Chemical alternatives to paraquat use in soybean

Lars Neumeister, pesticide expert, March 2016 (for WWF Germany)

Contents

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About this report

WWF Germany commissioned this study especially for discussions in the Round Table for Responsible Soy (RTRS) to generate an overview on possible alternative active ingredients for paraquat.

The intensive use of pesticides is a reality in many agriculture systems with tremendous and negative effects on the environment and humans. WWF Germany does not consider substituting one active toxic ingredient for another to be an adequate alternative for implementing a more sustainable agriculture system.

We do understand that a change in agriculture systems to more environmental friendly production takes time for an integrated and participatory approach with all stakeholders involved. Therefore, as a first, important step, WWF recommends that all highly hazardous pesticides (based on WHO I-II definitions and the PAN international list of highly hazardous pesticides) are excluded from use in production systems aiming for greater sustainability i.e. in RTRS. WWF highly recommends following an integrated pest management (IPM) approach with crop rotation, biological pest control and mechanical control. Should pesticides be applied, their application should be managed as part of an IPM system that accounts for target species and thresholds.

A shift toward a more sustainable production system will only be possible if more agroecology methods and techniques are applied[1]. Biodiversity plays a crucial role in the overall agro-ecosystem. For example, various herbs considered to be weed may play an important role as a habitat for beneficial insects. Therefore, these and other interlinkages in the agro-ecosystem, have to be re-considered in a sustainable agriculture approach.

With this understanding, WWF Germany has commissioned and are now publishing this report to provide foundational information for an informed discussion about the feasibility of banning the highly hazardous pesticide paraquat in responsible soy production systems.

We would like to thank Lars Neumeister, who is the author of this technical report, for the good and helpful cooperation.

[1] See good and practical examples in “Replacing Chemicals with Biology: Phasing out highly hazardous pesticides with agroecology” by Meriel Watts with Stephanie Williamson (2015)

Introduction

Paraquat dichloride is the pesticide with the highest fatality rate in world. Thousands of people are killed each year by paraquat, especially in Asia, where paraquat is a common suicidal agent. Massive occupational intoxication led to a process within the Rotterdam Convention[2] and most "better production standards" such as UTZ Certified, FSC[3], Fairtrade International (FLO), SAN, the entire EU and many other countries have banned the use of paraquat.

Weed resistance to glyphosate leads to an increasing use of paraquat, and Argentina alone imported in 2014 around 7.500 tons of paraquat[4].

The RTRS currently discusses the phase out/ban of paraquat and in that context a screening of all authorized herbicides (in soy bean) in Argentina, Brazil, India and Uruguay is conducted. The authorized pesticides are compared to the PAN International status and evaluated using the Toxic Load Indicator – a ranking instrument assessing 15 parameters (five for health, five for eco-toxicity, five for environmental fate).

Data on indications (target weed by pesticide) are also compiled, if available.

Efficacy and phytotoxicity to soybean is not evaluated, but it should be assumed that herbicides authorized for weed management, control the target weeds without damaging the crop.

India – weed control in soy without paraquat and glyphosate

A list of nationally registered pesticide active ingredients is available at www.cibrc.nic.in. The herbicide list comes as word document and contains authorization data for major crops including soy. The list includes the target species/genus or species group (indication), but no pesticide product names.

The governmental herbicide authorization lists about[5] 134 authorized indications (weed-herbicide combinations) for soybean production. Seventeen herbicides are allowed for weed control in soy. Two are authorized only in combination 1. clodinafop-propargyl & acifluorfen, sodium salt and 2. imazamox & imazethapyr.

The following table shows the list of herbicides authorized for use in soy. **Glyphosate and paraquat are not allowed in soy production**[6].

[2] http://www.pic.int/TheConvention/Chemicals/Recommendedforlisting/Paraquatdichloride/tabid/2396/language/en-US/Default.aspx

[3] Paraquat is allowed via derogation in FSC plantations in South Africa for maintenance of fire belts.

[4] www.senasa.gov.ar

[5] Some indications allow control of all species of a specific genus.

[6] In India Paraquat is allowed to use as herbicide in Apple, Coffee, Cotton Grapes, Maize, Potato Rice, Rubber, Sugarcane, Sunflower, Tea, Wheat.

Table 1 Herbicides authorized for soybean production in India

Herbicide active ingredients
Alachlor
Chlorimuron Ethyl
Clodinafop propargyl & Acifluorfen, sodium salt
Clomazone
Diuron
Fenoxaprop-p-ethyl
Fluazifop-p-butyl
Fluchloralin
Imazamox & Imazethapyr
Imazethapyr
Metolachlor
Metribuzin
Pendimethalin
Pendimethalin & Imazethapyr
Propaquizafop
Quizalofop-ethyl
Quizalofop-p-tefuryl

Five of the authorized herbicides are classified as "highly hazardous" by PAN International. The list is attached. The evaluation using the Toxic Load Indicator is attached as Annex.

The 17 pesticide active ingredients are authorized for the control of species of 20 broadleaf plant genera and 12 grass genera. The combination of clodinafop-propargyl & acifluorfen, sodium salt can control most genera (n=17). The highest number of herbicides are authorized for the control of Echinochloa (e.g. *E. crus-galli*) (n=13) and Digitaria (e.g. *D. sanguinalis*).

Brazil

A list of pesticide active ingredients authorized in Brazil (n=520) is accessible at the ANVISA webpage[7]. A pdf Monograph exists for each pesticide active ingredient, which contains the list of crops, in which the specific pesticide is allowed to be used. Specific indication (target species) or names of pesticide products are not included.

The evaluation of the 520 monographs showed that in addition to paraquat-dichloride 55 other herbicides[8] are authorized for use in soybeans.

18 of the authorized herbicides (including glyphosate and paraquat-dichloride) are classified as "highly hazardous" by PAN International.

Argentina

A list of pesticide active ingredients authorized in Argentina is accessible at the SENASA webpage[9]. This list does neither contain authorized crop uses nor indications. A list of herbicides authorized in soybeans was send by SENASA on request, it seems that the setting of MRLs (maximum residue levels) determines the specific use.

[7] http://portal.anvisa.gov.br/wps/content/Anvisa+Portal/Anvisa/Inicio/Agrotoxicos+e+Toxicologia/Assuntos+de+Interesse/Monografias+de+Agrotoxicos/Monografias

[8] Without several derivates (e.g salts, esters) of 2,4-D and glyphosate

[9] http://www.senasa.gov.ar/informacion/prod-vet-fito-y-fertilizantes/prod-fitosanitarios-y-fertili/registro-nacional-de-terapeutica-vegetal

The MRL list for soybeans differentiates by the use of the harvested product. Altogether 46 herbicides are authorized for use in soybeans (incl. paraquat-dichloride).

13 of the authorized herbicides (including glyphosate and paraquat-dichloride) are classified as "highly hazardous" by PAN International.

Uruguay

The Uruguayan Ministry of Animal Husbandry, Agriculture and Fishery (MGAP) maintains an online database[10] listing authorized pesticides. The database can be searched by crop, pest/weed, product and active substance. However, a list of authorized active substances per crop (or total) cannot be generated. Therefore, all authorized herbicidal products (soy) were individually checked for the active ingredients.

Altogether 220 herbicidal pesticide product are authorized for use in soybean. The evaluation shows 1654 indications (weed-pesticide authorizations).

In addition, to paraquat and glyphosate (incl. several salts), 32 other herbicides (a.i.) are authorized for weed control in soy beans in Uruguay.

Eight (10 incl. paraquat and glyphosate) qualify as highly hazardous by PAN International.

Synthesis

Authorization data of four countries (Argentina, Brazil, India and Uruguay) were evaluated. Available data differ per country: product names are not given in Brazil and India, whereas indications (target weeds) are not given in Brazil and Argentina.

Numerous herbicides authorized for use are rated "highly hazardous" by PAN International (n=21). Some pesticides score very high using the Toxic Load Indicator (e.g. pendimethalin a volatile, persistent, bio-accumulative and toxic herbicides) and are used in large amounts per ha (pendimethalin: 800-1000ml active substance /ha).

The next table summarized the available data.

Table 2 Information about herbicides authorized for use in soybeans in four countries

	Argentina	Brasil	India	Uruguay
Number of products (Herbicides)	875*	---	---	220
Number of Herbicide active ingredient(a.i.)	42** (39 with product registration)	56**	17	33
Number of PAN HHP a.i	13	18	5	10
Number of target weeds* **	---	---	44	117
Number of indications	---	---	134	1654

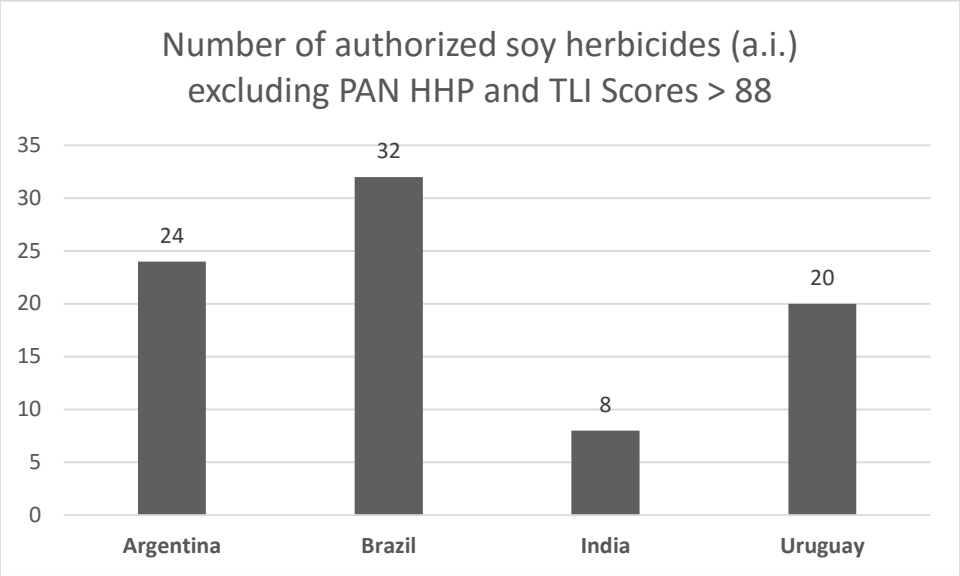
*about half are product cont. glyphosate or paraquat
**without several salts and ester of 2,4-D and Glyphosate
*** approximate since groups or genera are often indicated – the number presents an underestimation

Numerous pesticides should **not** be considered as alternatives to paraquat-dichloride because of their high human toxicity or the high "cumulative" toxicity. See in the attachment the list of herbicide active ingredients evaluated by toxic load indicator and "highly hazardous" by PAN International in all four countries.

[10] http://www.mgap.gub.uy/profit/consultacultivoplaga.aspx

A list of herbicides excluding PAN HH and a lower score than paraquat-dichloride is attached (List of herbicide active ingredients evaluated with lower toxic load indicator (TLI < 88) and without “highly hazardous” by PAN International in all four countries).

The following figure show the number of authorized soy herbicides (a.i.) excluding PAN HHP and TLI Scores over 88 (the score of paraquat dichloride).



Regarding non-HHP pesticides, a high toxic load indicator in combination with high use per ha is an indicator for potentially problematic pesticides.

Some herbicides are effective at very low rates[11]:

- halauxifen-methyl 7g/ha (EFSA Conclusion[12])
- chlorimuron-ethyl 20g/ha
- diclosulam 25g/ha
- flufenpyr-ethyl 30 g/ha (BCPC Manual[13])
- flumioxazin 60g/ha[14]
- imazethapyr 90g/ha[15]

The environmental toxicity and potential impacts of mobility in the environment is reduced by the low amounts used. Many herbicides are applied in an early stage (or before) of weed emergence.

However, it has to be emphasized that all herbicides are toxic to plants and non-toxic pesticides do not exist. In addition, workers who apply pesticides are commonly more frequently exposed to pesticides, than the individual agricultural site.

An integrated approach with crop rotation, manual control and low-toxic, low dose pesticides should be pursued. In India best results were shown with a combination of manual control and diclosulam:

[11] Glyphosate and Paraquat dichloride are commonly applied at > 1000g a.i./ha
[12] EFSA Journal 2014;12(12):3913
[13] http://www.bcpc.org/
[14] Highly hazardous pesticide according PAN
[15] Highly hazardous pesticide according PAN (“high bee toxic”)

"Application of diclosulam 18 g/ha supplemented with one hand weeding at 20 DAS[16] recorded significantly the lowest weed population of grassy as well the as non-grassy weeds at both 30 and 60 days stage."[17]

Hand weeding can also be replaced by machine manual weeding, which is more cost-effective.

It is very important to note, that a 100% weed control should never be the goal of any weed control strategy. Weeds play a crucial role in the agro-ecosystem (see Reuter & Neumeister 2016[18]).

The Annex with the indication in Uruguay, the table of indication (Chapter India) and the next table show that numerous herbicides exist for an effective control of weed. In India, weed management works without paraquat, glyphosate and glufosinate-ammonium.

Most of these herbicides have a better profile as paraquat and are effective at very low application rates.

Efficacy test of six herbicides for control of nine globally common weeds in soybean:

	Sulfentrazone 400g/ha	**Flumioxazin 60g/ha[19]**	**Imazethapyr 90g/ha**	**Diclosulam 25g/ha**	**Chlorimuron-ethyl 20g/ha**
Amaranthus viridis (B)	+++	+++	+++	+++	+++
Cenchrus echinatus (G)	+++	++	+++	++	++
Commelina benghalensis (B)	+++	+++ - ++	+++	+++	++
Euphorbia heterophylla (B)	+++	+++	+	++	++
Ipomoea spp. *(B)*	+++	+++ - ++	+++	+++	++
Bidens pilosa (B)	+++ - ++	+++ - ++	+++ - ++	+++	+++
Eleusine indica (G)	+++ - ++	+++ - ++	+++ - ++	++	++
Brachiaria plantaginea (G)	+	+	+++	+	+
Raphanus raphanistrum (B)	+	+	+++	+++	---
+++ = excellent/effective control *++ = intermediate control* *+ = poor control* *--- = not evaluated* *B = broadleaf* *G = grass*					
Source: Lopes Ovejero et al.(Monsanto) 2013[20]					

Conclusion by WWF

In May 2016, on the basis of this technical report, WWF prepared the following statement for the consultation process for the RTRS regarding the requirement in criteria 5.6.2 to ban paraquat for the use in RTRS certified soy farming:

"WWF strongly advocates for the complete and definitive prohibition of paraquat by 2017 as previously agreed. The evidence of its toxicity is still valid. The Rotterdam Convention is

[16] days after sowing

[17] Nainwal RC, Saxena SC & Singh VP (2010): Effect of pre-and post-emergence herbicides on weed infestation and productivity of soybean. Indian Journal of Weed Science 42 (1&2) : 17-20. http://isws.org.in/IJWSn/File/2010_42_Issue-1&2%20Supplymentary_17-20.pdf

[18] http://www.greenpeace.org/international/en/publications/Campaign-reports/Agriculture/Europes-Pesticide-Addiction/

[19] Flumioxacin and Imazethapyr are highly hazardous pesticides and not recommended to be used by WWF.

[20] Lopes Ovejero RF, Soares DJ, Oliveira WS, Fonseca LB, Berger GU, Soteres JK & Christoffoleti PJ (2013): Residual herbicides in weed management for glyphosate-resistant soybean in Brazil. Planta daninha 31(4) http://dx.doi.org/10.1590/S0100-83582013000400021 http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-83582013000400021&lng=en&nrm=iso&tlng=en

debating including it, and most "better standards" such as UTZ Certified, FSC[21], FLO, SAN and RSPO NEXT have already prohibited its use. Several RTRS certified soy producers are already producing soy without using paraquat.

In the European Union paraquat has been banned since 2007. The use of paraquat hampers the uptake of RTRS in Europe, since it creates reputational risks for European companies.

paraquat is used as an herbicide. In addition, it should be acknowledged that Paraquat is used in Brazilian soy production systems primarily as a desiccant pre crop or pre harvest (what allows a second crop). For weed control, WWF highly recommends an integrated pest management (IPM) approach including crop rotation.

WWF commissioned a study of alternatives to paraquat which identified 38 alternative herbicide active ingredients (24 of them are authorized for use in soy in Argentina, 31 in Brazil, 8 in India and 20 in Uruguay), with less environmental and human risks, considering toxic load.

*Attached is a list of authorized herbicides that could be used in soybean production in Argentina, Brazil, Uruguay and India (**list see attachment 1: "**List of herbicide active ingredients evaluated with lower toxic load indicator (TLI < 88) and without "highly hazardous" by PAN International in all four countries"). This list can be used as a RTRS reference list for producers. WWF is offering its support to develop similar lists for other producing countries, if needed.*

For comparison of the toxicity of different active ingredients, the study worked with a so called Toxic load indicator (TL), an approved and well known method for identification. The Toxic load indicator for paraquat stands at 88. The list includes all active ingredients with a TL lower than 88. WWF calls on RTRS to promote the use of alternatives, preferably with a considerably lower Toxic load indicator, amongst their certified producers."

WWF will continue its work on enhancing conditions and requirements regarding social and environmental issues related to pesticide use. We are looking forward to constructive discussions both with RTRS and other stakeholders.

Attachment

1. List of herbicide active ingredients evaluated with lower toxic load indicator (TLI < 88) and without "highly hazardous" by PAN International in all four countries.
2. List of all herbicide active ingredients officially authorized in soybeans in all four countries
3. List of Toxic Load indicator for herbicides authorized for use in soybeans an all four countries
4. List of authorized weed control options in soybean production in Uruguay

Annex 1 Toxic Load Indicator – brief description

The TLI can be described in brief as a qualitative indicator for pesticide active ingredients which translates numerical and non-numerical values (toxicological endpoints, classifications, pesticide properties/environmental behaviour) into a scoring system and which is applied to pesticide use data to measure and compare pesticide use (current use and trends). The developed indicator differs from existing evaluation systems[22]. The major advantage of the TLI is its design as an "open source" scoring system, which makes different pesticides properties

[21] Paraquat is allowed via derogation in FSC plantations in South Africa for maintenance of fire belts.

[22] Before the TLI methodology was proposed, an assessment of such existing evaluation systems, including the Environmental Impact Quotient (EIQ) by Kovach et al from Cornell University, the Environmental Toxic Load Indicator (ETL) by Alterra, the ICAC Measuring Sustainability Indicators related to pesticide use and the Higg Index/ Materials Sustainability Index by the Sustainable Apparel Coalition

transparent and more understandable. It is described in detail and the primary data sources are publicly available and free of cost.

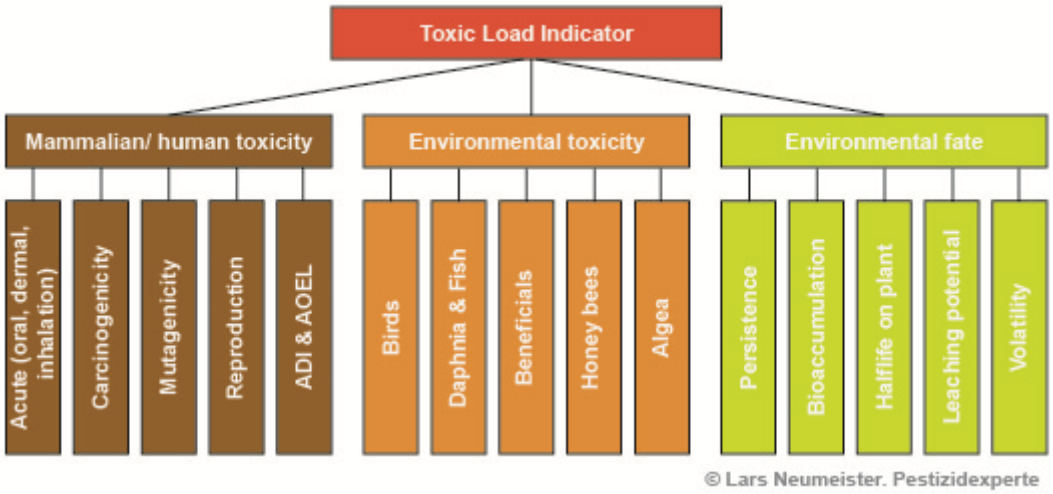
For the toxic load indicator, three different categories have been put together in order to cover

a) Toxicity for Humans (mammals),
b) Environmental toxicity and
c) Environmental Fate and Transport (Exposure Probability)

A set of parameters has been assigned to each category. Human toxicity categories cover both acute risks for intoxication and long-term severe or irreversible effects. The environmental toxicity category covers different indicators for terrestrial and aquatic species. The exposition probability comprises risks for humans and the environment, again covering both immediate and potential long-term effects.

An overview of the parameter sets is given in Figure A1.

Figure A1: Overview of toxicity parameters of the Toxic Load Indicator (TLI)



Attachment

1. List of herbicide active ingredients evaluated with lower toxic load indicator (TLI < 88) and without “highly hazardous” by PAN International in all four countries.

Toxic Load indicator

for herbicides authorized for use in soybeans
TLI < 88, without PAN HHP

	Active Ingredient	Argentina	Brazil	India	Uruguay	PAN	Total Score	WF	SUM1	Mammal toxicity: Acute Tox.	Carcinogenicity	Repro. Tox.	Mutagenicity	AOEL /ADI	SUM 2	Environmental Toxicity: Algae	Daphnia/Fish	Birds	Bee	Beneficial	SUM 3	Environmental Fate and Transport: Bioaccumulation	Persistence	Half life on plant	Leaching Pot.	Volatility
1	2,4-D		Y		Y		**63.0**	**2**	**40.0**	2	8	1	1	8	**10.0**	1	5	2	1	1	**13.0**	1	1	1	5	5
2	Acifluorfen, sodium salt	Y	Y	Y			**72.0**	**2**	**40.0**	2	8	1	1	8	**14.0**	1	2	5	1	*5*	**18.0**	2	1	5	*5*	5
3	Benazolin-ethyl	Y					**48.0**	**2**	**18.0**	1	1	1	1	*5*	**17.0**	1	5	1	5	*5*	**13.0**	1	1	5	1	5
4	Bentazone	Y	Y				**53.0**	**2**	**20.0**	2	1	1	1	5	**7.0**	1	2	2	1	1	**26.0**	1	10	5	5	5
5	Butroxydim	n.P.	Y				**71.0**	**2**	**44.0**	2	1	8	1	10	**17.0**	5	5	1	1	*5*	**10.0**	1	1	5	1	2
6	Carfentrazone-ethyl		Y				**43.0**	**2**	**24.0**	1	1	1	1	8	**13.0**	5	5	1	1	1	**6.0**	1	1	1	1	2
7	Chlorimuron ethyl	Y	Y	Y	Y		**69.0**	**2**	**34.0**	1	1	*5*	*5*	*5*	**17.0**	*5*	5	1	1	*5*	**18.0**	1	1	5	10	1
8	Chlorsulfuron				Y		**58.0**	**2**	**18.0**	1	1	1	1	5	**13.0**	5	1	1	1	5	**27.0**	1	10	5	10	1
9	Clethodim	Y	Y		Y		**62.0**	**2**	**42.0**	5	1	*5*	*5*	5	**14.0**	1	2	2	1	8	**6.0**	1	1	1	1	2
10	Clodinafop-propargyl			Y			**84.0**	**2**	**44.0**	2	8	1	1	10	**26.0**	5	8	2	1	10	**14.0**	1	1	5	*5*	2
11	Clomazone	Y	Y	Y			**74.0**	**2**	**36.0**	2	1	*5*	*5*	5	**10.0**	5	2	1	1	1	**28.0**	1	8	1	10	8
12	Cloransulam-methyl	Y	Y		Y		**67.0**	**2**	**40.0**	1	1	*5*	*5*	8	**14.0**	5	2	1	1	*5*	**13.0**	1	1	5	5	1
13	Cyanazine		Y				**82.0**	**2**	**44.0**	2	8	1	1	10	**21.0**	5	5	5	1	*5*	**17.0**	1	8	1	5	2
14	Dicamba		Y		Y		**69.0**	**2**	**34.0**	2	5	1	1	8	**12.0**	5	2	2	1	2	**23.0**	1	8	1	5	8
15	Diclosulam	Y	Y		Y		**62.0**	**2**	**34.0**	1	1	*5*	*5*	*5*	**14.0**	5	2	1	1	*5*	**14.0**	1	1	1	10	1
16	Dimethenamid-P		Y				**67.0**	**2**	**40.0**	2	8	1	1	8	**14.0**	5	5	2	1	1	**13.0**	1	2	1	1	8
17	Fenoxaprop-P-ethyl		Y	Y	Y		**58.0**	**2**	**24.0**	1	1	1	1	8	**20.0**	5	8	1	1	5	**14.0**	5	1	5	1	2
18	Fluazifop-P-butyl	Y	Y	Y	Y		**78.0**	**2**	**38.0**	1	1	8	1	8	**23.0**	5	8	1	1	8	**17.0**	5	1	5	1	5
19	Flufenpyr-ethyl		Y				**77.0**	**2**	**42.0**	*5*	1	*5*	*5*	*5*	**17.0**	5	5	1	1	*5*	**18.0**	1	*5*	5	*5*	2
20	Flumetsulam	Y	Y		Y		**51.0**	**2**	**28.0**	1	1	*5*	*5*	2	**9.0**	1	1	1	1	*5*	**14.0**	1	1	1	10	1

n.P. = authorized, but no products registered
Yellow numbers = average score for datagaps
WF: Weighting Factor for mammalian tox.
HHP = highly hazardous pesticide according PAN International

' Pesticides: 38

Toxic Load indicator

for herbicides authorized for use in soybeans
TLI < 88, without PAN HHP

Active Ingredient	Argentina	Brazil	India	Uruguay	PAN	Total Score	WF	SUM1	Mammal toxicity: Acute Tox.	Carcinogenicity	Repro. Tox.	Mutagenicity	AOEL /ADI	SUM 2	Environmental Toxicity: Algae	Daphnia/Fish	Birds	Bee	Beneficial	SUM 3	Environmental Fate and Transport: Bioaccumulation	Persistence	Half life on plant	Leaching Pot.	Volatility
21 Flumiclorac-pentyl	Y	Y				**64.0**	2	**34.0**	1	1	5	5	5	**17.0**	5	5	1	1	5	**13.0**	1	1	5	1	5
22 Fluroxypyr-meptyl		Y				**56.0**	2	**18.0**	1	1	1	1	5	**25.0**	5	8	1	1	10	**13.0**	1	1	5	1	5
23 Fomesafen	Y	Y		Y		**65.0**	2	**30.0**	2	1	1	1	10	**13.0**	5	1	1	1	5	**22.0**	1	8	1	10	2
24 Halauxifen-methyl				Y		**71.0**	2	**48.0**	1	5	5	5	8	**13.0**	5	5	1	1	1	**10.0**	2	1	5	1	1
25 Halosulfuron-methyl	Y					**72.0**	2	**40.0**	1	1	5	5	8	**15.0**	10	1	1	1	2	**17.0**	1	1	5	5	5
26 Haloxyfop-R-methyl	Y	Y		Y		**75.0**	2	**30.0**	2	1	1	1	10	**28.0**	5	10	2	1	10	**17.0**	1	1	5	5	5
27 Imazamox	Y	Y	Y			**52.0**	2	**12.0**	1	1	1	1	2	**14.0**	5	1	2	1	5	**26.0**	1	10	5	5	5
28 Imazapic		Y				**82.0**	2	**42.0**	1	5	5	5	5	**13.0**	5	1	1	1	5	**27.0**	1	10	1	10	5
29 Imazapyr	Y	Y		Y		**31.0**	2	**12.0**	1	1	1	1	2	**10.0**	1	2	1	1	5	**9.0**	1	1	1	1	5
30 Imazaquin	Y	Y		Y		**70.0**	2	**34.0**	1	1	5	5	5	**14.0**	1	1	1	1	10	**22.0**	1	10	5	5	1
31 Lactofen	Y	Y		Y		**85.0**	2	**48.0**	1	8	5	5	5	**20.0**	5	8	1	1	5	**17.0**	5	1	5	1	5
32 Nicosulfuron				Y		**75.0**	2	**34.0**	1	1	5	5	5	**14.0**	5	2	1	1	5	**27.0**	1	10	5	10	1
33 Oxasulfuron	n.P.	Y				**48.0**	2	**24.0**	1	1	1	1	8	**10.0**	5	2	1	1	1	**14.0**	1	1	5	5	2
34 Prometryn	Y					**86.0**	2	**42.0**	5	1	5	5	5	**18.0**	10	5	1	1	1	**26.0**	1	10	5	5	5
35 Propaquizafop	Y	Y	Y	Y		**87.0**	2	**48.0**	1	5	5	5	8	**17.0**	5	8	1	1	2	**22.0**	10	1	5	5	1
36 S-Metolachlor	Y	Y		Y		**70.0**	2	**32.0**	1	8	1	1	5	**22.0**	10	5	1	1	5	**16.0**	1	1	1	5	8
37 Saflufenacil		Y				**68.0**	2	**40.0**	1	1	5	5	8	**14.0**	5	2	1	1	5	**14.0**	1	1	1	10	1
38 Sulfentrazone	Y	Y		Y		**74.0**	2	**40.0**	1	1	5	5	8	**10.0**	1	2	1	1	5	**24.0**	1	10	1	10	2
Sum a.i.	**24**	**31**	**8**	**20**																					

n.P. = authorized, but no products registered
Yellow numbers = average score for datagaps
WF: Weighting Factor for mammalian tox.
HHP = highly hazardous pesticide according PAN International

' Pesticides: 38

Attachment

2. **List of all herbicide active ingredients officially authorized in soybeans in all four countries**

Herbicide active ingredients authorized in Soy beans

	Active ingredient	India	Brazil	Urugay	Argentina					
					Grano Consumo	Forage	Aceite	Green beans	Unripe beans	Soy
1	2,4-D incl. salts, esters		Yes	Yes						
2	2,4-DB				Yes					Yes
3	Acetochlor		Yes	Yes						
4	Acifluorfen, sodium salt	Yes	Yes		Yes					Yes
5	Alachlor	Yes	Yes		Yes	Yes				Yes
6	Benazolin-ethyl				Yes	Yes				Yes
7	Bentazone		Yes		Yes	Yes				Yes
8	Bromoxynil				Yes					Yes
9	Butroxydim		Yes		Yes					n.P.
10	Carfentrazone-ethyl		Yes							
11	Chlorimuron ethyl	Yes	Yes	Yes	Yes					Yes
12	Chlorsulfuron			Yes						
13	Clethodim		Yes	Yes	Yes					Yes
14	Clodinafop-propargyl	Yes								
15	Clomazone	Yes	Yes		Yes					Yes
16	Cloransulam-methyl		Yes	Yes	Yes					Yes
17	Cyanazine		Yes							
18	Dicamba incl. salts		Yes	Yes						
19	Diclofop-methyl		Yes	Yes						
20	Diclosulam		Yes	Yes	Yes					Yes
21	Dimethenamid		Yes		Yes					Yes
22	Dimethenamid-P		Yes							
23	Dinitramine				Yes					n.P.
24	Diquat dibromide		Yes							

Compiled by Lars Neumeister, February/ March 2016)

n.P. = authorized, but no products registered

Herbicide active ingredients authorized in Soy beans

	Active ingredient	India	Brazil	Urugay	Argentina					
					Grano Consumo	Forage	Aceite	Green beans	Unripe beans	Soy
25	Diuron	Yes	Yes							
26	Fenoxaprop-ethyl				Yes					n.P.
27	Fenoxaprop-P-ethyl	Yes	Yes	Yes						
28	Fluazifop-P-butyl	Yes	Yes	Yes	Yes					Yes
29	Fluchloralin	Yes								
30	Flufenpyr-ethyl		Yes							
31	Flumetsulam		Yes	Yes	Yes					Yes
32	Flumiclorac-pentyl		Yes		Yes					Yes
33	Flumioxazin		Yes		Yes			Yes		Yes
34	Fluoroglycofen				Yes					n.P.
35	Fluroxypyr-meptyl		Yes							
36	Fomesafen		Yes	Yes	Yes					Yes
37	Glufosinate-ammonium		Yes	Yes						
38	Glyphosate incl. salts		Yes	Yes	Yes	Yes			Yes	Yes
39	Halauxifen-methyl			Yes						
40	Halosulfuron-methyl				Yes					Yes
41	Haloxyfop-R		Yes							
42	Haloxyfop-R-methyl		Yes	Yes	Yes					Yes
43	Imazamox	Yes	Yes		Yes					Yes
44	Imazapic		Yes							
45	Imazapyr		Yes	Yes	Yes					Yes
46	Imazaquin		Yes	Yes	Yes	Yes				Yes
47	Imazethapyr incl. salts	Yes	Yes	Yes	Yes					Yes
48	Isoxaflutole		Yes							

Compiled by Lars Neumeister, February/ March 2016)

n.P. = authorized, but no products registered

Herbicide active ingredients authorized in Soy beans

	Active ingredient	India	Brazil	Urugay	Argentina					
					Grano Consumo	Forage	Aceite	Green beans	Unripe beans	Soy
49	Lactofen		Yes	Yes	Yes					Yes
50	Linuron		Yes	Yes	Yes	Yes				Yes
51	Metolachlor	Yes	Yes	Yes	Yes					Yes
52	Metribuzin	Yes	Yes	Yes	Yes					Yes
53	MSMA (arsenic compound)				Yes					Yes
54	Naptalam				Yes					n.P.
55	Nicosulfuron			Yes						
56	Oryzalin		Yes							
57	Oxasulfuron		Yes		Yes	Yes				n.P.
58	Oxyfluorfen		Yes		Yes		Yes			Yes
59	Paraquat dichloride		Yes	Yes	Yes	Yes				Yes
60	Pendimethalin	Yes	Yes		Yes					Yes
61	Prometryn				Yes	Yes				Yes
62	Propaquizafop	Yes	Yes	Yes	Yes					Yes
63	Quizalofop-ethyl	Yes	Yes	Yes	Yes					n.P.
64	Quizalofop-P-ethyl		Yes							
65	Quizalofop-p-tefuryl	Yes	Yes	Yes	Yes		Yes			Yes
66	S-Metolachlor		Yes	Yes	Yes					Yes
67	Saflufenacil		Yes							
68	Sethoxydim		Yes	Yes	Yes					Yes
69	Sulfentrazone		Yes	Yes	Yes					Yes
70	Tepraloxydim		Yes							
71	Trifluralin		Yes	Yes	Yes					Yes
	Sum a.i.	**17**	**56**	**33**						**39**

with product registration

Compiled by Lars Neumeister, February/ March 2016)

n.P. = authorized, but no products registered

Attachment

3. List of Toxic Load indicator for herbicides authorized for use in soybeans an all four countries

Toxic Load indicator

for herbicides authorized for use in soybeans

	Active Ingredient	Argentina	Brazil	India	Uruguay	PAN	Total Score	WF	SUM1	Mammal toxicity: Acute Tox.	Carcinogenicity	Repro. Tox.	Mutagenicity	AOEL /ADI	SUM 2	Environmental Toxicity: Algae	Daphnia/Fish	Birds	Bee	Beneficial	SUM 3	Environmental Fate and Transport: Bioaccumulation	Persistence	Half life on plant	Leaching Pot.	Volatility
1	Metribuzin	Y	Y	Y	Y	HHP	**72.0**	2	**34.0**	2	5	1	1	8	**18.0**	5	2	5	1	5	**20.0**	1	8	1	5	5
2	Dicamba		Y		Y		**69.0**	2	**34.0**	2	5	1	1	8	**12.0**	5	2	2	1	2	**23.0**	1	8	1	5	8
3	Linuron	Y	Y		Y	HHP	**114.0**	2	**62.0**	2	8	10	1	10	**29.0**	5	8	5	1	10	**23.0**	1	8	1	5	8
4	Imazethapyr	Y	Y	Y	Y	HHP	**77.0**	2	**34.0**	1	1	*5*	*5*	5	**18.0**	1	1	1	10	*5*	**25.0**	1	8	1	10	5
5	Glyphosate	Y	Y		Y	HHP	**63.0**	2	**36.0**	1	10	1	1	5	**14.0**	5	2	1	1	5	**13.0**	1	5	1	1	5
6	Imazapyr	Y	Y		Y		**31.0**	2	**12.0**	1	1	1	1	2	**10.0**	1	2	1	1	*5*	**9.0**	1	1	1	1	5
7	2,4-D		Y		Y		**63.0**	2	**40.0**	2	8	1	1	8	**10.0**	1	5	2	1	1	**13.0**	1	1	1	5	5
8	Clethodim	Y	Y		Y		**62.0**	2	**42.0**	5	1	*5*	*5*	5	**14.0**	1	2	2	1	8	**6.0**	1	1	1	1	2
9	Quizalofop-ethyl	n.P.	Y	Y	Y		**112.0**	2	**56.0**	5	5	*5*	*5*	8	**26.0**	5	5	1	5	10	**30.0**	10	5	5	5	5
10	Acetochlor		Y		Y	HHP	**95.0**	2	**44.0**	2	8	1	1	10	**31.0**	10	8	2	1	10	**20.0**	1	8	1	5	5
11	Metolachlor	Y	Y	Y	Y		**99.0**	2	**56.0**	5	8	*5*	*5*	5	**13.0**	1	5	1	1	*5*	**30.0**	1	10	1	10	8
12	Imazaquin	Y	Y		Y		**70.0**	2	**34.0**	1	1	*5*	*5*	5	**14.0**	1	1	1	1	10	**22.0**	1	10	5	*5*	1
13	Chlorimuron ethyl	Y	Y	Y	Y		**69.0**	2	**34.0**	1	1	*5*	*5*	*5*	**17.0**	*5*	5	1	1	*5*	**18.0**	1	1	5	10	1
14	Flumetsulam	Y	Y		Y		**51.0**	2	**28.0**	1	1	*5*	*5*	2	**9.0**	1	1	1	1	*5*	**14.0**	1	1	1	10	1
15	Trifluralin	Y	Y		Y	HHP	**95.0**	2	**38.0**	1	8	1	1	8	**27.0**	5	10	1	1	10	**30.0**	10	10	1	1	8
16	Diclofop-methyl		Y		Y	HHP	**84.0**	2	**48.0**	2	10	1	1	10	**23.0**	5	8	1	1	8	**13.0**	1	1	5	1	5
17	Chlorsulfuron				Y		**58.0**	2	**18.0**	1	1	1	1	5	**13.0**	5	1	1	1	5	**27.0**	1	10	5	10	1
18	Sethoxydim	Y	Y		Y		**91.0**	2	**48.0**	5	1	*5*	*5*	8	**21.0**	5	5	1	5	5	**22.0**	1	10	5	1	5
19	Nicosulfuron				Y		**75.0**	2	**34.0**	1	1	*5*	*5*	5	**14.0**	5	2	1	1	5	**27.0**	1	10	5	10	1
20	Glufosinate-ammonium		Y		Y	HHP	**75.0**	2	**48.0**	2	1	10	1	10	**14.0**	1	1	1	1	10	**13.0**	1	1	5	1	5

n.P. = authorized, but no products registered
Yellow numbers = average score for datagaps
WF: Weighting Factor for mammalian tox.
HHP = highly hazardous pesticide according PAN International

' Pesticides: 67

Toxic Load indicator

for herbicides authorized for use in soybeans

Active Ingredient	Argentina	Brazil	India	Uruguay	PAN	Total Score	WF	SUM1	Mammal toxicity: Acute Tox.	Carcinogenicity	Repro. Tox.	Mutagenicity	AOEL /ADI	SUM 2	Environmental Toxicity: Algae	Daphnia/Fish	Birds	Bee	Beneficial	SUM 3	Environmental Fate and Transport: Bioaccumulation	Persistence	Half life on plant	Leaching Pot.	Volatility
21 Lactofen	Y	Y		Y		**85.0**	**2**	**48.0**	1	8	*5*	*5*	*5*	**20.0**	*5*	8	1	1	*5*	**17.0**	5	1	5	1	5
22 Fenoxaprop-P-ethyl		Y	Y	Y		**58.0**	**2**	**24.0**	1	1	1	1	8	**20.0**	5	8	1	1	5	**14.0**	5	1	5	1	2
23 S-Metolachlor	Y	Y		Y		**70.0**	**2**	**32.0**	1	8	1	1	5	**22.0**	10	5	1	1	*5*	**16.0**	1	1	1	5	8
24 Fomesafen	Y	Y		Y		**65.0**	**2**	**30.0**	2	1	1	1	10	**13.0**	5	1	1	1	*5*	**22.0**	1	8	1	10	2
25 Sulfentrazone	Y	Y		Y		**74.0**	**2**	**40.0**	1	1	*5*	*5*	8	**10.0**	1	2	1	1	*5*	**24.0**	1	10	1	10	2
26 Cloransulam-methyl	Y	Y		Y		**67.0**	**2**	**40.0**	1	1	*5*	*5*	8	**14.0**	5	2	1	1	*5*	**13.0**	1	1	5	5	1
27 Diclosulam	Y	Y		Y		**62.0**	**2**	**34.0**	1	1	*5*	*5*	*5*	**14.0**	5	2	1	1	*5*	**14.0**	1	1	1	10	1
28 Propaquizafop	Y	Y	Y	Y		**87.0**	**2**	**48.0**	1	*5*	*5*	*5*	8	**17.0**	5	8	1	1	2	**22.0**	10	1	5	*5*	1
29 Haloxyfop-R-methyl	Y	Y		Y		**75.0**	**2**	**30.0**	2	1	1	1	10	**28.0**	5	10	2	1	10	**17.0**	1	1	5	*5*	5
30 Quizalofop-p-tefuryl	Y	Y	Y	Y	HHP	**95.0**	**2**	**58.0**	2	1	10	8	8	**20.0**	5	8	1	1	5	**17.0**	5	1	5	1	5
31 Fluazifop-P-butyl	Y	Y	Y	Y		**78.0**	**2**	**38.0**	1	1	8	1	8	**23.0**	5	8	1	1	8	**17.0**	5	1	5	1	5
32 Paraquat dichloride	Y	Y		Y	HHP	**88.0**	**2**	**42.0**	8	1	1	1	10	**24.0**	5	5	8	1	*5*	**22.0**	1	10	5	1	5
33 Halauxifen-methyl				Y		**71.0**	**2**	**48.0**	1	*5*	*5*	*5*	8	**13.0**	5	5	1	1	1	**10.0**	2	1	5	1	1
34 MSMA	Y				HHP	**100.0**	**2**	**64.0**	2	10	*5*	*5*	10	**14.0**	5	2	1	1	*5*	**22.0**	1	10	5	1	*5*
35 Fluchloralin			Y			**93.0**	**2**	**54.0**	2	*5*	*5*	*5*	10	**23.0**	*5*	10	2	1	*5*	**16.0**	1	5	1	1	8
36 Pendimethalin	Y	Y	Y			**95.0**	**2**	**32.0**	1	8	1	1	5	**31.0**	10	8	2	1	10	**32.0**	10	8	5	1	8
37 Diquat dibromide		Y			HHP	**90.0**	**2**	**42.0**	8	1	1	1	10	**26.0**	5	5	5	1	10	**22.0**	1	10	5	1	5
38 Diuron		Y	Y		HHP	**85.0**	**2**	**48.0**	2	10	1	1	10	**19.0**	10	5	2	1	1	**18.0**	1	5	5	5	2
39 Cyanazine		Y				**82.0**	**2**	**44.0**	2	8	1	1	10	**21.0**	5	5	5	1	*5*	**17.0**	1	8	1	5	2
40 Oxyfluorfen	Y	Y			HHP	**97.0**	**2**	**62.0**	1	10	*5*	*5*	10	**17.0**	5	8	2	1	1	**18.0**	10	1	1	1	5

n.P. = authorized, but no products registered
Yellow numbers = average score for datagaps
WF: Weighting Factor for mammalian tox.
HHP = highly hazardous pesticide according PAN International

' Pesticides: 67

Toxic Load indicator

for herbicides authorized for use in soybeans

Active Ingredient	Argentina	Brazil	India	Uruguay	PAN	Total Score	WF	SUM1	Mammal toxicity: Acute Tox.	Carcinogenicity	Repro. Tox.	Mutagenicity	AOEL /ADI	SUM 2	Environmental Toxicity: Algae	Daphnia/Fish	Birds	Bee	Beneficial	SUM 3	Environmental Fate and Transport: Bioaccumulation	Persistence	Half life on plant	Leaching Pot.	Volatility
41 Bromoxynil	Y				HHP	**93.0**	2	**66.0**	8	8	8	1	8	**14.0**	5	2	5	1	1	**13.0**	1	1	5	1	5
42 Bentazone	Y	Y				**53.0**	2	**20.0**	2	1	1	1	5	**7.0**	1	2	2	1	1	**26.0**	1	10	5	5	5
43 Prometryn	Y					**86.0**	2	**42.0**	5	1	5	5	5	**18.0**	10	5	1	1	1	**26.0**	1	10	5	5	5
44 Alachlor	Y	Y	Y		HHP	**74.0**	2	**44.0**	2	8	1	1	10	**18.0**	5	5	2	1	5	**12.0**	1	1	1	1	8
45 Oryzalin		Y			HHP	**76.0**	2	**58.0**	1	10	5	5	8	**13.0**	1	5	5	1	1	**5.0**	1	1	1	1	1
46 Acifluorfen, sodium salt	Y	Y	Y			**72.0**	2	**40.0**	2	8	1	1	8	**14.0**	1	2	5	1	5	**18.0**	2	1	5	5	5
47 Clomazone	Y	Y	Y			**74.0**	2	**36.0**	2	1	5	5	5	**10.0**	5	2	1	1	1	**28.0**	1	8	1	10	8
48 2,4-DB	Y				HHP	**71.0**	2	**40.0**	2	8	1	1	8	**14.0**	5	5	2	1	1	**17.0**	1	1	5	5	5
49 Flumiclorac-pentyl	Y	Y				**64.0**	2	**34.0**	1	1	5	5	5	**17.0**	5	5	1	1	5	**13.0**	1	1	5	1	5
50 Dimethenamid	Y	Y				**96.0**	2	**56.0**	2	8	5	5	8	**23.0**	5	5	2	1	10	**17.0**	1	1	5	5	5
51 Carfentrazone-ethyl		Y				**43.0**	2	**24.0**	1	1	1	1	8	**13.0**	5	5	1	1	1	**6.0**	1	1	1	1	2
52 Imazamox	Y	Y	Y			**52.0**	2	**12.0**	1	1	1	1	2	**14.0**	5	1	2	1	5	**26.0**	1	10	5	5	5
53 Isoxaflutole		Y			HHP	**79.0**	2	**56.0**	1	10	8	1	8	**13.0**	5	5	1	1	1	**10.0**	1	1	5	1	2
54 Dimethenamid-P		Y				**67.0**	2	**40.0**	2	8	1	1	8	**14.0**	5	5	2	1	1	**13.0**	1	2	1	1	8
55 Tepraloxydim		Y			HHP	**93.0**	2	**52.0**	1	8	8	1	8	**15.0**	1	2	1	1	10	**26.0**	1	10	5	5	5
56 Oxasulfuron	n.P.	Y				**48.0**	2	**24.0**	1	1	1	1	8	**10.0**	5	2	1	1	1	**14.0**	1	1	5	5	2
57 Benazolin-ethyl	Y					**48.0**	2	**18.0**	1	1	1	1	5	**17.0**	1	5	1	5	5	**13.0**	1	1	5	1	5
58 Fluroxypyr-meptyl		Y				**56.0**	2	**18.0**	1	1	1	1	5	**25.0**	5	8	1	1	10	**13.0**	1	1	5	1	5
59 Flumioxazin	Y	Y			HHP	**77.0**	2	**46.0**	1	1	10	1	10	**22.0**	10	5	1	1	5	**9.0**	1	1	1	1	5
60 Clodinafop-propargyl			Y			**84.0**	2	**44.0**	2	8	1	1	10	**26.0**	5	8	2	1	10	**14.0**	1	1	5	5	2

n.P. = authorized, but no products registered
Yellow numbers = average score for datagaps
WF: Weighting Factor for mammalian tox.
HHP = highly hazardous pesticide according PAN International

' Pesticides: 67

Toxic Load indicator

for herbicides authorized for use in soybeans

Active Ingredient	Argentina	Brazil	India	Uruguay	PAN	Total Score	WF	SUM1	Mammal toxicity: Acute Tox.	Carcinogenicity	Repro. Tox.	Mutagenicity	AOEL /ADI	SUM 2	Environmental Toxicity: Algae	Daphnia/Fish	Birds	Bee	Beneficial	SUM 3	Environmental Fate and Transport: Bioaccumulation	Persistence	Half life on plant	Leaching Pot.	Volatility
61 Butroxydim	n.P.	Y				**71.0**	**2**	**44.0**	2	1	8	1	10	**17.0**	5	5	1	1	*5*	**10.0**	1	1	5	1	2
62 Imazapic		Y				**82.0**	**2**	**42.0**	1	*5*	*5*	*5*	5	**13.0**	5	1	1	1	*5*	**27.0**	1	10	1	10	5
63 Quizalofop-P-ethyl		Y				**101.0**	**2**	**60.0**	*5*	5	*5*	*5*	10	**23.0**	5	8	1	1	8	**18.0**	5	1	5	*5*	2
64 Flufenpyr-ethyl		Y				**77.0**	**2**	**42.0**	*5*	1	*5*	*5*	*5*	**17.0**	5	5	1	1	*5*	**18.0**	1	*5*	5	*5*	2
65 Halosulfuron-methyl	Y					**72.0**	**2**	**40.0**	1	1	*5*	*5*	8	**15.0**	10	1	1	1	2	**17.0**	1	1	5	5	5
66 Haloxyfop-R		Y				**92.0**	**2**	**54.0**	2	*5*	*5*	*5*	10	**19.0**	1	2	5	1	10	**19.0**	1	1	5	10	2
67 Saflufenacil		Y				**68.0**	**2**	**40.0**	1	1	*5*	*5*	8	**14.0**	*5*	2	1	1	*5*	**14.0**	1	1	1	10	1
Sum a.i.	**42**	**56**	**17**	**33**																					

n.P. = authorized, but no products registered
Yellow numbers = average score for datagaps
WF: Weighting Factor for mammalian tox.
HHP = highly hazardous pesticide according PAN International

' Pesticides: 67

Attachment

4. List of authorized weed control options in soybean production in Uruguay

Authorized weed control options in soy bean production in Uruguay

Acacia caven	*Broadleaf*
dicamba	
Agropyron repens	***Grasses***
clethodim	
propaquizafop	
quizalofop-p-tefuryl	
Alternanthera phylloxeroides	***Broadleaf***
glyphosate	
Amaranthus quitensis	***Broadleaf***
2,4-D	
acetochlor	
chlorimuron ethyl	
chlorsulfuron	
cloransulam-methyl	
dicamba	
diclosulam	
flumetsulam	
flumioxazin	
fomesafen	
glufosinate-ammonium	
glyphosate	
halauxifen-methyl	
imazapyr	
imazaquin	
imazethapyr	
lactofen	
linuron	
metolachlor	
metribuzin	
nicosulfuron	
paraquat dichloride	
s-metolachlor	
sulfentrazone	
trifluralin	
Amaranthus viridis	***Broadleaf***
lactofen	
Ambrosia tenuifolia	***Broadleaf***
linuron	

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Authorized weed control options in soy bean production in Uruguay

Ammi majus	*Broadleaf*
chlorimuron ethyl	
imazaquin	
metribuzin	
Ammi visnaga	**_Broadleaf_**
dicamba	
diclosulam	
flumetsulam	
halauxifen-methyl	
imazethapyr	
Anagallis arvensis	**_Broadleaf_**
flumetsulam	
flumioxazin	
glyphosate	
Anoda cristata	**_Broadleaf_**
diclosulam	
glyphosate	
halauxifen-methyl	
imazaquin	
imazethapyr	
Anthemis cotula	**_Broadleaf_**
chlorimuron ethyl	
flumetsulam	
glufosinate-ammonium	
imazaquin	
metribuzin	
Artemisa verlotorum	**_Broadleaf_**
glyphosate	
Avena fatua	**_Grasses_**
glyphosate	
haloxyfop-p-methyl	
Avena sativa	**_Grasses_**
diclofop-methyl	
fenoxaprop-p-ethyl	
fluazifop-p-butyl	
glyphosate	
haloxyfop-p-methyl	
paraquat dichloride	

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Authorized weed control options in soy bean production in Uruguay

propaquizafop	
quizalofop-p-tefuryl	
sethoxidim	
Avena strigosa	***Grasses***
haloxyfop-p-methyl	
Baccharis coridifolia	***Broadleaf***
dicamba	
Bidens pilosa	***Broadleaf***
acetochlor	
chlorimuron ethyl	
chlorsulfuron	
cloransulam-methyl	
diclosulam	
fomesafen	
glyphosate	
halauxifen-methyl	
imazethapyr	
lactofen	
paraquat dichloride	
Bidens subalternans	***Broadleaf***
glyphosate	
Bowlesia incana	***Broadleaf***
imazethapyr	
Brachiaria platyphylla	***Grasses***
acetochlor	
clethodim	
diclofop-methyl	
fenoxaprop-p-ethyl	
glyphosate	
haloxyfop-p-methyl	
metolachlor	
metribuzin	
propaquizafop	
s-metolachlor	
sethoxidim	
trifluralin	
Brassica campestris	***Broadleaf***
2,4-D	

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Authorized weed control options in soy bean production in Uruguay

chlorimuron ethyl	
chlorsulfuron	
diclosulam	
flumioxazin	
glyphosate	
imazethapyr	
linuron	
metribuzin	
nicosulfuron	
Brassica napus	***Broadleaf***
diclosulam	
glyphosate	
halauxifen-methyl	
imazethapyr	
Brassica nigra	***Broadleaf***
glyphosate	
imazethapyr	
Brassica rapa	***Broadleaf***
lactofen	
Bromus auleticus	***Grasses***
fenoxaprop-p-ethyl	
glyphosate	
quizalofop-ethyl	
trifluralin	
Bromus unioloides	***Grasses***
clethodim	
glyphosate	
quizalofop-p-tefuryl	
trifluralin	
Capsella bursa pastoris	***Broadleaf***
imazethapyr	
metribuzin	
paraquat dichloride	
s-metolachlor	
Carduus nutans	***Broadleaf***
2,4-D	
flumetsulam	
imazethapyr	

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Authorized weed control options in soy bean production in Uruguay

Cenchrus echinatus	*Grasses*
clethodim	
glyphosate	
haloxyfop-p-methyl	
imazethapyr	
propaquizafop	
quizalofop-ethyl	
trifluralin	
Cestrum parqui	***Broadleaf***
dicamba	
Chenopodium album	***Broadleaf***
2,4-D	
acetochlor	
chlorimuron ethyl	
chlorsulfuron	
diclosulam	
flumioxazin	
glyphosate	
halauxifen-methyl	
imazaquin	
imazethapyr	
linuron	
metribuzin	
paraquat dichloride	
sulfentrazone	
trifluralin	
Cirsium vulgare	***Broadleaf***
2,4-D	
dicamba	
flumetsulam	
glyphosate	
Coleostephus myconis	***Broadleaf***
2,4-D	
flumetsulam	
Commelina Benghalensis	***Broadleaf***
chlorimuron ethyl	
lactofen	
Commelina erecta	***Broadleaf***

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Authorized weed control options in soy bean production in Uruguay

fomesafen	
imazethapyr	
Convolvulus arvensis	***Broadleaf***
dicamba	
flumetsulam	
glyphosate	
paraquat dichloride	
Conyza bonaeriensis	***Broadleaf***
chlorimuron ethyl	
cloransulam-methyl	
diclosulam	
flumioxazin	
halauxifen-methyl	
Conyza bonariensis	***Broadleaf***
chlorimuron ethyl	
glyphosate	
sulfentrazone	
Conyza sumatriense	***Broadleaf***
chlorimuron ethyl	
cloransulam-methyl	
diclosulam	
halauxifen-methyl	
Coronopus didymus	***Broadleaf***
chlorimuron ethyl	
diclosulam	
flumetsulam	
imazaquin	
imazethapyr	
metribuzin	
Cynodon dactylon	***Grasses***
clethodim	
fenoxaprop-p-ethyl	
fluazifop-p-butyl	
glufosinate-ammonium	
glyphosate	
haloxyfop-p-methyl	
imazethapyr	
paraquat dichloride	
propaquizafop	

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Authorized weed control options in soy bean production in Uruguay

quizalofop-ethyl	
quizalofop-p-tefuryl	
sethoxidim	
Cyperus esculentus	***Grasses***
glyphosate	
imazethapyr	
metolachlor	
sulfentrazone	
Cyperus rotundus	***Grasses***
glyphosate	
imazethapyr	
sulfentrazone	
Datura ferox	***Broadleaf***
acetochlor	
chlorimuron ethyl	
cloransulam-methyl	
diclosulam	
glyphosate	
halauxifen-methyl	
imazaquin	
imazethapyr	
paraquat dichloride	
sulfentrazone	
Digitaria sanguinalis	***Grasses***
acetochlor	
clethodim	
diclofop-methyl	
diclosulam	
fenoxaprop-p-ethyl	
fluazifop-p-butyl	
flumioxazin	
glyphosate	
halauxifen-methyl	
haloxyfop-p-methyl	
imazaquin	
imazethapyr	
linuron	
metolachlor	
metribuzin	
paraquat dichloride	

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Authorized weed control options in soy bean production in Uruguay

propaquizafop	
quizalofop-ethyl	
quizalofop-p-tefuryl	
s-metolachlor	
sethoxidim	
trifluralin	
Echinochloa colona	***Grasses***
acetochlor	
clethodim	
diclosulam	
flumioxazin	
glyphosate	
halauxifen-methyl	
haloxyfop-p-methyl	
imazethapyr	
metolachlor	
s-metolachlor	
Echinochloa crus-galli	***Grasses***
clethodim	
diclosulam	
flumioxazin	
glyphosate	
halauxifen-methyl	
haloxyfop-p-methyl	
imazethapyr	
metribuzin	
Echium plantagineum	***Broadleaf***
chlorimuron ethyl	
dicamba	
diclosulam	
flumetsulam	
imazaquin	
Eleusine indica	***Grasses***
acetochlor	
clethodim	
diclofop-methyl	
fenoxaprop-p-ethyl	
flumetsulam	
glyphosate	
haloxyfop-p-methyl	

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imazaquin	
imazethapyr	
metolachlor	
propaquizafop	
quizalofop-p-tefuryl	
sethoxidim	
trifluralin	
Eragrostis lugens	***Grasses***
glyphosate	
metolachlor	
s-metolachlor	
sethoxidim	
trifluralin	
Eragrostis plana	***Grasses***
glyphosate	
Eupatorium buniifolium	***Broadleaf***
dicamba	
Euphorbia heterophylla	***Broadleaf***
fomesafen	
glyphosate	
imazethapyr	
lactofen	
sulfentrazone	
Fumaria officinalis	***Broadleaf***
chlorimuron ethyl	
glufosinate-ammonium	
Galinsoga parviflora	***Broadleaf***
acetochlor	
chlorimuron ethyl	
fomesafen	
glyphosate	
paraquat dichloride	
Gramíneas	***Grasses***
glyphosate	
imazethapyr	
Gramíneas anuales	***Grasses***
glyphosate	
imazethapyr	

Authorized weed control options in soy bean production in Uruguay

Gramíneas perennes	***Grasses***
glyphosate	
Heliantus annuus	***Broadleaf***
2,4-D	
chlorimuron ethyl	
imazethapyr	
Hordeum vulgaris	***Grasses***
glyphosate	
imazethapyr	
quizalofop-p-tefuryl	
Ipomoea grandifolia	***Broadleaf***
chlorimuron ethyl	
diclosulam	
imazethapyr	
Lamium amplexicaule	***Broadleaf***
acetochlor	
chlorimuron ethyl	
glyphosate	
imazaquin	
imazethapyr	
Latifoliadas	***Broadleaf***
glyphosate	
imazethapyr	
Latifoliadas anuales	***Broadleaf***
glyphosate	
Latifoliadas perennes	***Broadleaf***
glyphosate	
Lolium multiflorum	***Grasses***
acetochlor	
clethodim	
diclofop-methyl	
fluazifop-p-butyl	
flumioxazin	
glyphosate	
haloxyfop-p-methyl	
metribuzin	
paraquat dichloride	

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Authorized weed control options in soy bean production in Uruguay

propaquizafop	
quizalofop-ethyl	
quizalofop-p-tefuryl	
s-metolachlor	
Matricaria chamomilla	***Broadleaf***
acetochlor	
chlorimuron ethyl	
Nicandra physaloides	***Broadleaf***
glyphosate	
Panicum bergii	***Grasses***
fenoxaprop-p-ethyl	
quizalofop-p-tefuryl	
trifluralin	
Panicum dichotomiflorum	***Grasses***
acetochlor	
diclofop-methyl	
Panicum maximun	***Grasses***
glyphosate	
Panicum milioides	***Grasses***
acetochlor	
Paspalum dilatatum	***Grasses***
glufosinate-ammonium	
glyphosate	
haloxyfop-p-methyl	
quizalofop-ethyl	
Paspalum distichum	***Grasses***
fluazifop-p-butyl	
glyphosate	
haloxyfop-p-methyl	
Pennisetum clandestinun	***Grasses***
glyphosate	
Plantago lanceolata	***Broadleaf***
glyphosate	
metribuzin	
paraquat dichloride	
Poa annua	***Grasses***

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Authorized weed control options in soy bean production in Uruguay

linuron	
metribuzin	
paraquat dichloride	
propaquizafop	
quizalofop-ethyl	
s-metolachlor	
trifluralin	
Poáceas/gramíneas anuales	***Grasses***
glyphosate	
Poáceas/gramíneas perennes	***Grasses***
glyphosate	
Polygonum aviculare/ P.spp	***Broadleaf***
glyphosate	
Polygonum aviculare/P.spp	***Broadleaf***
2,4-D	
dicamba	
flumetsulam	
glyphosate	
imazaquin	
imazethapyr	
linuron	
paraquat dichloride	
trifluralin	
Polygonum convolvulus	***Broadleaf***
2,4-D	
chlorimuron ethyl	
dicamba	
diclosulam	
flumetsulam	
glufosinate-ammonium	
glyphosate	
halauxifen-methyl	
imazethapyr	
paraquat dichloride	
Portulaca oleracea	***Broadleaf***
acetochlor	
chlorimuron ethyl	
cloransulam-methyl	
dicamba	

Authorized weed control options in soy bean production in Uruguay

diclosulam	
flumetsulam	
flumioxazin	
fomesafen	
glyphosate	
halauxifen-methyl	
imazapyr	
imazaquin	
imazethapyr	
linuron	
metolachlor	
metribuzin	
paraquat dichloride	
s-metolachlor	
sulfentrazone	
trifluralin	
Raphanus raphanistrum	***Broadleaf***
2,4-D	
chlorimuron ethyl	
diclosulam	
flumetsulam	
fomesafen	
glyphosate	
imazaquin	
imazethapyr	
metribuzin	
Rapistrum rugosum	***Broadleaf***
2,4-D	
chlorimuron ethyl	
diclosulam	
flumetsulam	
glyphosate	
halauxifen-methyl	
imazethapyr	
linuron	
metribuzin	
Richardia brasiliensis	***Broadleaf***
fomesafen	
Rumex crispus	***Broadleaf***
2,4-D	

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Authorized weed control options in soy bean production in Uruguay

flumetsulam	
flumioxazin	
glyphosate	
metribuzin	
Schkuhria pinnata	***Broadleaf***
glyphosate	
Senecio brasiliensis	***Broadleaf***
dicamba	
linuron	
Senecio grisebachii	***Broadleaf***
flumioxazin	
Senecio madagascariensis	***Broadleaf***
diclosulam	
flumetsulam	
flumioxazin	
Setaria geniculata	***Grasses***
acetochlor	
diclofop-methyl	
diclosulam	
fenoxaprop-p-ethyl	
fluazifop-p-butyl	
glyphosate	
halauxifen-methyl	
haloxyfop-p-methyl	
linuron	
metolachlor	
quizalofop-ethyl	
quizalofop-p-tefuryl	
s-metolachlor	
trifluralin	
Setaria viridis	***Grasses***
haloxyfop-p-methyl	
Sida rhombifolia	***Broadleaf***
diclosulam	
glyphosate	
imazethapyr	
lactofen	
sulfentrazone	

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Authorized weed control options in soy bean production in Uruguay

Sida spinosa	***Broadleaf***
cloransulam-methyl	
diclosulam	
Silene gallica	***Broadleaf***
flumetsulam	
imazaquin	
Sinapsis arvensis	***Broadleaf***
linuron	
metribuzin	
Solanum chacoense	***Broadleaf***
glyphosate	
Solanum sisymbrifolium	***Broadleaf***
flumioxazin	
imazapyr	
imazaquin	
imazethapyr	
Solanum sisymbriifolium	***Broadleaf***
diclosulam	
glyphosate	
imazethapyr	
Sonchus oleraceus/ Spp	***Broadleaf***
glyphosate	
imazaquin	
imazethapyr	
metribuzin	
Sorghum bicolor	***Grasses***
quizalofop-p-tefuryl	
Sorghum halepense	***Grasses***
acetochlor	
clethodim	
diclofop-methyl	
fenoxaprop-p-ethyl	
fluazifop-p-butyl	
glufosinate-ammonium	
glyphosate	
haloxyfop-p-methyl	
imazaquin	

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Authorized weed control options in soy bean production in Uruguay

imazethapyr	
nicosulfuron	
paraquat dichloride	
propaquizafop	
quizalofop-ethyl	
quizalofop-p-tefuryl	
sethoxidim	
trifluralin	
Spergula arvensis	***Broadleaf***
metribuzin	
Stachys arvensis	***Broadleaf***
diclosulam	
Stellaria media	***Broadleaf***
acetochlor	
chlorimuron ethyl	
diclosulam	
flumetsulam	
imazaquin	
imazethapyr	
linuron	
metribuzin	
trifluralin	
Sylibum marianum	***Broadleaf***
2,4-D	
Tagetes minuta	***Broadleaf***
acetochlor	
chlorimuron ethyl	
diclosulam	
glyphosate	
halauxifen-methyl	
imazapyr	
imazaquin	
imazethapyr	
sulfentrazone	
Taraxacum officinalis	***Broadleaf***
2,4-D	
lactofen	
metribuzin	

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Authorized weed control options in soy bean production in Uruguay

Trifolium repens	***Broadleaf***
imazaquin	
Triticum aestivum	***Grasses***
clethodim	
fenoxaprop-p-ethyl	
glyphosate	
imazethapyr	
quizalofop-p-tefuryl	
Urtica urens	***Broadleaf***
chlorimuron ethyl	
imazethapyr	
trifluralin	
Verbesina enceliodes	***Broadleaf***
glyphosate	
Verónica arvensis	***Broadleaf***
chlorimuron ethyl	
Wedelia glauca	***Broadleaf***
glyphosate	
Xanthium cavanillesii	***Broadleaf***
2,4-D	
chlorimuron ethyl	
diclosulam	
glyphosate	
imazethapyr	
lactofen	
paraquat dichloride	
Xanthium spinosum	***Broadleaf***
2,4-D	
dicamba	
diclosulam	
imazaquin	
linuron	
paraquat dichloride	
Zea mays	***Grasses***
clethodim	
fenoxaprop-p-ethyl	
glyphosate	

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Authorized weed control options in soy bean production in Uruguay

haloxyfop-p-methyl
quizalofop-p-tefuryl

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