



Compilation of **WHEAT/BARLEY** field trials

Season 2019/2020.

During the 2019/20 season, 6.6 million hectares of wheat were planted in Argentina, 6.5% above the previous campaign's area.

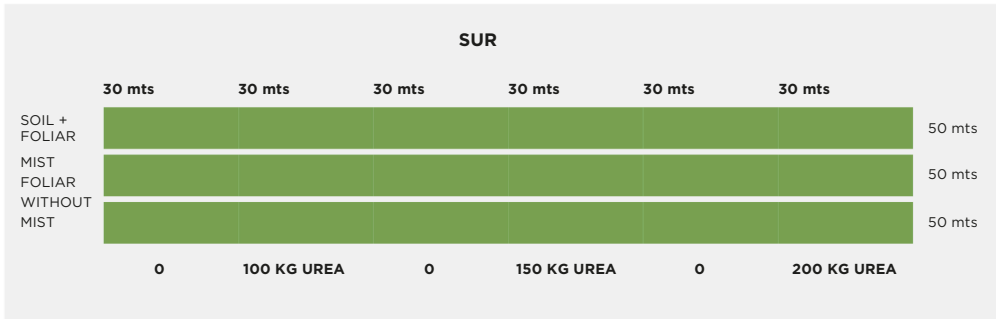
During this season, Kioshi Stone carried out trials with Mist product protocols in 3 locations (under the responsibility of Universidad Nacional del Litoral, FCA in Rafaela; INTA San Antonio de Areco; and INTA Barrow) on wheat and barley crops.

1. Trial conducted by UNL FCA, Rafaela

During field trials the used variety was DM Algarrobo, and the treatment was:

- Control
- MIST N foliar 5 l/ha
- MIST N soil 3 l/ha + foliar 3 l/ha

The trials were conducted under different nitrogen availability environments generated by fertilizations of 0, 100, 150 and 200 kg/ha of UREA.



Results:

Foliar-applied MIST N treatment showed a 12% yield increase compared to the control when no urea was applied.

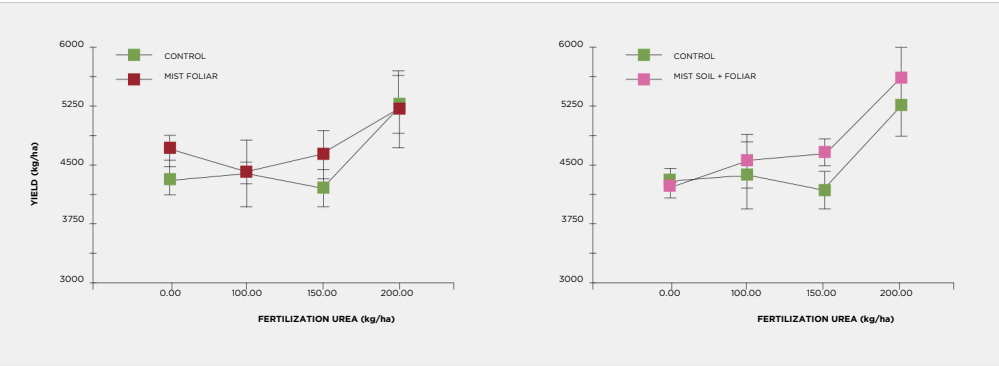


Figure 1: Number of spikes according to UREA fertilization level for each of the MIST N treatments.

SUR							
	30 mts	30 mts	30 mts	30 mts	30 mts	30 mts	
SUELO + FOLIAR	4308	4580	4149	4684	4281	5612	50 mts
MIST FOLIAR	4383	4408	4834	4628	4945	5213	50 mts
SIN MIST	3902	4393	4633	4204	4374	5273	50 mts
	0	100 KG UREA	0	150 KG UREA	0	200 KG UREA	

Figure 2: Average yields per plot. Regarding the relationship between kg of grain and kg of N available at the beginning of the crop (soil + fertilizer), this allows us to estimate the efficiency of N use. In general, it was found that the higher the amount of N available from UREA, the lower the utilization efficiency.

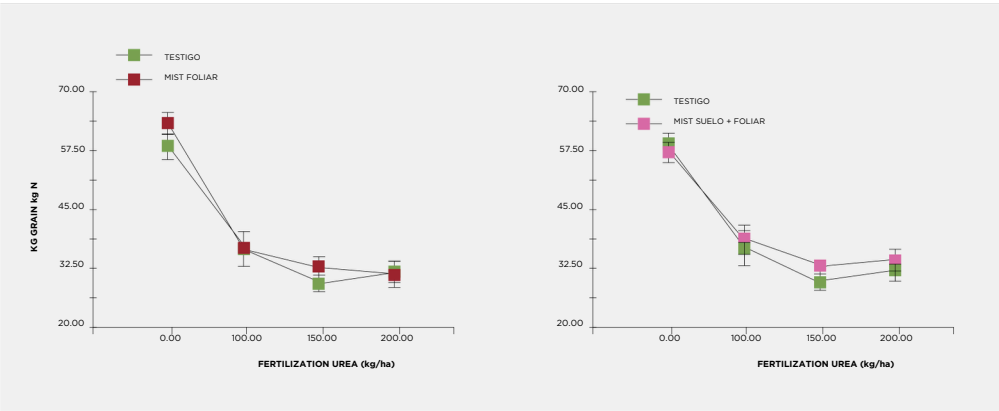


Figure 3: Wheat yield according to UREA fertilization level for each of the MIST N treatments.

2. INTA San Antonio de Areco

The trial was carried out on wheat crop with the DM Algarrobo variety, and the treatments were as follows:

T1: Control (with P and N) according to a current use technique (CUT) (120 kg/ha of MAP + 200 kg/ha of Urea).

T2: Full Mist package (without MAP or Urea): Vm or Vg applied to seed 200 cc/100 kg of seed + 3 l/ha P (MIST-P) + 3 l/ha Mist N (at tillering) + 2 l/ha Mist N (at flag leaf stage with fungicide) (3 products in total + product with P).

T3: Mist package without Vm or Vg: 3 l/ha P (MIST-P) + 3 l/ha Mist N (at tillering) + 2 l/ha Mist N (at flag leaf stage with fungicide) (3 products in total + product with P). This treatment was designed to assess the effect of Vm.

T4: 120 kg/ha of MAP + 200 kg/ha of Urea + 3 l/ha Mist N (at tillering) + fungicide at flag leaf stage (FL).

T5: 120 kg/ha of MAP + 200 kg/ha of Urea + 3 l/ha Mist N (at flag leaf stage with fungicide).

T6: 120 kg/ha of MAP + 200 kg/ha of Urea + 3 l/ha Mist N (at tillering) + 2 l/ha Mist N (at flag leaf stage with fungicide).

Results

The following table shows the importance of re-fertilization with Mist N at tillering and/or booting stage compared to the other treatments.

Although no statistically significant differences were observed between treatments, there was a 6% yield increase in the previously mentioned treatments.

Treat	pl/m ²	Spikes/m ²	gr/m ²	TKW	HLW	Kg/ha	Dif kg	Dif%
1	283a	526 ab	21 c	25 ab	75,4 a	4599 b	-	-
2	288a	392 a	17a	23,5 a	74 a	3280 a	-1319	-28
3	284a	455 ab	18ab	23,2 a	74,2 a	3282 a	-1317	-28
4	311a	542 b	20,6 bc	27 b	74 a	4662 b	63	1,3
5	275a	528 a	20,7c	27,7 b	74,3 a	4878 b	279	6
6	274a	545 a	20,7 c	25 ab	74,6 a	4728 b	129	2,8

3. INTA Barrow - Integrated Experimental Farm (INTA-MDA)

The trials carried out at INTA Barrow were conducted on barley, using the Andreia variety, and the treatments were as follows:

Treat	Seed	Post-sowing soil	Tillering	First node	Flag leaf	Ear emergence
1	Producer's control FDA (100 kg ha ⁻¹)		Urea (200 kg ha ⁻¹)			
2	Biostimulant 300cc/100kg + FDA (50 kg ha ⁻¹)	Mist P 1,5 l ha ⁻¹	Mist mezcla (1,5 l ha ⁻¹) +Urea (100 kg ha ⁻¹)		Mist N (3 l ha ⁻¹)	CIK (1,5 l ha ⁻¹)
3	Biostimulant 300cc/100kg	Mist P 3 l ha ⁻¹	Mist N 3 l ha ⁻¹	Mist Mix (3 l ha ⁻¹)	Mist N (3 l ha ⁻¹)	CIK (3 l ha ⁻¹)
4	Biostimulant 300cc/100kg	Mist P 1,5 l ha ⁻¹	Mist N 1,5 l ha ⁻¹	Mist Mix (1,5 l ha ⁻¹)	Mist N (1,5 l ha ⁻¹)	CIK (1,5 l ha ⁻¹)
5	Biostimulant 300cc/100kg	Mist P 1 l ha ⁻¹	Mist N 1 l ha ⁻¹	Mist Mix (1 l ha ⁻¹)	Mist N (1 l ha ⁻¹)	CIK (1 l ha ⁻¹)
6	Control without P or N					

Table 1. Products, application timing, and doses used in the different treatments.

Results

Statistically significant differences among treatments were detected for yield, protein content, and grain number (Table 2). Although no differences were observed in grain size, none of the treatments exceeded the size threshold required by the industry (85%).

All fertilization treatments significantly outperformed the unfertilized control in yield. The highest application rates of Mist products at different timings (treatment 3) showed the best responses in yield and grain number, compared to those in which lower doses were applied. However, this improved performance was not reflected in protein content.

The most outstanding treatments in terms of both yield and quality were the farmer's control (1) and 50% fertilizer dose with the addition of Mist (2). No differences were detected between them in yield and grain number, although differences in protein content were observed.

Treat	Yield	Protein	Grain size	Gr m ⁻²
1	5484 a	12,6 a	80	17982 a
2	5424 a	11,3 bc	79	17765 a
3	5012 b	11,2 bc	81	16282 b
4	4615 c	10,8 c	85	15055 c
5	4518 c	11,1 bc	81	14379 c
6	3984 d	11,1 bc	83	12468 d
Average	4815	11,4	82	15592
Anova (p)	<0,0001	<0,0001	0,407	<0,0001
CV (%)	4,94	3,12	4,81	4,97

Table 2. Yield (kg ha⁻¹), grain protein (%), grain size (%), and number of grains (grains m⁻²), according to the treatments evaluated.

The application of different nutrients in the form of nanoparticles improved barley yield, by up to 25% compared to the unfertilized control. The application of nano-fertilizers improved the efficiency of both diammonium phosphate and urea.

Finally, after reviewing the three trials conducted in different areas (with different climate and soil conditions), the efficiency of Mist products, whether applied to the soil or foliar, matched or improved both yield and product quality compared to the other fertilization strategies. Our products are formulated with a focus on practicality in logistics, storage, and application, reducing costs as well as the carbon footprint, thereby lowering environmental pressure.



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