 0.25 and 0.50L ha⁻¹
- *Amaranthus retroflexus*: 0.28 and 0.55L ha⁻¹

Application: single application in post-emergence phase of the infestation. Applied volume equalling 200L of water per hectare with irrigating bar supplied with Teejet 8001 EVS nozzle (working pressure 3bar)

5.6 Tested parameters

The effects of the application of the formulations have been determined by evaluating the following symptoms of phytotoxicity:

- modifications of the color of leaf borders (chlorosis, different intensity, browning, reddening)
- leaf deformations (rolling-up, modifications of size, withering)
- tissue necrosis
- death of the plants

The intensity of herbicide activity has been expressed by means of a 0-10 scale (0=no effects, 10=death of the plants). The promptness of activity has been visually estimated by registering the quickness of appearance of the symptoms.

5.7 Criterion of validity of the research

The validity of the observations here registered on the samples has been confirmed and made into norm by the observation of non-treated plants.

5.8 Processes carried out and date of their execution

Here follows the list of procedures carried out within the experimentation and their respective date of execution:

Treatment	October 2 nd , 2003 – <i>A. retroflexus</i> and <i>S. viridis</i> treated at the BBCH 13-14 state (3-4 leaves)
<i>A. retroflexus</i> measures	Promptness of action: 1, 2, 3 and 4 DAT. Intensity of action: 7, 10, 14 and 21 DAT
<i>S. viridis</i> measures	Promptness of action: 1, 2, 3 and 4 DAT. Intensity of action: 7, 10, 14 and 21 DAT

Note: DAT=Days After Treatment

5.9 Registries utilized during the experimentation

The rough data obtained through the measures have been copied into the respective cards supplied to the main experimenter.

6. RESULTS

6.1 *Amaranthus retroflexus*

During the three following days to the treatment no sample showed any symptom of activity. After four days the samples treated with Glyphosate std/high proportion/E activator displayed the first signs of activity. At the same time, although at a lesser intensity, also the samples treated with Glyphosate std/low proportion/E activator displayed the first signs of activity. The measures of activity promptness can be found in table 1.

Table 1. *Amaranthus retroflexus*, activity promptness at 1-4 DAT

Sample	Proportion (L F/ha)	1 DAT	2 DAT	3 DAT	4 DAT
Glyphosate std + D activator	0.28				
Glyphosate std + D activator	0.55				
Glyphosate std + E activator	0.28				*
Glyphosate std + E activator	0.55				**

Notes: blank cell=no symptoms, *=low activity, **=easily recognizable activity, L F/ha=liters of formulations per hectare

Starting by day seven, measures of intensity of action have been taken. The results can be found in table 2.

Table 2. *Amaranthus retroflexus*, activity intensity at 7-21 DAT

Sample	Proportion (L F/ha)	Intensity of herbicide activity			
		7 DAT	10 DAT	14 DAT	21 DAT
Glyphosate std + D activator	0.28	1.0	1.0	1.5	1.5
Glyphosate std + D activator	0.55	7.5	6.0	6.2	5.5
Glyphosate std + E activator	0.28	6.5	6.0	6.0	5.5
Glyphosate std + E activator	0.55	7.7	6.0	6.0	5.5

Notes: 0=no symptoms, 10=100% control, L F/ha=liters of formulations per hectare

In low proportion the Glyphosate std/D activator shows a much lesser control compared to the equally proportioned Glyphosate std/E activator. In high proportion there has not been revealed any significant difference between the D and E activators.

6.2 *Setaria viridis*

As already seen with AMARE, during the first three days following the treatment no samples showed any sign of activity. After four days both the Glyphosate std/high proportion samples displayed initial symptoms of activity. The measures of activity promptness can be found in table 3.

Table 3. *Setaria viridis*, activity promptness at 1-4 DAT

Sample	Proportion (L F/ha)	1 DAT	2 DAT	3 DAT	4 DAT
Glyphosate std + D activator	0.25				
Glyphosate std + D activator	0.50				**
Glyphosate std + E activator	0.25				
Glyphosate std + E activator	0.50				**

Notes: blank cell=no symptoms, **=easily recognizable activity, L F/ha=liters of formulations per hectare

Starting by day seven, measures of intensity of activity have been taken. The results can be found in table 4.

Table 4. *Setaria viridis*, activity intensity at 7-21 DAT

Sample	Proportion (L F/ha)	Intensity of herbicide activity			
		7 DAT	10 DAT	14 DAT	21 DAT
Glyphosate std + D activator	0.25	3.5	4.0	4.0	3.0
Glyphosate std + D activator	0.50	6.0	8.0	8.5	8.5
Glyphosate std + E activator	0.25	3.0	3.0	3.5	3.5
Glyphosate std + E activator	0.50	5.5	7.5	8.5	9.0

Notes: 0=no symptoms, 10=100% control, L F/ha=liters of formulations per hectare

At low proportion, no significant difference has emerged between the samples. At high proportion, E activator provides better results than D.

6.3 Overall intensity of herbicide activity

The evaluation of the overall effectiveness of a herbicide formulation against a wide variety of infestating plants ought necessarily to hinge in bigger proportion upon its effectiveness against the most difficult ones to be kept under control.

It is commonly known that glyphosate shows a higher effectiveness against monocotyledonous infestants, here represented by *Setaria viridis*.

In the present research, in order to keep into account glyphosate's different effectiveness against respectively monocotyledonous (SETVI) and dycotyledonous (AMARE) species, and thus provide an overall evaluation, the sampled species have been treated with so-called "equivalent effect" dosages.

In this way it has been possible to express the overall herbicide activity effectiveness as the average of the two separate effectiveness ratios (see table 5), according more relative height to the increments of activity registered towards the dycotyledonous plant of the test (AMARE).

In high proportion samples we notice Glyphosate std/E activator being more effective than Glyphosate std/D activator. In low proportion samples, there where the test is more probing, Glyphosate std/D activator's performance clearly appears to be inferior to Glyphosate std/E activator's.

Table 5. Intensity of activity SETVI+AMARE, 21 DAT

Sample	Proportion	Average measure 21 DAT
Glyphosate std + E activator	High	7.2
Glyphosate std + D activator	High	7.0
Glyphosate std + E activator	Low	4.5
Glyphosate std + D activator	Low	2.2

7. CONCLUSIONS

Object of the evaluation has been the activity of glyphosate-based formulations and activators provided by SO.IT.EM. towards the species *Setaria viridis* (monocotyledonous) and *Amaranthus retroflexus* (dicotyledonous), with the purpose of finding out increments of overall herbicide activity towards both monocotyledonous and dicotyledonous species.

With regards to the promptness of activity, the research shows how Glyphosate std with E activator performs better than its counterpart with D activator. With reference to the final intensity of activity, it is important to notice that the gap between D and E activators is originated in the control of dicotyledonous species, where more significant is the contribution supplied by the activator.

8. REGISTRATION OF THE DATA AT THE END OF THE RESEARCH

At the end of the research all the originals of the cards, rough data and calculations, plus copies of the study protocol and final report, have been archived and will be saved for at least ten years. All the data concerning the research will be kept according to safety and privacy standards. The access to the archive can be granted to persons other than the Director and Science Head of the research only on a case-by-case basis, and by the Director of the research himself.

NOTE ADDED BY SO.IT.EM.

Isagro Ricerca was commissioned a research on Glyphosate 360 g/l and 480 g/l boosted with our activators, and was provided formulations that had been labelled only with a letter. The following table includes those whose performances we have estimated satisfactory.

	A	B	C	D	E
Glyphosate	360 g/l	360 g/l	360 g/l	480 g/l	480 g/l
SOITEM 1007/KM	90 g/l	120 g/l	100 g/l	135 g/l	120 g/l
SOITEM 1007/C	30 g/l	/	100 g/l	65 g/l	80 g/l
Water up to	1 lt	1 lt	1 lt	1 lt	1 lt

Note: SOITEM 1007/KM is SOITEM 1007/K neutralized with IPA