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The Study of Quinoa Salinity Tolerance in the Field Conditions

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UAE geography

- situated in south eastern corner of the Arabian Peninsula
- a relatively small country with an area of 83, 600 square km
- most of the country is desert which is part of a vast sea of sand called Rub' al Khali or Empty Quarter

Agricultural problems in the UAE

- **Limited cultivated land**

- Most of the country is comprised of desert
- Small area for agriculture farming is available.

Fewer water resources

- Annual rain is less than 120mm (4.7 inch) in most of the areas
- Most of the ground water is brackish, which is not suitable for majority of crops

Challenges

- To find crops which can be grown in such harsh environments with limited amount of fresh water
- Apart from other crops, QUINOA was tried in the United Arab Emirates to see its potential as food and feed
- Evaluation of the performance of selected genotypes of quinoa for their productivity on different qualities of irrigation water.

Experimental site

- The experiment was conducted at the International Center for Biosaline Agriculture (ICBA), Dubai, United Arab Emirates
- 25°05.794 N
- 055°23.386 E

Soil type

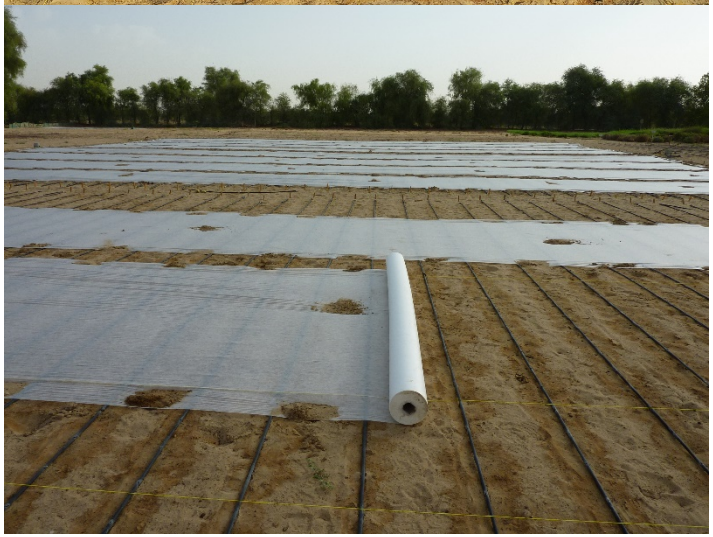
- The soils at ICBA experimental fields are sandy in texture, that is, fine sand (sand 98%, silt 1%, and clay 1%)
- Calcareous (50–60% CaCO3 equivalents)
- Moderately alkaline (pH 8.22).
- Saturation percentage of the soil is 26 and has very high drainage capacity
- Electrical conductivity of its saturated extract (ECe) is 1.2 dS m^{-1} .

Accessions

S.N.	Accessions	S.N.	Accessions
1	ICBA-Q1	11	Salcedo Inia
2	ICBA-Q2	12	Blanca Junin
3	ICBA-Q3	13	Amarilla Marangani
4	ICBA-Q4	14	L 11
5	ICBA-Q5	15	L 119
6	NSL 86649	16	L 123
7	Ames 13749	17	L 142
8	Ames 13757	18	L 143
9	Ames 22155	19	Puno
10	Inia 415 Pasankalla	20	Titicaca

Planting

- Each set of accessions was sown in randomized complete block design (RCBD) in three replications
- Two water treatments (0 dS/m and 15 dS/m)
- Plot size was 2.5 x 2 m
- The seeds were sown manually by dibbling 3-4 seeds into the soil to a depth of 1-2 cm close to the dripper
- After sowing, field was covered with Acryl sheet



Irrigation

- A drip irrigation system was used
- with a spacing of 50 cm between the laterals
- 25 cm between the emitters has been installed in all of the experimental farms.
- water was applied for 15 min @ 4 L/h

Fertilizers

- Organic manure was applied before planting @ 40 tons/ha

- Urea (46%) @ 30 kg/ha

- NPK @ 30 kg/ha

Study

The **growth performance** and **yield potential** of the 20 **quinoa** accessions was evaluated based on the study of different characteristics including

Plant height

Number of primary branches per plant

Number of inflorescences per plant

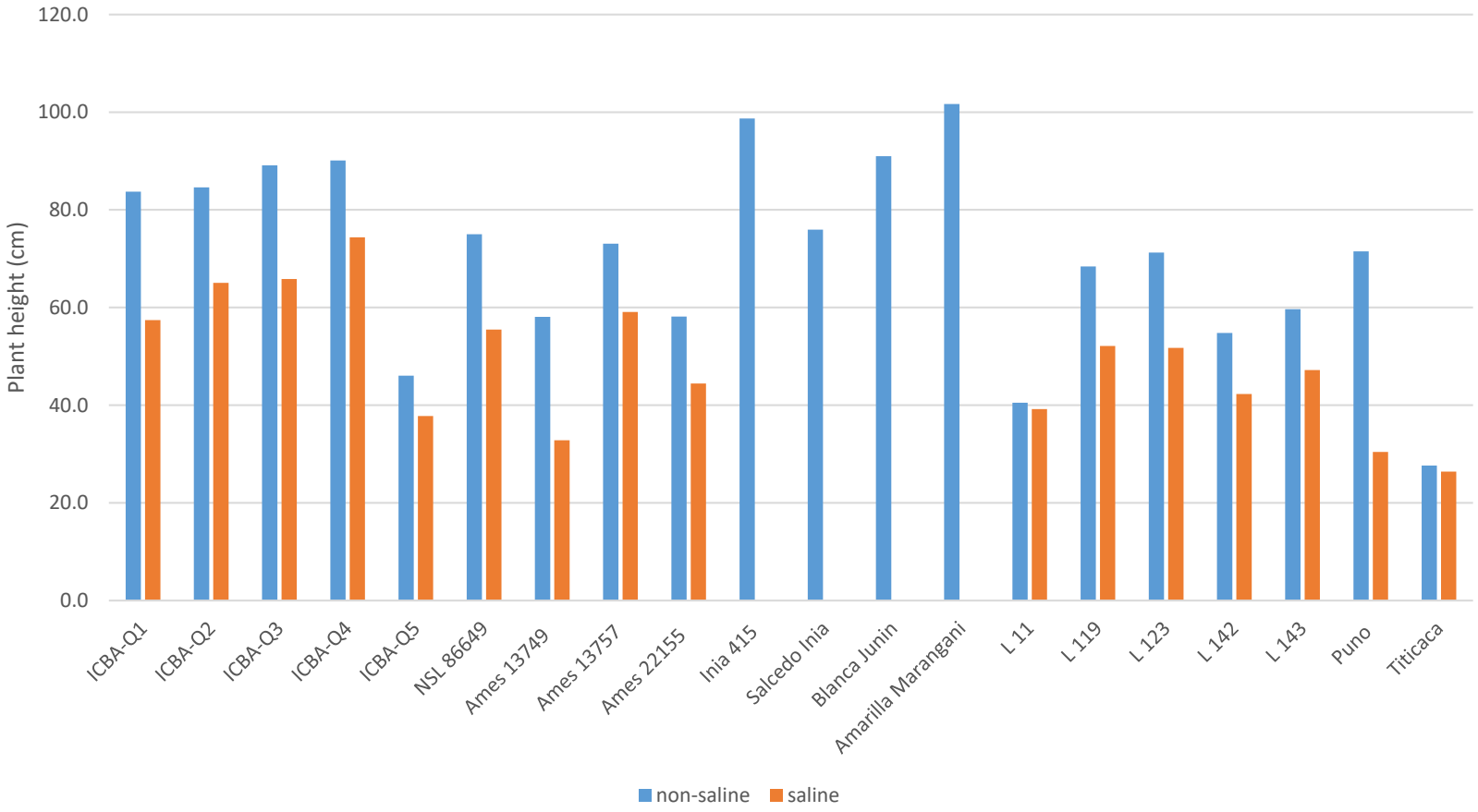
Inflorescence length

Yield

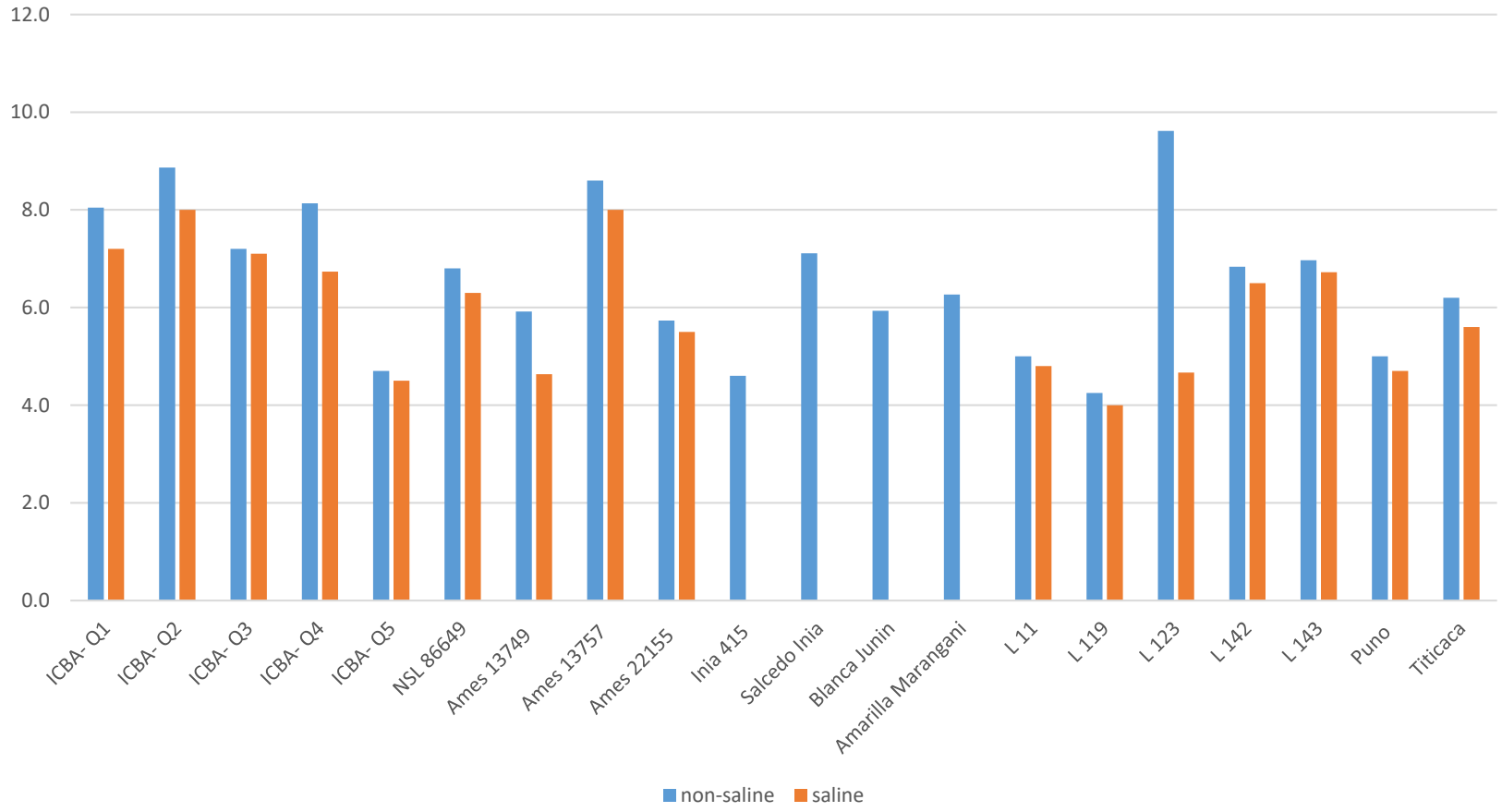
1,000 seed weight

Concentration of K and Na in seeds

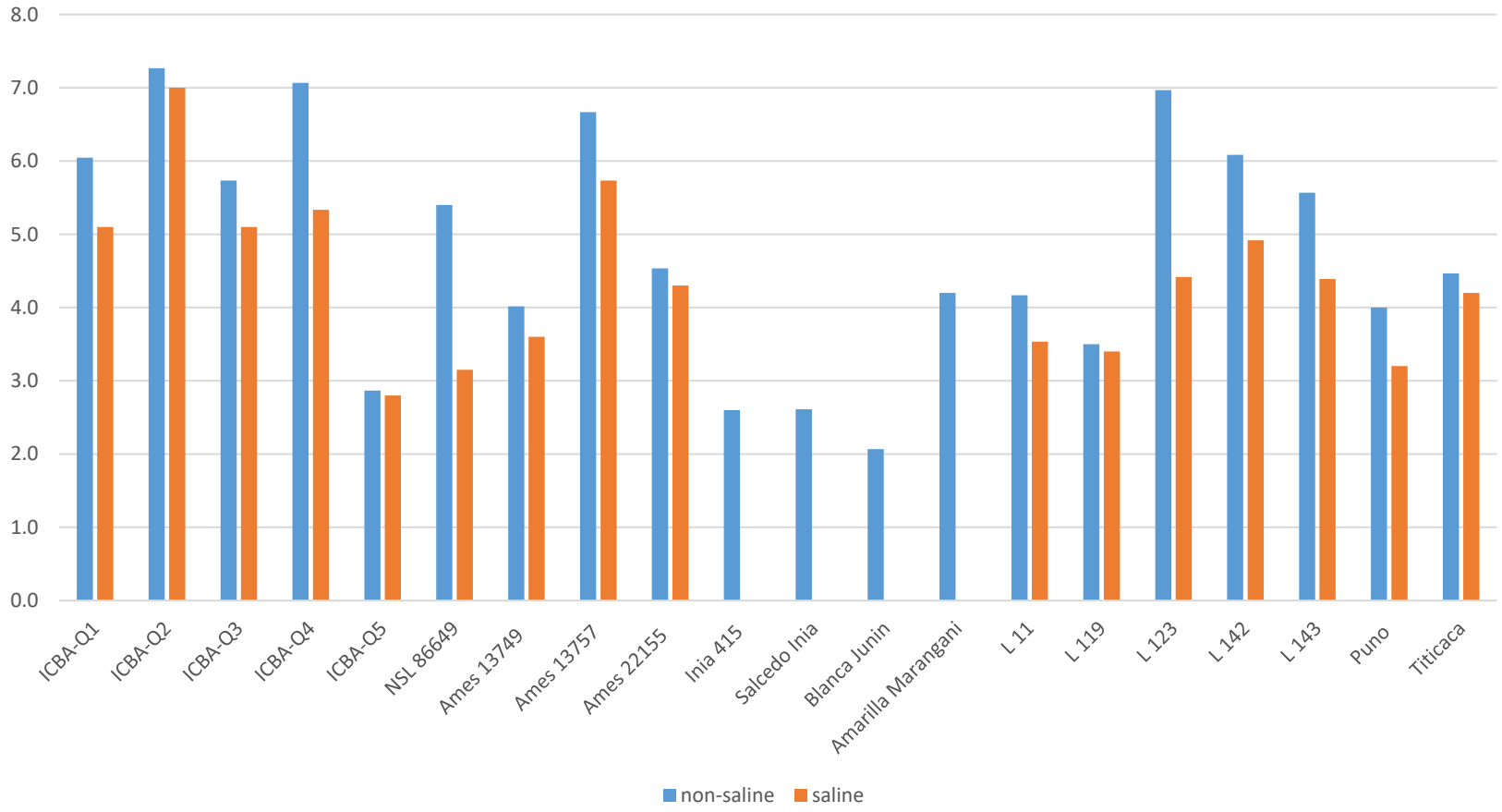
Plant height



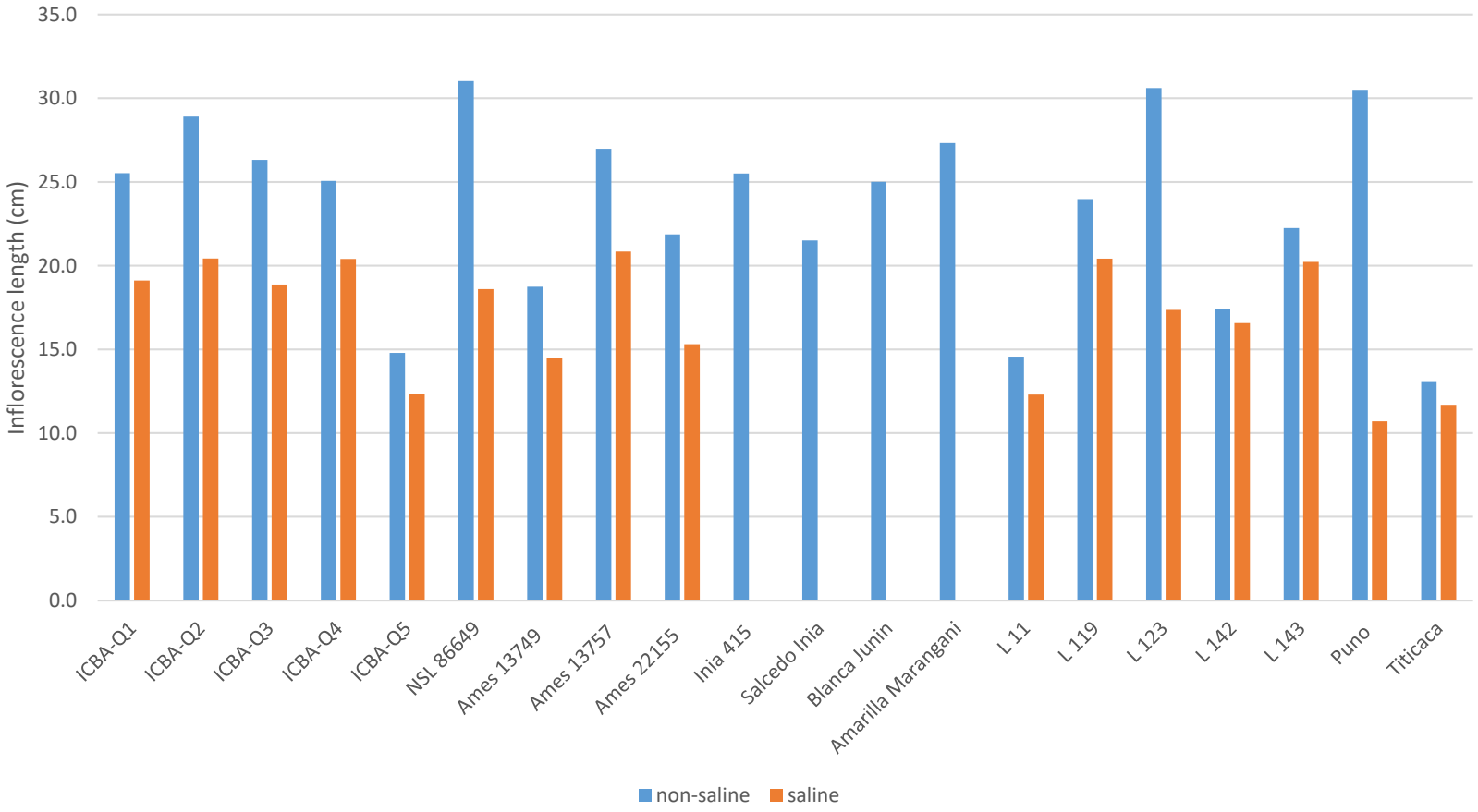
Number of branches per plant



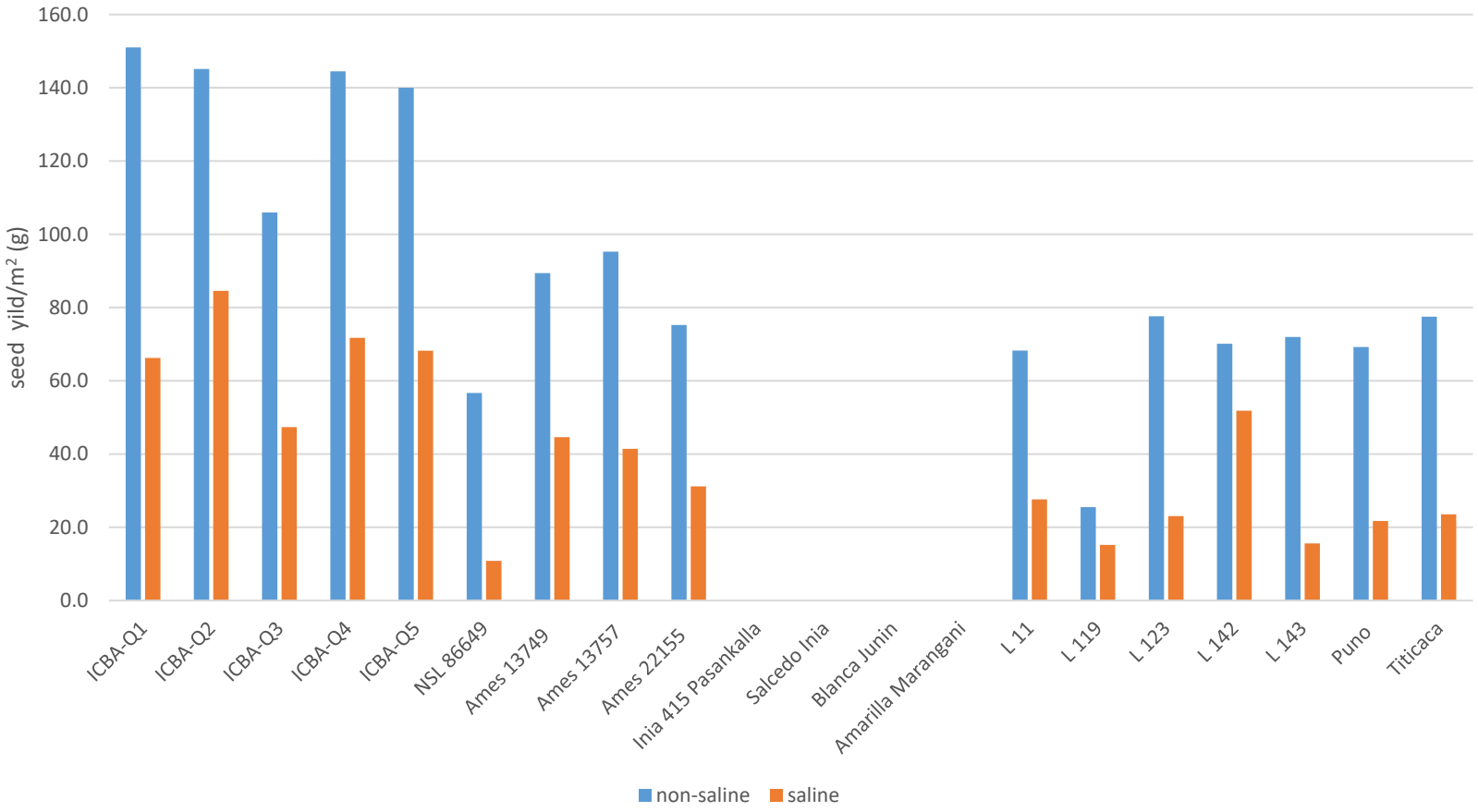
Number of inflorescence per plant



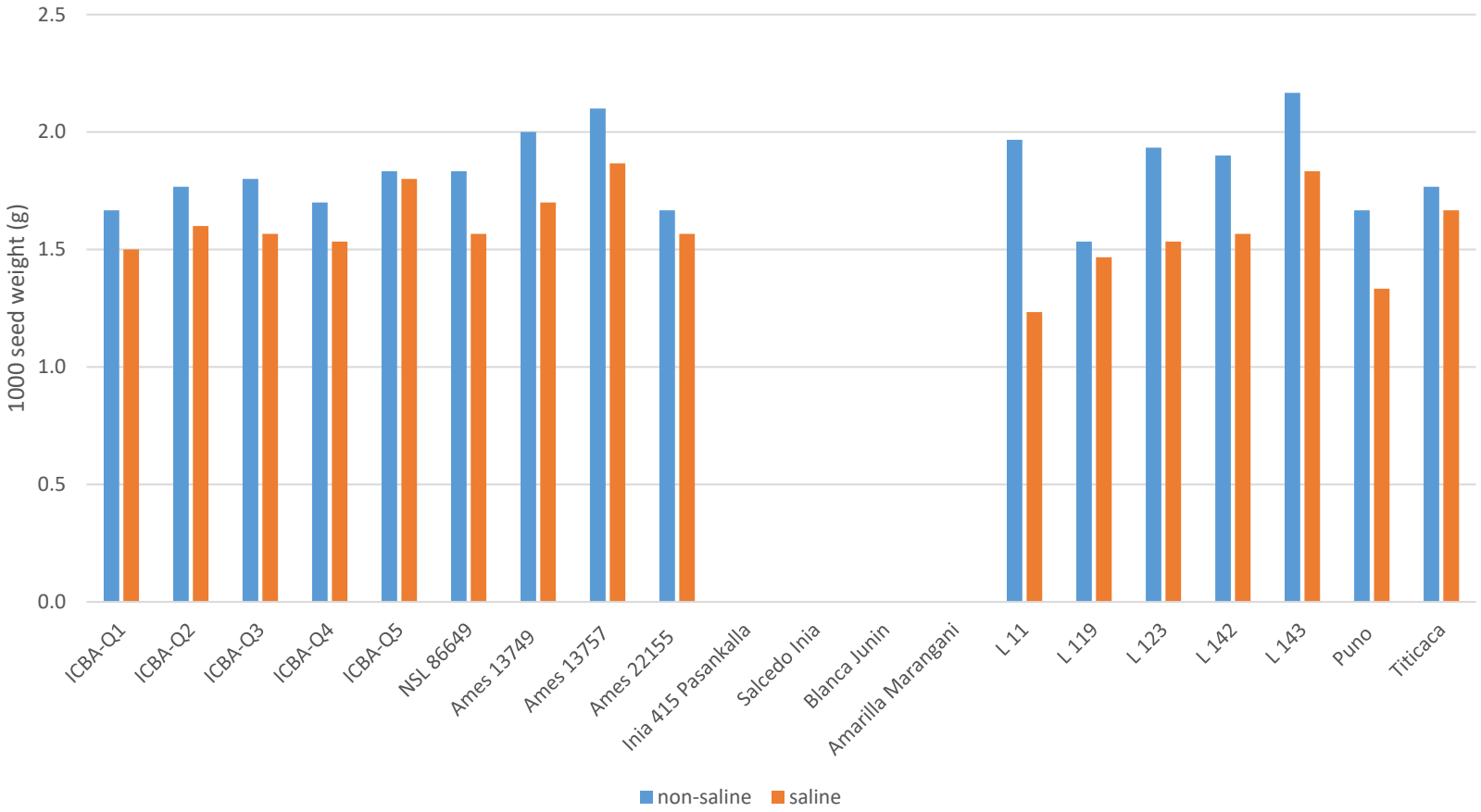
Inflorescence length



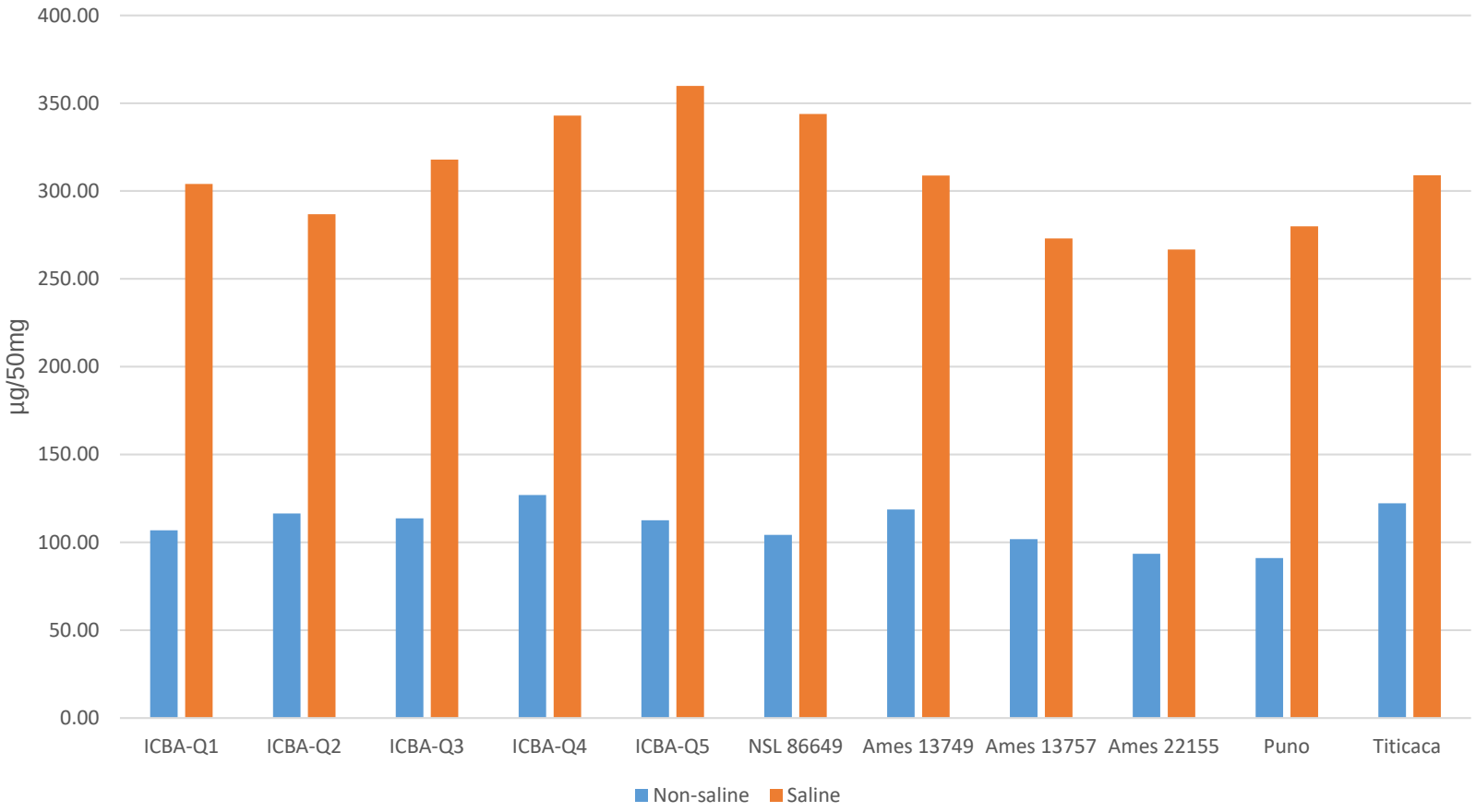
Seed yield per m^2



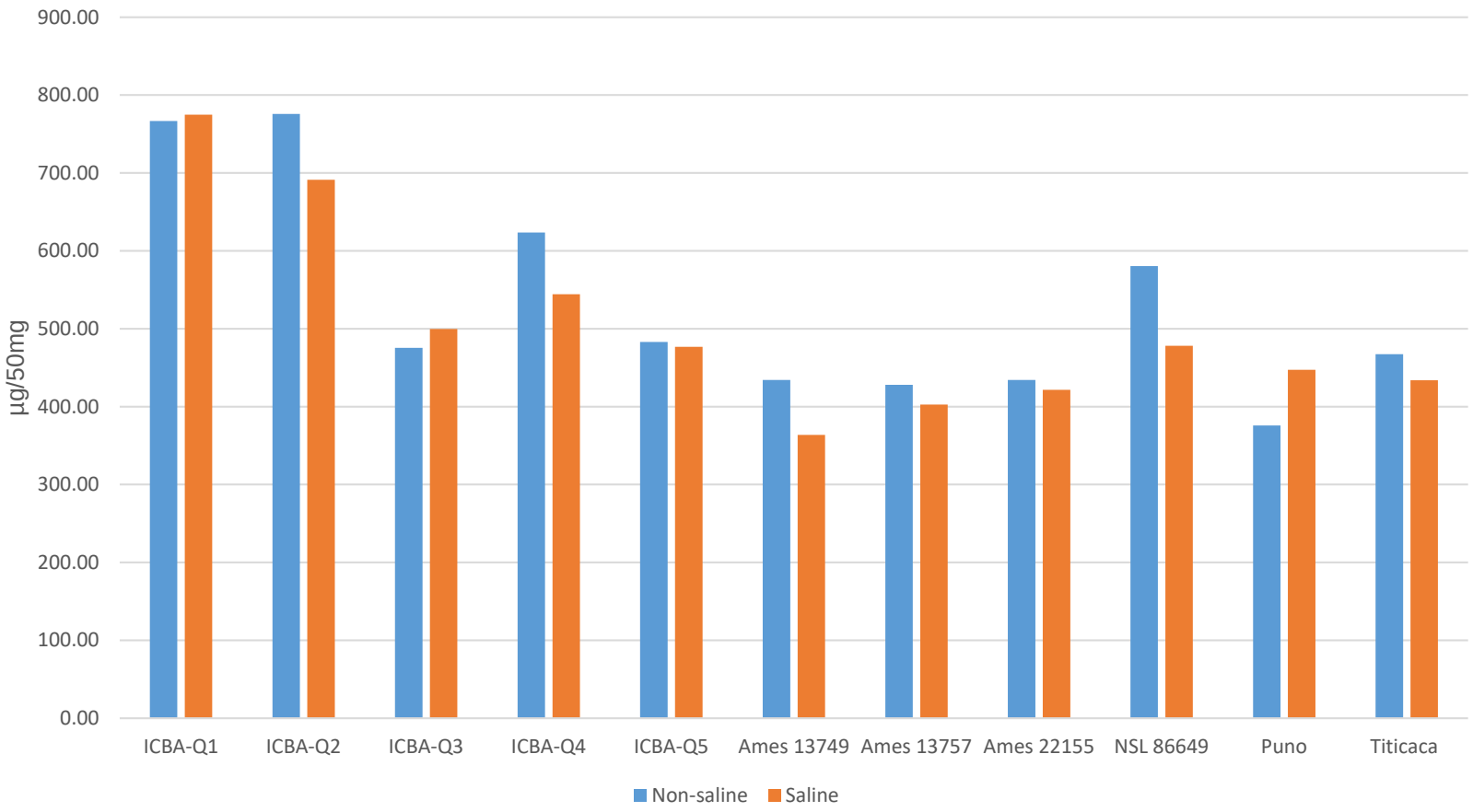
1,000 seed weights



Na concentration in seeds



K concentration in seeds



Conclusions

- Five of the quinoa lines (ICBA-Q1…Q5) developed at ICBA performed better than the other accessions.
- Their performance was superior both at low and high salinity
- These lines have the potential to be grown in the similar type of regions with saline water of up 15 dS/m
- Salinity treatment increases the Na concentration in the quinoa seeds up to 400%

Thanks