Glyphosate residues detection in honey bees from Uruguay protected areas

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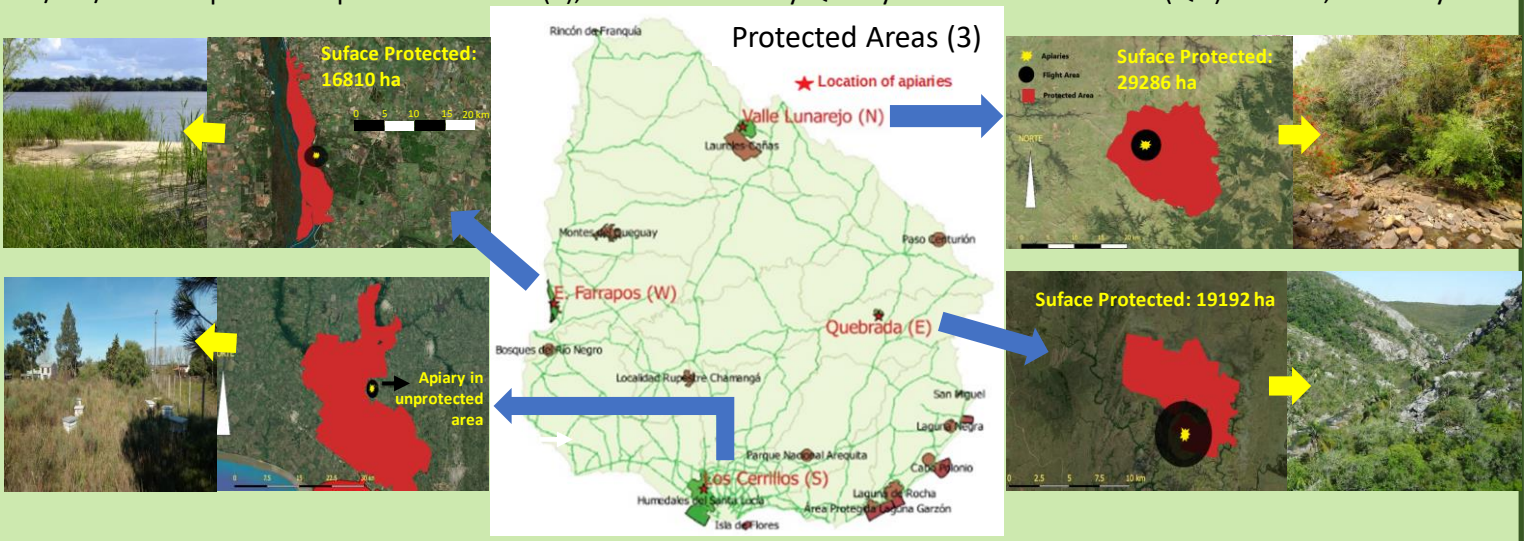
Introduction.

Beekeeping in Uruguay is present throughout the territory and honey despite being a prominent exporting product still miss differentiation that could increase its value. On the other hand, the country has a national system of protected areas (SNAP) where native fauna and flora are preserved. It is in these areas where a different honey could be achieved both for its botanical originality and for its environmental quality. The potential for producing a differentiated and without pollution product of selected region from the SNAP was explored.

Methodology.

The work was realized in four areas in Uruguay (3 protected areas) and two harvests of honey were performed in South, East and North region, while only one harvest was obtained in the West region, due to environmental problems (flooding due to excessive rainfall in the apiary area). This research was carried out with ten hives in each place. Palynological analysis was performed according to Louveaux et al. (1). Glyphosate and AMPA were determined by LC/MS/MS with prior solid phase extraction (2), in the Laboratory Quality Services International (QSI) Bremen, Germany.



Results and Discussion.

Glyphosate content of Honey coming in two dates of harvest

Region	Harvest	Glyphosate (mg/kg)	AMPA (mg/kg)
South	1 (Spring)	0.019	<LOD
	2 (Summer)	0.077	<LOD
East	1 (Summer)	Detected	<LOD
	2 (Autumn)	<LOD	<LOD
North	1 (Summer)	< LOD	<LOD
	2 (Spring)	Detected	<LOD
West	1 (Spring)	0.014	<LOD

Values are mean of two determinations for each region and date of harvest. **LOQ** = 0.010 mg/kg **LOD** = 0.005 mg/kg. **MRL** for honey bee in UE: 0.05 mg/kg

Number of botanical species in Protected Area (East, North and West) and Unprotected area (South) at two date of harvest (1 and 2)

Region	Harvest	Natives	Exotic	Cultivated	Botanic name** and number of monofloral samples
South	1	12	7	3	0
	2	6	4	4	*Lotus sp* (9)
East	1	11	2	0	***Schinus longifolius*** (1), ***Tripodanthus acutifolius*** (2)
	2	12	2	0	***Tripodanthus acutifolius***(1)
North	1	16	2	1	***Schinus longifolius*** (2), ***Tripodanthus acutifolius*** (1)
	2	8	2	0	***Lithraea brasiliensis*** (3), ***Myrcianthes sp*** (4)
West	-	8	5	2	***Parkinsonia aculeata*** (2), ***Myrcianthes sp*** (4), *Trifolium repens* (1)

* Honey dew element ** In bold case native species.

Levels above maximum limit of residual admissible for European union (0.05 mg/kg) were detected in agricultural areas (South region, harvest 2) mainly with abundance of crop production for animal intensive production or commercial crops for exportation as Glycine max . Low levels below maximum admissible were also detected in the protected area located near crop production and agricultural activities (West region).

Protected areas East and North, located near of fields where pastoral animal production (cattle and sheep) predominates with forest activities, on a honey harvest date, glyphosate was detected. AMPA was not detected in any honey harvest. Monofloral honeys were obtained from species cultivated in the West (red clover) and in the South (Lotus sp). No monofloral honeys from exotic species were obtained.

Conclusions.

Highest concentrations of glyphosate residues in honey were detected in the unprotected area, although residues in lower concentrations were detected in protected areas of Uruguay. Rethinking the geometry and size of protected areas be necessary to minimize the presence of pesticide residues in order to have differentiated honeys. This work confirms the role of bees in detecting pollutants.

References. 1) Louveaux, J.; Maurizio, A.; Vorwohl, G. Methods of melissopalynology. Bee World. 1978, 59, 139–157. 2) https://www.affinisep.com/media/booklet_glyphosate_ampa_glufosinate__080995600_1756_18072018.pdf 3) http://www.snap.gub.uy/sisnap/web/mapa_conceptual/snap