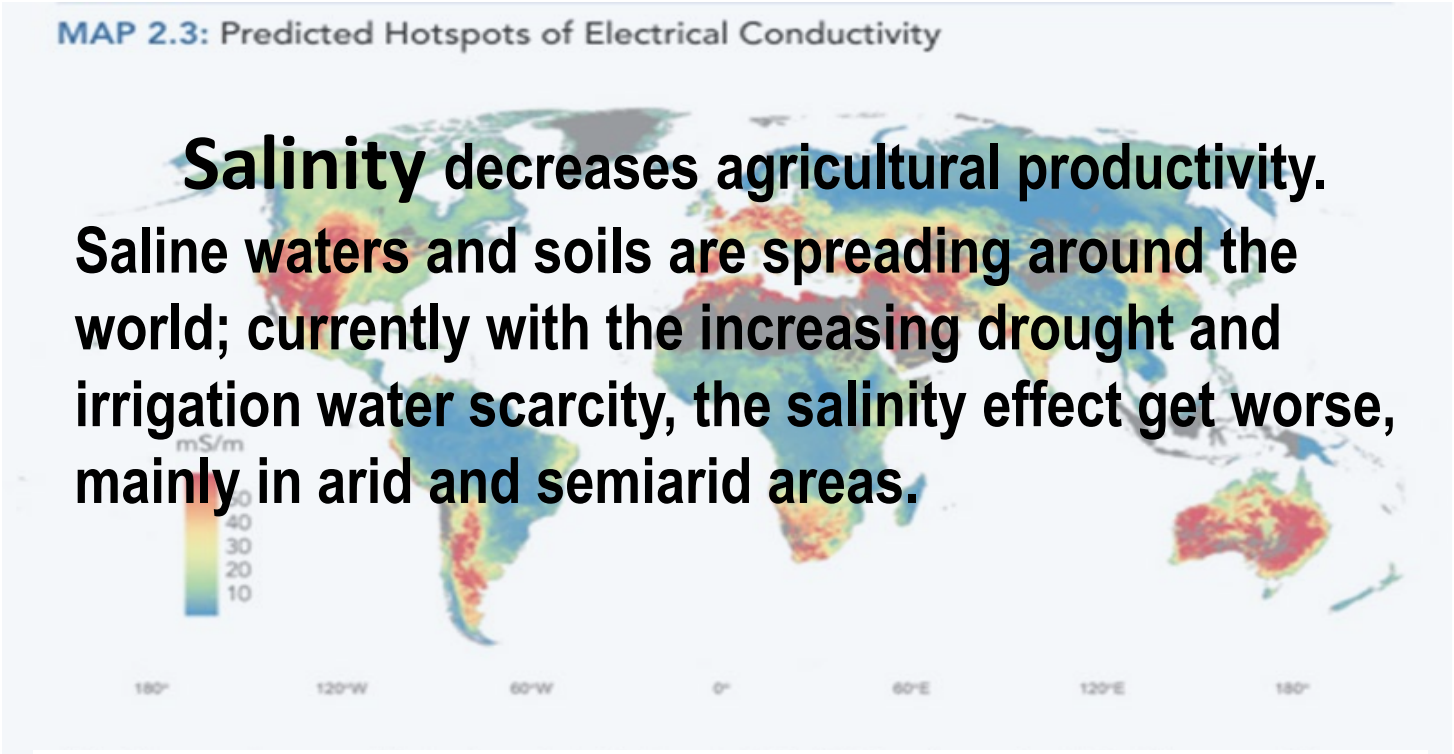
Salinity effects on the performance of alfalfa populations in a semiarid enviroment of Argentina

2022 WORLD ALFALFA CONGRESS SAN DIEGO CA | USA
November 14-17, 2022

Mónica Cornacchione and Salvador Prieto Angueira
National Institute of Agricultural Technology, Santiago del Estero, Argentina.



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.

"Damania, et al. 2019. Quality Unknown: The Invisible Water Crisis.
https://openknowledge.worldbank.org/handle/10986/32245

Alfalfa

Importance globally

✓ Recent research has shown that alfalfa is more tolerant to salinity (*Cornacchione and Suarez, 2015 , 2017; Putnam et al, 2017; Benes et al, 2018, etc*) than previous studies with oldest varieties.

potential to contribute to the sustainability of semiarid regions

Evaluate the alfalfa populations under natural saline conditions

Santiago del Estero, NW **Argentina**
high T°C and long warm season
pp (2019-2021): ~500 mm/year

Salinity

pre sowing /before raining season/ final

EM38 to assess the spatial and temporal variability in soil salinity

EM-38 instrument

① **Apparent -ECa**

② **Extracted soil -ECex**

③ **Estimated -ECes** for each plot

Populations

Ameristand801 **(AME)**
Salado **(SDO)**

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

Chenini **(CHE)**

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

Sardi **(SAR)***

Sowing (fall 2019)
Thinning (spring 2019): 55pl/m²

water: establishment and winter and early spring 2020.

Experimental design:

Latinized row-column (4x3), three rep.

Biomass production (16 cuts), survival

Statistical analysis

ANOVA using GLM model and **ECes as a covariable.** AP means were compared using the LSD Fisher test ($P<0.05$).

Salinity

TEMPORAL variability

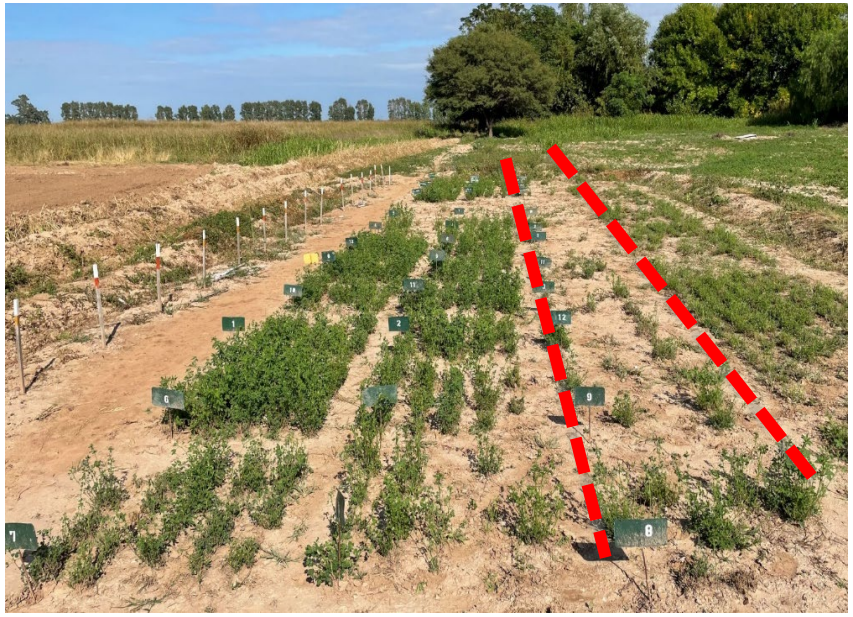
Average ECes dS/m

Depth (cm)	Pre-sowing March 2019	Dec. 2020	Oct. 2021
0-90	9.5	27.4	25.8
range	6.0 - 13.5	22.0 - 33.1	23.4 - 29.2

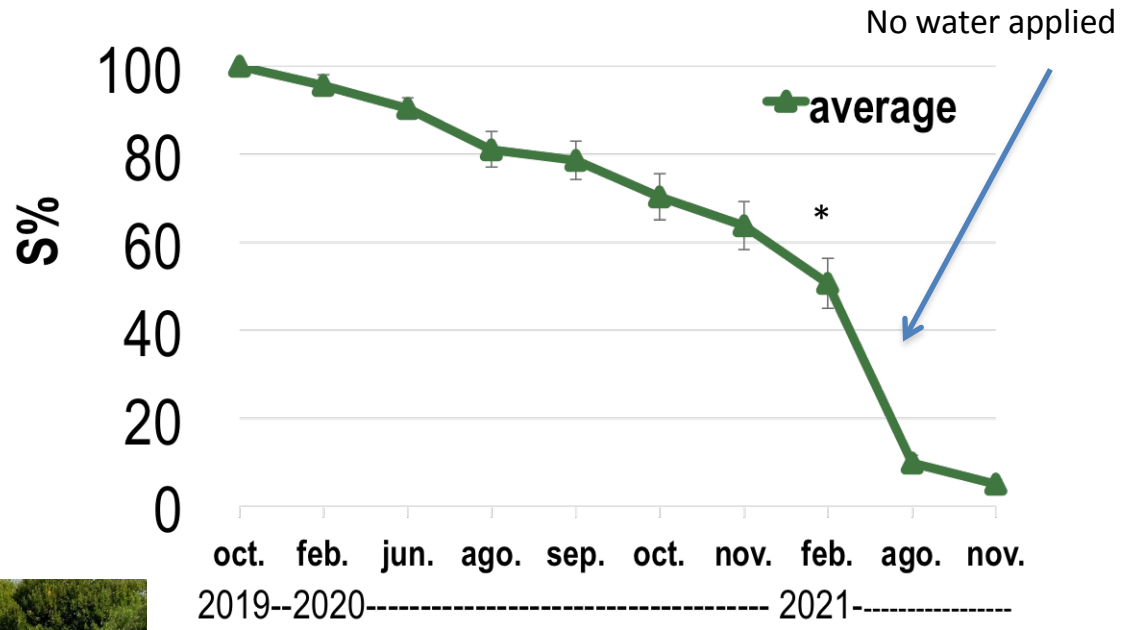
pH 6.7 to 7.4

COVARIABLE

SPATIAL variability



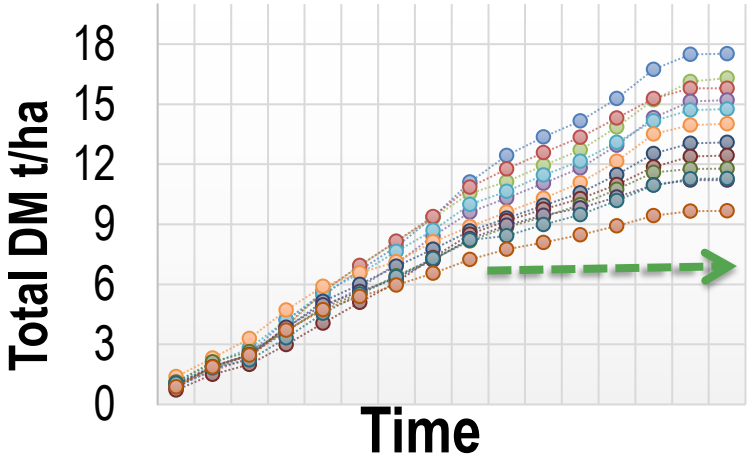
Relative survival of plants



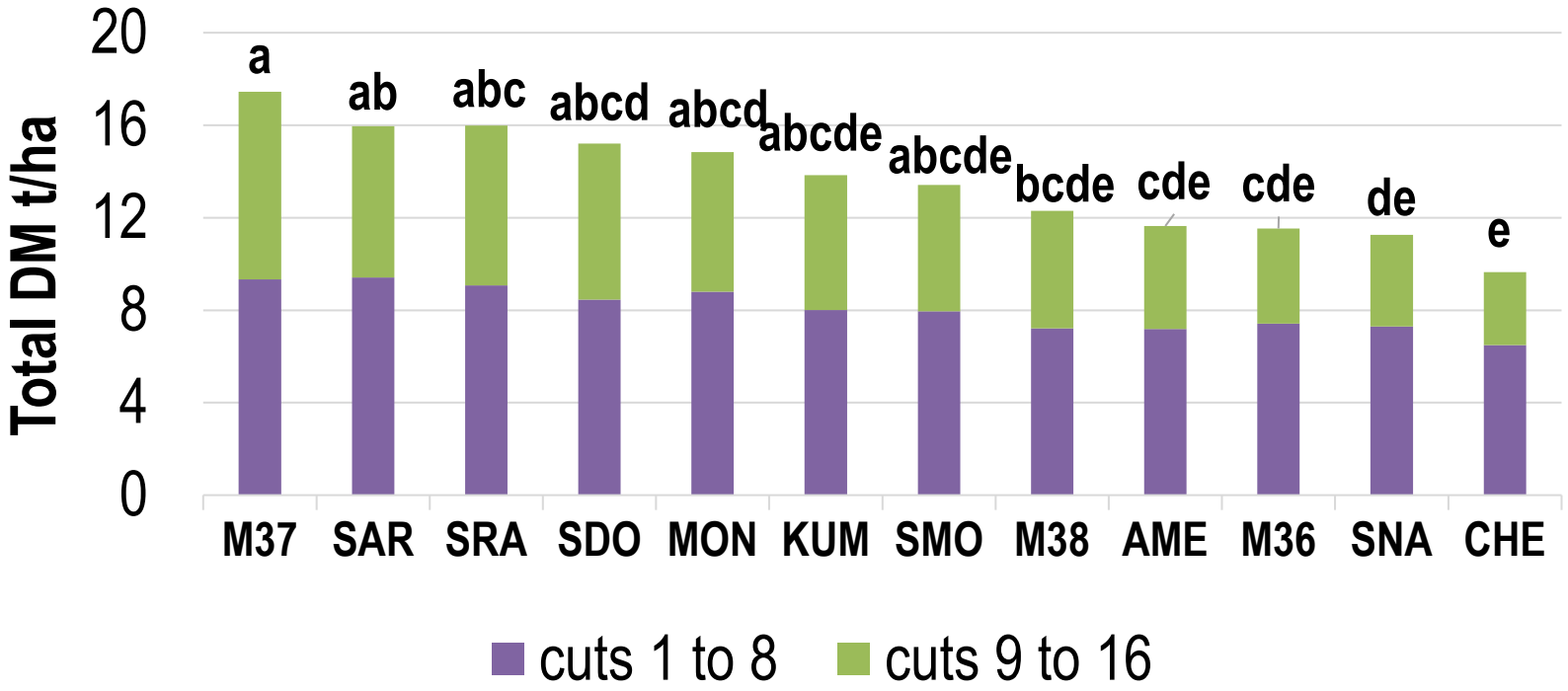
*Cut 13; *P*=0.06

Noticeable loss of plants on the right side of the trial -column 3- (date: april 2021)

Biomass production



first 8 cuts (*P*>0.05): ~9.5 to 6.5 t/ha (pp + irrigation)
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

Our results suggest that when **soil 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.

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 increases the knowledge about both the decrease and variability of alfalfa production under saline conditions.

Many thanks