

STARTER FERTILIZER OF VARYING GRADES AND RATES FOR NO-TILLAGE CORN IN ARGENTINA

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INTA - Exp.St. Pergamino and Mercedes

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Fluid fertilizer development in Argentina

- There has been a wide and deep progress since many years
- Today the use of UAN and N-S solutions represent more than 35 % of the N supply to cereal crop

New developments in NPS solutions





LABRADOR-P

Manufacturer	Grade N-P2O5-K2O-S					
Labrador/Nidera	0-10-0; 6-8-0; 4-7.5-0-5					
DUALFOS	0-10-0; 6-8-0; 4.5-8-0-5					
FASIL	4.5-22-0-3.4					
MAP Liquid/ALS	6-20-0-5					
SolFOS/Bunge	11-37-0; 11-30-0-5					



The growing domestic availability of fluid P sources, AGRILIQUID SOLUTIONS S.A. may offer special and distinct challenges to all the value chain, from distributors to end users.





Survey of 800 farmers in Pampa region. ICASA, 2008



- N and P, alone or placed together are thought the major contributors.
- The challenge is to apply as much at sowing to cover replacement without waste and potential fitotoxicity:

Corn 10 mt ha⁻¹ → 38 kg P ha⁻¹ 48 kg K ha⁻¹ 10 kg S ha⁻¹

Heckman et al, 2003

Starters (solid or fluids)

- The application of NP or NPS/NPKS solutions as a starter has to have distinctive advantages over the solid granular blends for a rapid adoption by farmers, as well as lack of disadvantages
 - Among the major concerns of farmer using starters, solid or fluids, is the effect of placement toxicity to seed, which has to do with the N- ureic grade and the proximity of the fertilizer to the line of seeds.

Objective

PETROPLANTA

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To find out the best NPKS grades and rates as a starter for corn grain yield in two regions of Argentina

IQUIDOS

FEBTILIZANTES

We aimed to get a simple blend proportion among common fluid sources that would be easily adopted by retailers and farmers

Experiments in two different environments

- Pergamino (Buenos Aires, 34°S).
 Thermic. Very High soil K low S
- Mercedes (Corrientes, 29°S).
 Hyperthermic. Very Low soil K low S



Location	Texture top soil	рН	ОМ	P- Bray 1	S-SO4	K		
			g kg⁻¹	mg kg ⁻¹				
Pergamino	Loamy clay	5.7	37	14.6	7.8	486		
2012-13		5.5	35	44.7	17.5	505		
Mercedes	Sandy loam	5.8	24	10.0	8.0	47		
2012-13		5.5	18	10.7	4.9	55		

- Pergamino
 - NK900, sown November 15-2011, 7.5 pl m²
 - Arvales 2310 MG, sown December 15 -2012, 7.6 pl m²
- Mercedes
 - DK390 HX RR, sown December 22-2011, 6.1 pl m²
 - M510 HX RR2, sown August 30-2012, 7.9 pl m²



Materials and Methods

Treatment Eactors:

Contrast: Granular vs. Fluid Varying P:N ratios: + S in Pergamino + K in Mercedes

Rates of product:
120 & 180 kg/ha - Pergamino

150 & 250 kg/ha - Mercedes

Fluid materials used to prepare the mixes

Product	Ν	P_2O_5	K ₂ O	S	SG - Density
		kg/lt			
APP	0.11	0.37			1.42
TSA	0.12			0.26	1.32
TSK			0.25	0.17	1.46
UAN	0.32				1.32

Granular sources used to prepare the mixes

	Pergamino			Mercedes	
N:P ratio	N:P = 1:1	N:P 1:2	N:P:K ratio	1:1:1	1:2:1
	F 1 0/	720/	DAP	9%	35%
DAP	51%	12%	CLK	21%	15%
SSP	49%	28%	SSP	70%	50%

Fertilizer treatments - Pergamino

	Starter		Nutrie	Nutrients w/starter			Urea			
Treatments	Ratio	Rate	Ν	Ρ	S	Sowing	at V-6	N Total	P:N	S:N
	ISA:APP				kg/ha					
Check	-	0	-	-	-	36	312	160		
Granular A	-	65	3	18	6	33	309	160	1.0	0.2
Fluid 1	1:1	120	22	22	7		298	160	1.0	0.2
Fluid 2	1:1	180	33	33	11	-	273	160	1.0	0.2
Granular B	-	75	7	26	4	21	306	160	1.5	0.1
Fluid 1	1:2	120	19	29	5		306	160	1.5	0.1
Fluid 2	1:2	180	29	44	4	-	285	160	1.5	0.1

Fertilizer treatments - Pergamino

	Starter		Nutrients w/starter				Urea			Ratios	
Treatments	Ratio	Rate	Ν	Ρ	S	Sowing	at V-6	N Total	P:N	S:N	
	ISA.APP				kg/ha						
Check	-	0	-	-	-	36	312	160			
Granular A	-	65	3	18	6	33	309	160	1.0	0.2	
Fluid 1	1:1	120	22	22	7	- -	298	160	1.0	0.2	
Fluid 2	1:1	180	33	33	11	-	273	160	1.0	0.2	
Granular B	-	75	7	26	4	21	306	160	1.5	0.1	
Fluid 1	1:2	120	19	29	5	- [306	160	1.5	0.1	
Fluid 2	1:2	180	29	44	7	-	285	160	1.5	0.1	

Fertilizer treatments - Mercedes

	Starter		Nutrients w/starter					Urea			Ratios	
Treatments	Ratio UAN:APP	Rate	Ν	Ρ	Κ	S	Sowing	at V-6	N Total	P:N	K:N	
	:TSK				kg/	'ha						
Check	-	0	0	0	0	0	43	218	120			
Granular A	-	100	2	18	12	8	43	215	120	0.9	0.6	
Fluid 1	1:1:1	150	21	18	12	8	0	215	120	0.9	0.6	
Fluid 2	1:1:1	250	35	31	21	14	29	184	120	0.9	0.6	
Granular B	-	110	7	29	10	7	0	217	120	1.4	0.5	
Fluid 1	1:2:1	150	20	28	9	6	0	217	120	1.4	0.5	
Fluid 2	1:2:1	250	34	46	16	11	0	188	120	1.4	0.5	

Fertilizer treatments - Mercedes

	Starter		Nutrients w/starter			Urea		Ratios			
Treatments	Ratio UAN:APP	Rate	Ν	Ρ	Κ	S	Sowing	at V-6	N Total	P:N	K:N
	:TSK				kg/	ha					
Check	-	0	0	0	0	0	43	218	120		
Granular A	-	100	2	18	12	8	43	215	120	0.9	0.6
Fluid 1	1:1:1	150	21	18	12	8	0	215	120	0.9	0.6
Fluid 2	1:1:1	250	35	31	21	14	29	184	120	0.9	0.6
Granular B	-	110	7	29	10	7	0	217	120	1.4	0.5
Fluid 1	1:2:1	150	20	28	9	6	0	217	120	1.4	0.5
Fluid 2	1:2:1	250	34	46	16	11	0	188	120	1.4	0.5

Results & Discussion



Results & Discussion



Statistics

	Merc	edes	Pergamino		
	2011-12	2012-13	2011-12		
		Pr > F			
Treat vs Control	<.0001 **	<.0001	0.076		
Granular vs. Fluid	0.0004 **	0.33 ns	0.72 ns		
Rate	<.0001 **	0.47 ns	0.47 ns		
P:N ratio	<.0001 **	0.38 ns	0.52 ns		
Rate* P:N ratio	0.88 ns	0.15 ns	0.96 ns		
LSD 5%	643	597	471		
CV %	6.7	6.9	3.5		

Pergamino – Very high K In high P fertility soils the response to P is low, regardless N:P ratio, fertilizer form or P rate



Pergamino – Very high K

The same is observed on S response, low since requirement is low relative to the supply



Available S-SO4 ~ 8 ppm

Pergamino – Very high K

Several rates & NPS ratio appears suitable, given the lack of difference among the RY, the cost of the nutrients and the closest balance

Pergamino	Applied	Removal kg ha-1		Relative yield	Р	S
Treatments	Kg P $-S_1$ ha ⁻	Ρ	S	%	Use/Rem	oval ratio
Granular A	18 – 6	35	9.1	99%	51%	63%
Fluid 1	22 – 7	35	9.1	99%	64%	79%
Fluid 2	33 – 11	34	9.0	98%	97%	120%
Granular B	26 - 4	35	9.1	99%	74%	45%
Fluid 1	29 – 5	35	9.2	100%	84%	52%
Fluid 2	44 - 7	35	9.1	99%	127%	78%

Mercedes – Very Low K N:P ratio or the rate of the starter means a definite P rate in low P soils, regardless N ratio or fertilizer form



Mercedes – Very Low K

On the other hand, response to K seems linear, therefore starter response is response to K



Soil exchangeable K~47-55 ppm

Mercedes – Very Low K

That rate & NPK ratio seems the best, given the highest RY, the highest K supply and the closest balance

Mercedes	Applied	Remo	∕al kg ha⁻¹	Relative yield	Р	K
Treatments	Kg P –K ha ⁻¹	Р	К	%	Use/Remo	val ratio (*)
Granular A	18-12	25	32	84%	74%	39%
Fluid 1	18-12	25	31	. 84%	74%	40%
Fluid 2	31-21	28	36	94%	111%	58%
Granular B	29-10	26	32	87%	113%	30%
Fluid 1	28-9	22	27	73%	129%	35%
Fluid 2	46-10	25	32	84%	188%	49%

(*) Average of the 2 years

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- There was response to fertilization in the three experiments
 - Fluid was not different to granular at same rate and P:N ratio
- Only in one trial P:N ratio 1:1 was better than 1:1.5 at the same nutrient rate
 Only in one trial rate effect was significant but..
 Only in one trial granular was superior than fluid at same ratio and P:N ratio

There is always a concern on how starters affect plant stand, but in none of the trials was observed any reduction in stand

The effect of starter on early growth were observed along the whole growth cycle in all trials, and resulted in grain yield differences (check vs. others)

All evaluated grades were able to supply enough P or S to achieve a reasonable replacement percentage (application vs. removal), but not K

Thank you very much for your attention...

Questions?

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ks so much also to ollaborators ...



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