

Salinity decreases agricultural productivity. Saline waters and soils are spreading around the world; currently with the increasing drought and irrigation water scarcity, the salinity effect get worse, mainly in arid and semiarid areas.

The main goal was to evaluate the performance of alfalfa populations under natural saline conditions.

## Materials and Methods

- Santiago del Estero, NW Argentina
- Climate: mesothermal, semi-arid type
- T° min-max mean annual: 11.7 - 28.6°C
- pp mean/year (2019/2021): 500 mm/year



## Alfalfa populations from different origins (AP)

Ameristand801 (AME)  
Salado (SDO)

Salina PV (SNA)  
Kumen PV INTA (KUM)  
Salinera INTA (SRA)  
Monarca (MON)\*  
SuperMonarca (SMO)\*

MSI0036 (M36)  
MSI0037 (M37)  
MSI0038 (M38)

Chenini (CHE)

Sardi (SAR)\*

\* These populations don't have records of salinity tolerance

**Experimental design:** latinized row-column (4x3), three rep

**Sowing (may 2019) Thinning (oct.2019)**

55 plants/ plot (1m<sup>2</sup>).



A minimum amount of water was applied to moisten the soil surface during establishment and during winter and early spring 2020.

## Biomass production and survival

from 16 cuts by measuring: the dry matter biomass (DM) per plot (DMplot, g.m<sup>-2</sup>), the biomass per plant (DMplant, g), and the relative survival (S, %) over time.

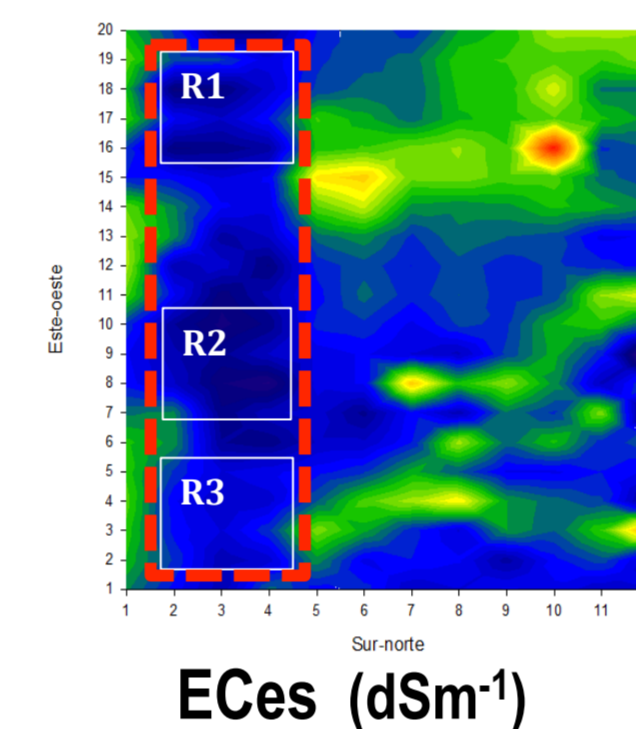
## Statistical analysis

ANOVA using GLM model: AP as a fixed factor while column, row, and replications as random factors, and the ECes as a covariable. AP means were compared using the LSD Fisher test (P<0.05).

## Salinity conditions

Evaluations in **March 2019** (before sowing), **December 2020**, and **October 2021**, following three steps:

- ① apparent soil electrical conductivity (ECa) measurements were made in the field with EM-38 DD instrument (Geonics);
- ② extracted soil electrical conductivity (ECex) measurements were determined in the laboratory (0-30, 30-60, 60-90 cm) in selected soil samples taken in the field after interpretation of the ECa;
- ③ the EC was estimated (ECes) for each plot using a linear regression (p<0.05) between ECex (ave. from three depth) and ECa.



Map of estimated EC with the location of the experimental site selected (with three rep.) within of the large area mapped.



EM-38 instrument

## Results

### Salinity

At the beginning, the average ECes in the plots was 9.5 ds.m<sup>-1</sup>. However, due to the salt dynamic, the ECes changed over time.

### Average ECex dS/m

Deep (cm)	March 2019	Dec. 2020	Oct. 2021
0-30	5.01	32.44	26.03
31-60	9.40	26.20	22.98
61-90	10.22	22.96	21.93

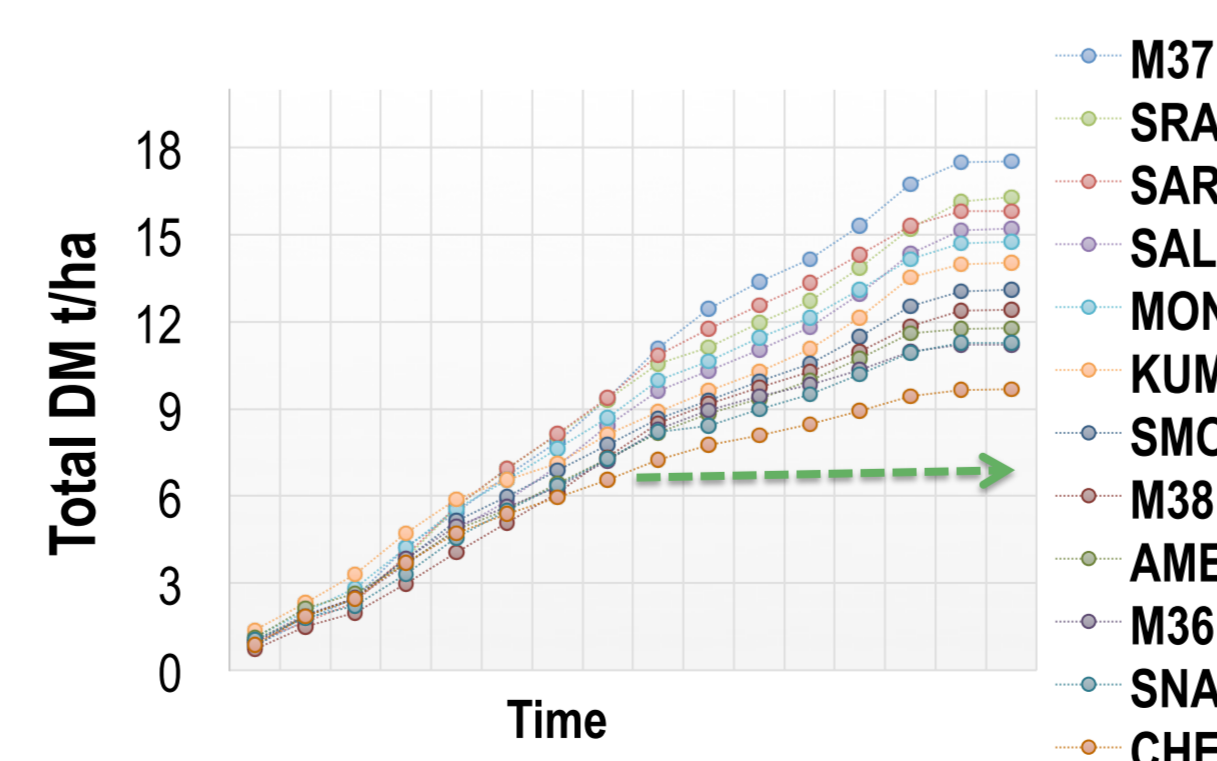
### Average ECes dS/m (range)

0-90	9.5 (6.0-13.5)	27.4 (22.0-33.1)	25.8 (23.4-29.2)
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pH 6.7 to 7.4

### Biomass production

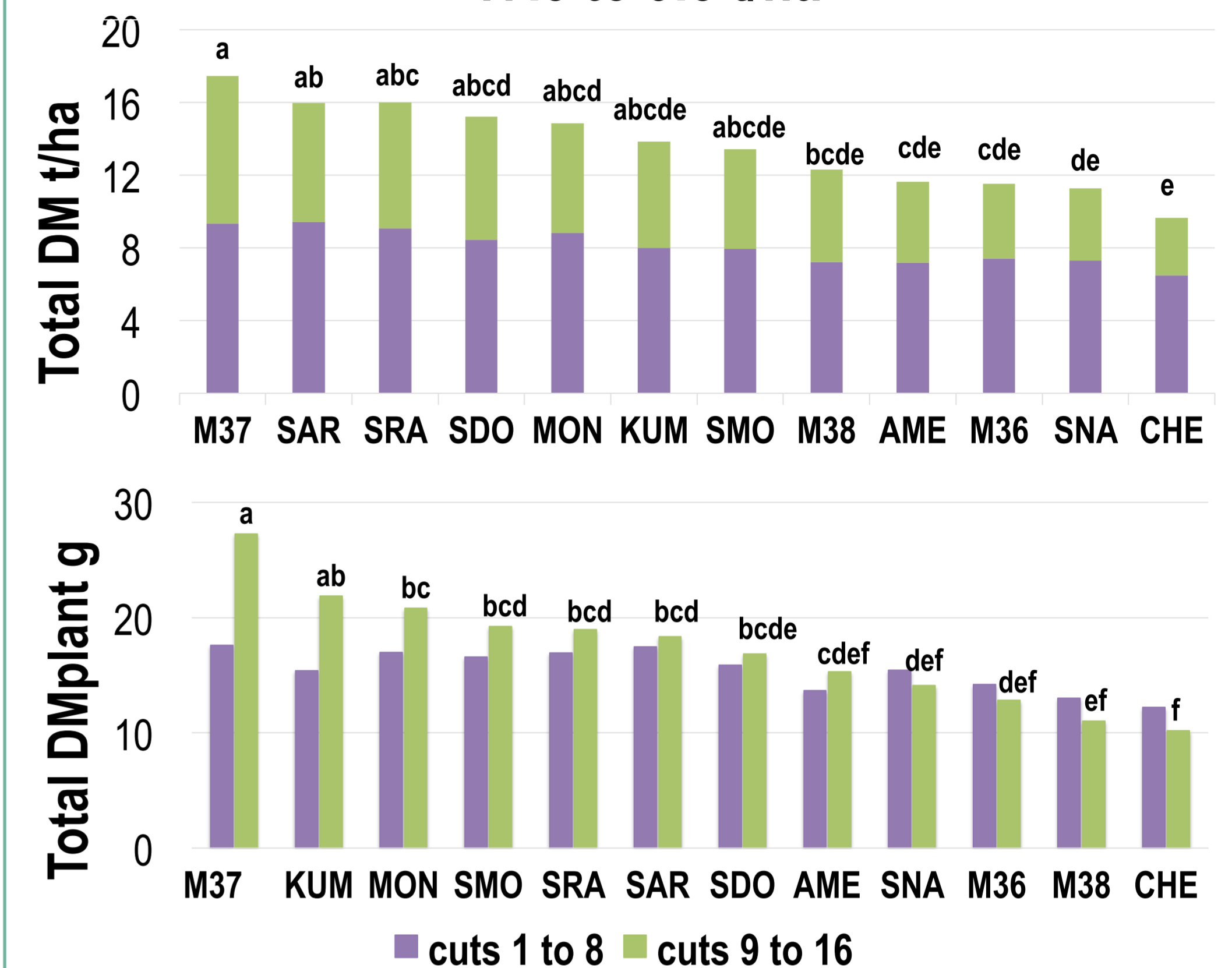
Analysis by cut showed significant differences among AP for DMplot and DMplant from cut 9 to 16.



For the first 8 cuts (P>0.05): ~9.5 to 6.5 t/ha (pp + water)  
The second 8 cuts (P<0.05): ~8 to 3 t/ha (pp)

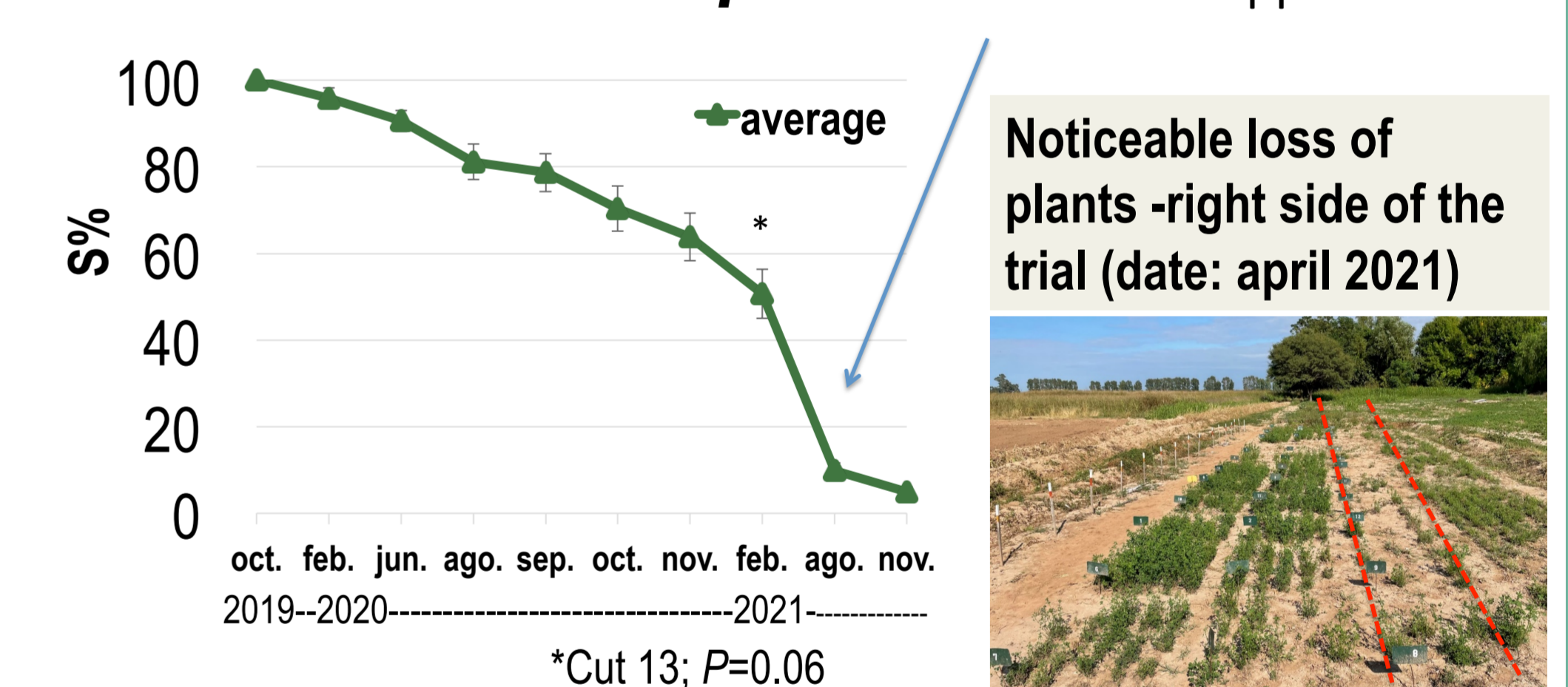
## Total production (P<0.05) 2019/2021, 16 cuts:

~17.5 to 9.5 t/ha



For the second 8 cuts, DMplant (P<0.01). M37 and CHE ranked first and last in both ranks.

## Relative survival of plants



## Conclusions

Our results suggest that when the salinity increased to values around 20 dS/m, the AP displayed a different aptitude to cope with this stress, which also was more stressful without irrigation. Remember: the emergence and establishment took place with lower EC.

Even though screening populations in the field is difficult due to the high heterogeneity, this study provides more knowledge about the decrease and variability of alfalfa production under saline conditions.