

EVALUATION OF PRODUCT ASSOCIATION TO ROUNDUP TRANSORPIN SOYBEAN

INSTITUIÇÃO DE PESQUISA:

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Rodovia da Mudança – Km 08 – CEP: 78.455-000 Caixa

Postal 159 – Lucas do Rio Verde - MT Telefone: (65) 3549

-1161 / 99995 – 7407

fundacao@fundacaorioverde.com.br – www.fundacaorioverde.com.br Credenciada no MAPA pela Portaria 39 de 15/03/2004 e pela Portaria 202 de 06/11/2015 via Superintendência Federal no Estado de Mato Grosso.

TÉCNICOS RESPONSÁVEIS:

Rodrigo Pengo Rosa – Engenheiro Agrônomo, Mestre.

Pesquisador da Fundação Rio Verde, CREA/MT: 36435-D.

Departamento de Fitotecnia e Nutrição de Plantas.

rodrigopengo@fundacaorioverde.com.br

Fabio Kempim Pittelkow – Engenheiro Agrônomo, Doutor.

Pesquisador Fundação Rio Verde, CREA/RO: 4224-D. Diretor de Pesquisa.

fabio@fundacaorioverde.com.br

INSTITUIÇÃO REQUERENTE: ALBION

LABORATORIES

67 South Main Street Suite 100 Layton,
UT 84041, USA

Objective

To evaluate the effect of Albion Minerals' product association and market standards on Roundup Transorb in soybean application in Lucas do Rio Verde, MT.

Material and methods

The experiment was installed in the dependencies of the Rio Verde Technological Research and Development Foundation, located between the geographic coordinates 13 ° 00'27 "S - 55 ° 58'07" W and 12 ° 59'34 "S - 55 ° 57'50 "W, with an average altitude of 387meters, in the municipality of Lucas do Rio Verde - MT. The region is comprised in the Cerrado biome and its predominant climate is the Aw (Savana Tropical) type according to the classification of Köppen-Geiger (Peel et al., 2007), presenting two well defined seasons (rainy, October to April and dry , from May to September), the soil is classified as RED LATOSOLO Dystrophic yellow with a clayey texture. Seeding occurred in no - tillage mode on second crop maize straw, using a randomized complete block design (DBC) with four replications.

The experimental plots were constituted by 8 crop lines in the spacing of 0.45 meters by 5.5 meters in length, totaling an area of 19.8 m² per plot and 79.2 m² per treatment.

The experiment was carried out during the 2017/18 harvest, with the soybean crop being sown on November 9, 2017, with fertilization of 500.0 kg ha⁻¹ of the formulated 00-18-18, totaling 90.0 kg ha⁻¹ of P₂O₅ and 90.0 kg ha⁻¹ of K₂O.

The treatments employed in the soybean test are described in Table 1.

Table 1. Description of the treatments used in the experiment with the soybean crop in Lucas do Rio Verde. Rio Verde Foundation, 2018.

Nº Trat.	Treatment	Rate	Spray moment
1	Roundup Transorb	2,5 L ha ⁻¹	V5
	Metalosate Big 5	0,5 L ha ⁻¹	V5
	Roundup Transorb	2,5 L ha ⁻¹	V5
2			
3	Metalosate Big 5	1,0 L ha ⁻¹	V5
	Roundup Transorb	2,5 L ha ⁻¹	V5
	Metalosate Big 5	2,0 L ha ⁻¹	V5
	Roundup Transorb	2,5 L ha ⁻¹	V5

4

5	Broadacre Mn	0,5 L ha ⁻¹	V5
	Roundup Transorb	2,5 L ha ⁻¹	V5

Kellus Manganese	0,5 Kg ha ⁻¹	V5
Roundup Transorb	2,5 L ha ⁻¹	V5

6

7	Sulfato de Manganês	0,5 Kg ha ⁻¹	V5
	Roundup Transorb	2,5 L ha ⁻¹	V5

Starter Manganês	2,0 L ha ⁻¹	V5
Roundup Transorb	2,5 L ha ⁻¹	V5

8

9	Metalosate Crop-Up	250,0 mL / 100 kg de sem.	TS
	Metalosate Big 5	1,0 L ha ⁻¹	V5
	Roundup Transorb	2,5 L ha ⁻¹	V5

Seed treatment was performed on the day of sowing and 1000.0 grams of seed were treated using the product and dose described in Table 1, where the product was diluted in distilled water to form a homogeneous 5.0 mL solution to provide the total covering of the seeds. The mixture of the product with the seeds was carried out in a 5.0 kg plastic bag and vigorously stirred for two minutes, in order to standardize the treatments on the seed mass (Castro et al, 2008). The applications of the treatments were performed as described in Table 1, as of 07/12/2017 when the lines were still not closed by soybean cultivation, thus allowing the control of weeds, a costal CO2 spraying equipment of constant pressure (50 psi), containing 3 m bar and 6 nozzles J5-2 empty cone type (J5 disc, external diameter 15 mm) with a volume of 150 L ha⁻¹.

Table 2 shows the characteristics of each product used in soybean crop applications.

Table 2. Description of the products used in the test treatments. Rio Verde Foundation, 2018.

Marca Comercial ou Codificação: Roundup Transorb

Ingrediente Ativo: Equivalente ácido de N-(fosfometil) glicina - Glifosato

Concentração: 480,0 g L⁻¹

Grupo químico: Glicina Substituída

Ingrediente Ativo: Glifosato - Sal de Isopropilamina

Concentração: 648,0 g L⁻¹

Grupo químico: Glicina Substituída

Tipo de Formulação: Concentrado Solúvel - SL

Número de Registro no MAPA: 4299

Classificação Toxicológica: II - Altamente tóxico

Commercial Brand: Metalosate Big 5

Nutrient: Manganese (Mn)

Concentration: 3,0 %

Nutrient: Zinc (Zn)

Concentration: 3,0 %

Nutrient: Sulphur (S)

Concentration: 3,0 %

Nutrient: Nitrogen (N)

Concentration: 1,5 %

Nutrient: Boron (B)

Concentration: 0,25 %

Commercial Brand: Metalosate Crop-Up

Nutrient: Magnesium (Mg)

Concentration: 0,5 %

Nutrient: Boron (B)

Concentration: 0,025 %

Nutrient: Copper (Cu)

Concentration: 0,25 %

Nutrient: Iron (Fe)

Concentration: 0,25 %

Nutrient: Manganese (Mn)

Concentration: 2,5 %

Nutrient: Zinc (Zn)

Concentration: 1,25 %

Commercial Brand: Broadacre Mn⁺

Nutrient: Manganese (Mn)

Concentration: 500,0 g L⁻¹

Commercial Brand: Kellus Manganese

Nutrient: Phosphorus (P₂O₅)

Concentration: 30,0 g Kg⁻¹

Nutrient: Manganese (Mg)

Concentration: 90,0 g Kg⁻¹

Nutrient: Zinc (Zn)

Concentration: 30,0 g L⁻¹

Commercial Brand: Sulfato de Manganês

Nutrient: Manganese (Mn)

Concentration: 310,0 g kg⁻¹

Nutrient: Sulphur (S)

Concentration: 180,0 g kg⁻¹

Commercial Brand: Starter Manganês	
Nutrient: Nitrogen (N)	
Concentration: 67,5 g L ⁻¹	
Nutrient: Sulphur (S)	
Concentration: 54,0 g L ⁻¹	
Nutrient: Boron (B)	
Concentration: 4,0 g L ⁻¹	
Nutrient: Copper (Cu)	
Concentration: 4,0 g L ⁻¹	
Nutrient: Manganese (Mn)	
Concentration: 67,5 g L ⁻¹	
Nutrient: Molibdenium (Mo)	
Concentration: 0,67 g L ⁻¹	
Nutrient: Zinc (Zn)	
Concentration: 40,5 g L ⁻¹	

The sower was regulated for a population of 260,000 plants per hectare, with cultivar M 8210 IPRO. The climatic data occurring 10 days prior to trial installation until the date of harvest are shown in Figure 1.

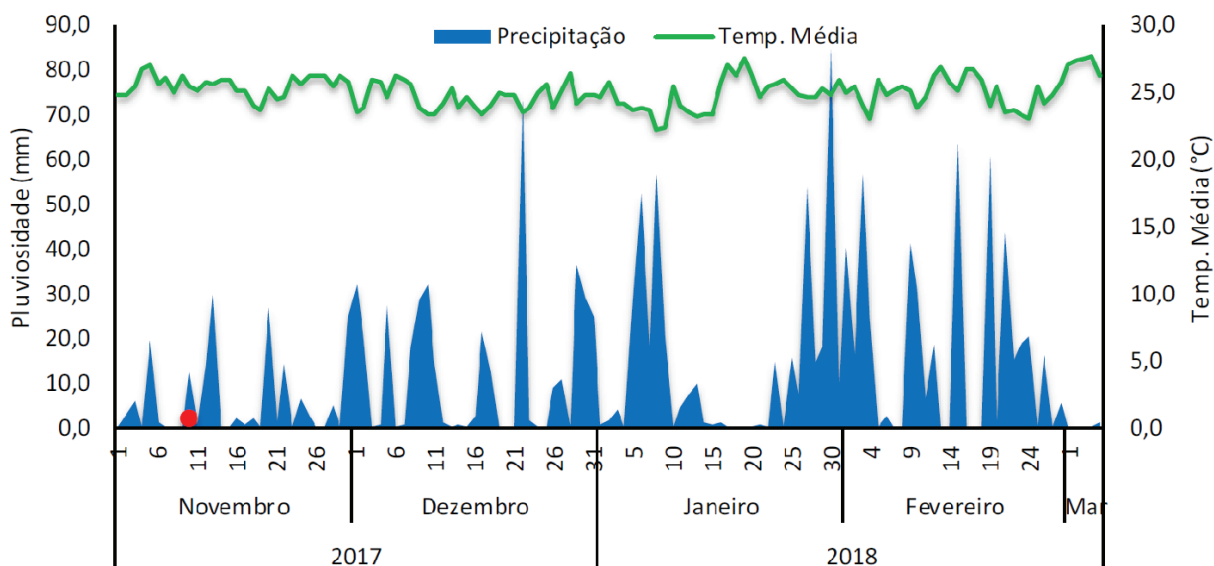


Figure 1. Mean temperature and precipitation occurred 10 days before sowing the soybean crop until harvest, accumulating 1,480.8 mm of precipitation in the period. Rio Verde Foundation, 2018. ● = Date of Sowing.

The desiccation of the area was carried out at the fifteenth day before sowing the crop with the application of glyphosate-ammonium salt at the dose of 1.6 kg ha^{-1} and ethyl-quizalofope-P at the dose of 50.0 g ha^{-1} , for the control of the *Digitaria insularis* in post emergence of the culture was performed an application of cletodim at the dose of 120.0 g ha^{-1} .

Pest control during the crop cycle was performed with two applications of flubendiamide at the dose of 24.0 g ha^{-1} , two applications of imidacloprid + beta-cyfluthrin at a dose of 78.8 g ha^{-1} , two applications of imidacloprid + bifenthrin at 60.0 g ha^{-1} , three applications of acetamiprid + alpha-cypermethrin at the dose of 120.0 g ha^{-1} , two applications of chlorantraniliprole at the dose of 10.0 g ha^{-1} , and one application of pyriproxyfen at the dose of 25.0 g ha^{-1} .

Two applications of pyraclostrobin + fluxapiraxade at the dose of 150.0 g ha^{-1} and two applications of prothioconazole + trifloxystrobin at 130.0 g ha^{-1} were used for disease control.

The **evaluations** carried out during the conduction of the test, as well as the dates and phenological stages following the BBCH scale at the time of the evaluations are described below.

Plant Height: Distance from ground level to the apex of the plant, being carried out in two random plants in each plot at the end of the crop cycle, on 04/03/2018 when the crop was in stage 89;

First pod insertion height: Distance from ground level to first pod insertion, being performed at the end of the crop cycle in two random plants in each plot on 04/03/2018 when the crop was in stage 89 ;

Plant Population: Number of plants per hectare, being counted the plants in two linear meters of the two central lines of each plot, converted to unit area, performed at the end of the crop cycle on 04/03/2018 when the culture was at stage 89;

Control: Visual evaluations of the weed control level were carried out at 7, 14 and 21 days after application of the products on the respective dates of 12/14/2017, 12/21/2017 and 12/28/2017, at the cultures 18, 69 and 69 respectively.

Phytotoxicity: Visual evaluations were carried out at 7, 14 and 21 days after application of the products on the respective dates of 12/14/2017, 12/21/2017 and 12/28/2017, at the stages of culture 18, 69 and 69 respectively .

Mass of a thousand grains: Weighed 100 grains of each plot and converted to a thousand grain mass with the standard commercialization humidity of 13%, performed in post harvest on 03/03/2018;

Yield: For the yield determination, two central lines of 4 linear meters of the useful area of each plot were collected manually on 05/03/2018 when the crop was in stage 89, later the mass of plants was traced in a stationary forklift and the cleaned grains were weighed and their moisture content was determined, then yield was calculated in unit area with standard commercial moisture content of 13%.

Subsequently, the data of each evaluated attribute were submitted to analysis of variance by applying the F test ($P < 0.05$) and then comparing the means by the Scott-Knott test ($P < 0.10$) through statistical program Sisvar 5.6 (Ferreira, 2008).

Results and discussion

The soybean cultivar M 8210 IPRO showed no influence of the treatments tested on its development cycle being harvested at 116 days after sowing without desiccation.

Plant height, first pod insertion height, final plant population and weed control did not present statistical difference between treatments evaluated (Table 3).

For weed control evaluations performed at 14 and 21 days after the application of the products, no visual difference between the evaluated treatments was verified.

For the evaluation of phytotoxicity only a low phytotoxicity of the culture was verified the application of the treatment with Roundup Transorb associated with Kellus Manganese of 4.5% at 7 days after the applications of the products, for the evaluations carried out at 14 and 21 days was not verified no crop phytotoxicity to the products applied.

Table 3. Height of plants, height of insertion of the first pod, plant population and weed control in soybean crop as a function of evaluated treatments. Rio Verde Foundation, 2018

Treatments	AP ^{ns} centimeters	AIV ^{ns}	POP ^{ns} plants ha ⁻¹	C7DAA %
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Control	61,8	16,6	233.334	95,8
Metalosate Big 5 - 0,5 L ha⁻¹	61,5	16,9	244.445	96,5
Metalosate Big 5 - 1,0 L ha⁻¹	60,9	17,4	230.556	95,8
Metalosate Big 5 - 2,0 L ha⁻¹	63,1	17,8	220.833	96,0
Broadacre Mn (Agrichem) - 0,5 L ha⁻¹	62,8	16,8	237.500	96,3
Kellus Manganese (Produquimica) - 0,5 kg ha⁻¹	62,4	17,6	230.556	96,0
Manganese sulphate - 0,5 kg ha⁻¹	62,3	18,4	229.167	96,3
Starter Mn (Stoller) - 2,0 L ha⁻¹	61,0	16,6	240.278	95,5
Metalosate Big 5 - 1,0 L ha⁻¹ + TS	60,5	16,5	222.222	94,8
Average	61,8	17,2	232.099	95,9
Coefficient of variation (%)	4,4	12,0	7,5	0,9

AP = Plant height at the end of the cycle; AIV = Insertion Height of the First Pod; POP = Final Plant Population; CN7DAA = Control of weeds at 7 days after application.* Averages followed by the same lowercase letters in the column do not differ by Scott-Knott's test at the 10% probability level. ns - not significant.

The yield of the soybean crop presented a statistical difference between the evaluated treatments (Table 4 and Figure 2). The treatments that received the application of Metalosate Big 5 in the doses of 0.5 L ha⁻¹ and 1,0 L ha⁻¹ without the treatment of seeds, presented the highest productivities, with a mean of 70.5 sc ha⁻¹, equivalent to the gain of 8.0% in relation to the Control treatment (5.2 sc ha⁻¹).

The treatment with Metalosate Crop-Up in the treatment of seeds and application of Metalosate Big 5, presented the same productivity as the Control treatment and the other treatments presented values statistically inferior to the control treatment.

We can observe a numerical tendency of decrease of the productivity with the increase of the dose of Metalosate Big 5, being recommended its use between the doses of 0,5 to 1,0 L ha⁻¹. The mass of a thousand grains did not present statistical difference for the evaluated treatments.

Table 4. Mass of thousand grains and yield of soybean crop as a function of evaluated treatments. Rio Verde Foundation, 2018.

Treatments	MMG ^{ns}	Yield*	
	grams	kg ha ⁻¹	bags ha ⁻¹
Control	154,1	3.920,5 a	65,3 b
Metalosate Big 5 - 1,0 L ha ⁻¹ + TS	150,0	3.958,5 a	66,0 b
Average	152,7	3.813,0	63,6
Coefficient of variation (%)	3,1	5,7	
Metalosate Big 5 - 0,5 L ha ⁻¹	153,5	4.322,0 a	72,0 a
Metalosate Big 5 - 1,0 L ha ⁻¹	151,9	4.136,2 a	69,0 a
Metalosate Big 5 - 2,0 L ha ⁻¹	152,5	3.564,1 b	59,4 c
Broadacre Mn (Agrichem) - 0,5 L ha ⁻¹	150,0	3.791,4 b	63,2 c
Kellus Manganese (Produquimica) - 0,5 kg ha ⁻¹	155,5	3.519,0 b	58,7 c
Manganese sulphate - 0,5 kg ha ⁻¹	153,7	3.527,2 b	58,8 c
Starter Mn (Stoller) - 2,0 L ha ⁻¹	153,1	3.578,5 b	59,7 c

MMG = Thousand Grain Mass. * Averages followed by the same lowercase letters in the column do not differ by Scott-Knott's test at the 10% probability level. ns - not significant.

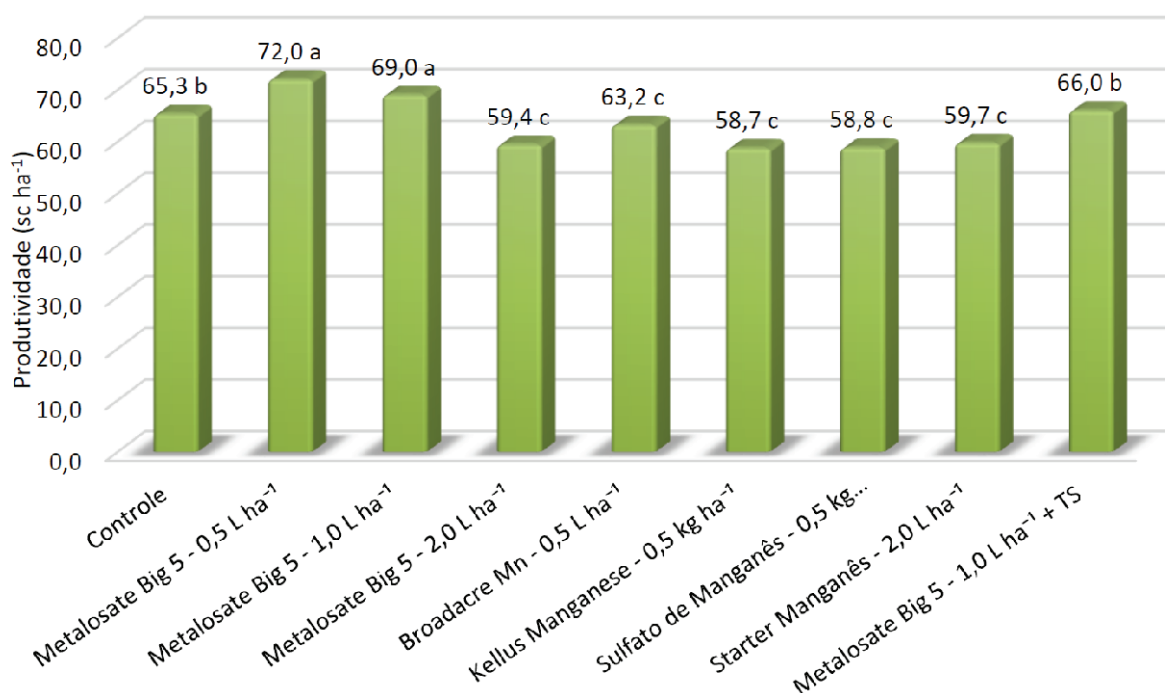


Figure 2. Productivity of soybean crop as a function of treatments evaluated in Lucas do Rio Verde, MT. Rio Verde Foundation, 2018.

Final considerations

Under the conditions under which this test was performed, we can conclude that:

- The association of the products tested did not cause statistical difference for the variables plant height, height of insertion of the first pod, plant population, weed control and mass of a thousand grains.
- There was no incompatibility between the evaluated products and Roundup Transorb, for the control of weeds.
- Treatments with Metalosate Big 5 in the doses of 0.5 L ha⁻¹ and 1,0 L ha⁻¹ presented a productivity gain of 8.0% in relation to the Control treatment where only the application of Roundup Transorb was performed.
- In view of the conditions observed in this trial, the association of Metalosate Big 5 at the doses of 0.5 L ha⁻¹ and 1.0 L ha⁻¹ to the Roundup Transorb herbicide in the soybean crop can be recommended.

Literature

CASTO, G.S.A.; BOGIANI J.C.; DA SILVA M.G.; GAZOLA E. E ROSOLEM C.A. **Tratamento de**

sementes de soja com inseticidas e um bioestimulantes. Pesquisa Agropecuária Brasileira vol. 43, n.10, pp. 1311-1318, Brasília Oct. 2008.

FERREIRA, D. F. **SISVAR: Um programa para análises e ensino de estatística.** Revista Symposium (Lavras), v.6, p.36-41, 2008.

PEEL, M.C.; FINLAYSON, B.L. E MCMAHON, T.A. **Updated world map of the Köppen- Geiger climate classification.** *Hydrology and Earth System Sciences*, vol. 11, p. 1633- 1644, 2007.