

Zinc Availability in the Pampean Region of Argentina

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INTRODUCTION

The area cropped in Argentina as well as in other southern countries of South America known as Mercosur expands at an 8% annual rate fueled by the world demand of grains. Soybean is the colonizing crop on new areas. This crop together with wheat, maize and sunflower cover 85 % of the country's agricultural lands in five provinces. The agriculture expansion is over neutral to high pH soils of the sub humid west with low soil available Zn which are highly responsive to Zn addition. This paper reviews the available information on the Zn status of the major grain producing areas of Argentina.

METHODS

Zinc availability status was assessed using: 1) Database from commercial laboratories in surveys of 2780 soil samples from production plots. Data were grouped according to the critical level (1.0 mg Zn kg⁻¹, DTPA). 2) A database of plant nutrition indicators from a survey of 125, 48, 233 and 133 foliar samples of soybean, wheat, corn and sunflower were compared with sufficiency standards.

Field Trials

A set of 23 field trials were conducted in several locations (1997-2001) on maize (14) and soybean (9). Zinc was applied as granular oxisulfate at sowing (2 to 6 kg Zn ha⁻¹). Another set of maize field trials (32) were carried out (2004-2010) to study the response to applied Zn by different methods: coated on seed (12), by foliar sprays (16), and soil applied (4).

Geographic Map Trials

Availability indicators were compared with calculated demand of Zn by crops, considering the exported Zn from soils a function of grain yield and the Zn concentration in grain. Using official production statistics, maps of exported Zn were generated using GIS methodologies. Other maps of probability of response were generated by over imposing Zn demand by crops and available Zn in soils.

RESULTS AND DISCUSSION

Table 1 indicates that about two thirds of production plots may be responsive to Zn application (63 to 37 %), with important differences among regions. The Eastern Pampas or Entre Rios province is the region showing the lowest Zn availability.

The plant tissue survey indicated median Zn concentration values of 23, 28, 37 and 27 mg kg⁻¹ for soybean, wheat, corn and sunflower, respectively. The frequency distribution indicated that 45, 37, 55 and 15% fall between the low and very low categories respectively for soybean, wheat, corn and sunflower.

Table 2 depicts a summary of field trial experiments results (only averages are shown).

Figure 1 shows the spatial distribution of exported grains.

Table 1. Percentages of samples below and above the soil critical level (CL) (1.0 mg Zn kg⁻¹ DTPA).

	Below CL	Above CL	Laboratory	
	(% of samples)		n	
Buenos Aires	59	41	1,353	ACA
Santa Fe	71	29	741	ACA
Cordoba	75	25	129	ACA
Eastern Pampas	85	15	179	TecnoAgro
Western Pampas	44	56	378	TecnoAgro

Table 2. Proportion of samples referred to soil critical level (CL) (1.0 mg Zn kg⁻¹ DTPA).

Treatments	Field Trials in 2004 to 2010			Field trials in 1997 to 2001	
	Application method – on Maize			Crop – at Soil	
	Seed (12)	Foliar (16)	Soil(4)	Maize (14)	Soybean (9)
	(kg ha ⁻¹)				
Control – Zn	9,416	10,319	10,972	9,505	3,565
Treated + Zn	9,814	11,931	11,974	10,267	3,789
Yield Increase	4%	16%	9%	8%	6%

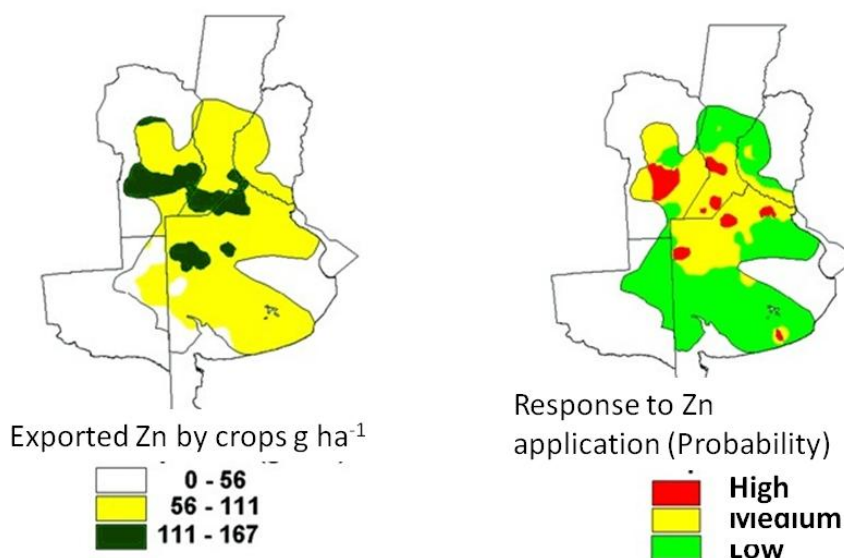


Fig. 1. Exported Zn in grains and response probability to applied Zn.

CONCLUSIONS

About two thirds of production plots may be responsive to Zn application (63 to 37 %). The Eastern Pampas or Entre Rios province is the region showing the lowest Zn availability.

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