

Evaluation of fertilization strategies in maize (corn) crop.

Experimentation report. 2021/22 Season. Southeastern
Buenos Aires.

Objective of the study

The aim is to evaluate the effect of applying Mist fertilizers with N, P, and Zn in contrast with the most common fertilization models used in the southeastern region of Buenos Aires.

2. Trial description

The trial was carried out in a field near the town of Balcarce (37°52'58.94"S 58°19'16.66"W).

Five maize nutrition treatments were evaluated:

Treatment	Dose, source, and maize growth stage at the time of fertilization
1	150 kg/ha urea (V4)
2	150 kg/ha urea + 0,5 L/ha Mist Zn (V4)
3	3 L/ha MistN (V4) + 3 L/ha Mist N (V8)
4	3 L/ha MistN + 2 L/ha Mist P (V4) + 3 L/ha Mist N (V8)
5	3 L/ha MistN + 2 L/ha Mist P (V4) + 0,5 L/ha Mist Zn + 3 L/ha Mist N (V8)

The trials were carried out in a field sown on October 25 with the hybrid DK7220. Plant density was 80,000 plants/ha. All treatments received a basal fertilization of 40 kg/ha of diammonium phosphate (18-46-0).

The application of urea and Mist (N, P or Zn) was performed at the V4 and V8 stages, as appropriate. Urea was broadcast applied as full coverage, while Mist was applied using an experimental backpack sprayer with constant pressure and a 2 m boom width. These liquid fertilizers were diluted in water at a rate of 80 L/ha.

Weed control was performed by applying glyphosate in crop post-emergence.

Harvest was conducted manually, collecting the ears from a central row of each plot over a distance of 10 linear meters. Samples were threshed with a stationary thresher. Grain moisture content was recorded, and the thousand kernel weight (TKW) was determined. Grain yield was adjusted to 14% moisture content.

In order to characterize nutrient availability, prior to sowing, a soil sampling was carried out at depths of 0-20, 20-40, and 40-60 cm. The samples were sent to the Fertilab laboratory (<https://www.laboratoriofertilab.com.ar/>).

A randomized complete block design with 4 replications was used. Each plot measured 4 rows wide by 10 m long, with row spacing of 52 cm.

Treatment comparisons were performed through ANOVA, using the PROC GLM procedure. A mean comparison analysis was carried out using the Least Significant Difference (LSD) test.

Table 1 details soil characteristics and nutrient availability at sowing. Phosphorus (P) availability was found to be high, explained by the fact that maize was preceded by potato cultivation (two seasons earlier), which receives high fertilizer doses of this nutrient.

Organic matter (OM) and pH values were typical of fields in the region. Sulfate-S availability was close to the response threshold reported by Carciochi et al. (2015) in the region, while Zn content exceeded the critical threshold reported by Martínez Cuesta et al. (2021), although the high availability of P could limit its bioavailability (Cakmak and Marschner, 1986).

Table 1. Soil analysis at crop sowing. (FERTILAB Laboratory)

Depth cm	P Bray (mg/kg)	OM (%)	N-Nitrate (kg/ha)	S-Sulfate (kg/ha)	pH	Zinc (mg/kg)
0-20	68,7	5,5	32,5	11,2	6,2	3,4
20-40			24,3	12,1		
40-60			19,4	12,4		

Results and Discussion

Adequate rainfall was recorded for crop growth (Figure 1). In addition, rainfall occurred around the fertilization timings, which allowed for rapid incorporation or absorption of the applied fertilizers.

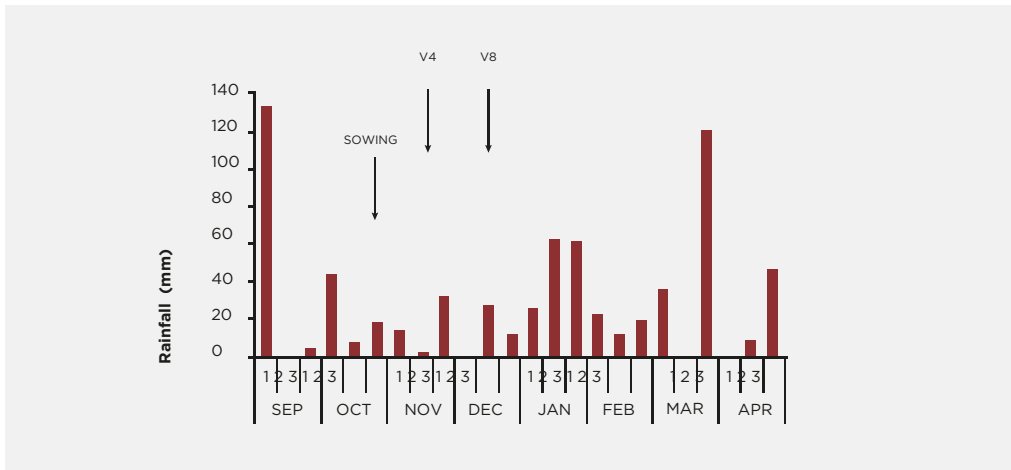


Figure 1. Decadal rainfall during the crop cycle. Arrows indicate sowing and fertilization timings (V4 and V8). The thousand kernel weight (TKW) was similar among treatments ($p = 0.62$). On the other hand, all treatments that received Mist fertilizer combinations showed a higher number of grains/m². The highest value was observed with the combination of double Mist N application together with Mist P at V4 (Figure 2) ($p < 0.05$).

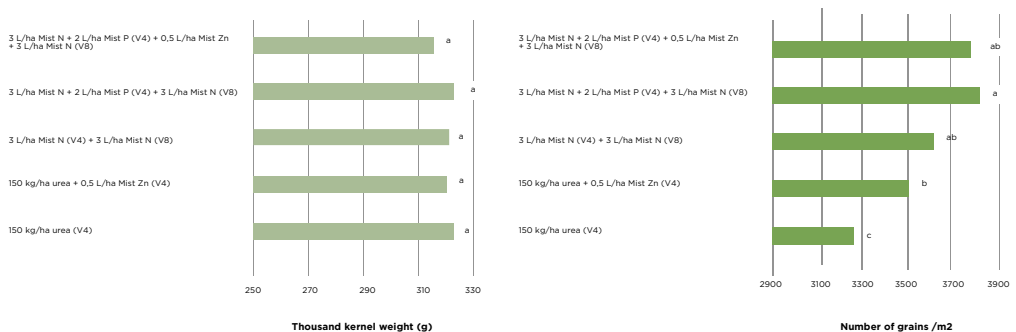


Figure 2. Thousand kernel weight (left) and number of grains (right) according to treatment. Identical letters among treatments indicate no significant differences ($p < 0.05$, LSD).

The average yield of the treatments ranged between 10,400 and 12,300 kg/ha, consistent with reports for high-productivity fields in the region that did not experience marked water deficit.

The highest yields were observed in treatments that received Mist N at V4 and V8, combined with Mist P or Mist P + Zn ($p < 0.05$). It is also noteworthy that the addition of Mist Zn to the baseline urea treatment resulted in higher yield ($p > 0.05$) (Figure 3).

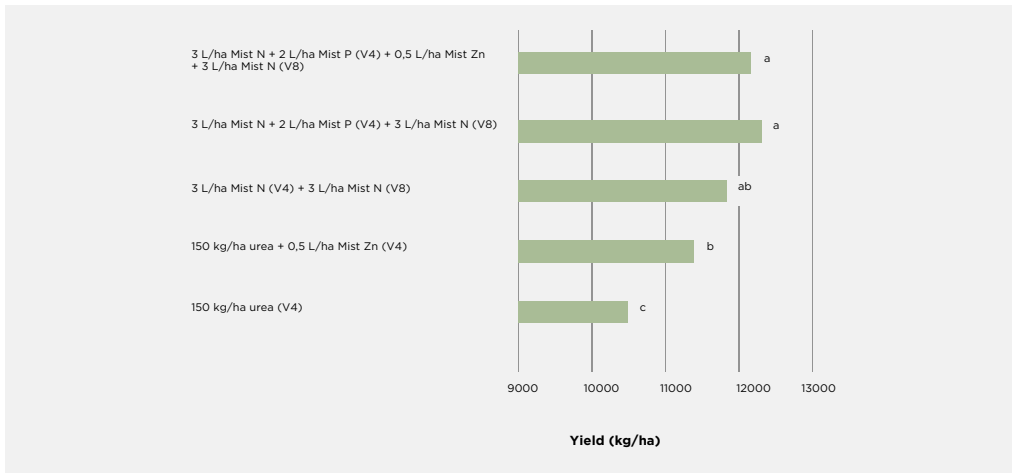


Figure 3. Grain yield of the crop under different fertilization treatments. Treatments with the same letters do not differ significantly ($p < 0.05$, LSD).

Final Considerations

Overall, the trial yields were high, consistent with the favorable water conditions observed during the season.

It was observed, firstly, that the addition of foliar Zn (Mist Zn) to baseline urea treatments produced yield increases. This may be associated with an induced deficiency due to high P concentrations under the conditions in which the trial was conducted.

In addition, it was found that fertilization with Mist N at two phenological stages (V4 and V8) also generated higher yields compared to the baseline urea treatment. These differences were greater when fertilization also included Mist P or Mist P + Mist Zn.



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