

International Quinoa Conference 2016:
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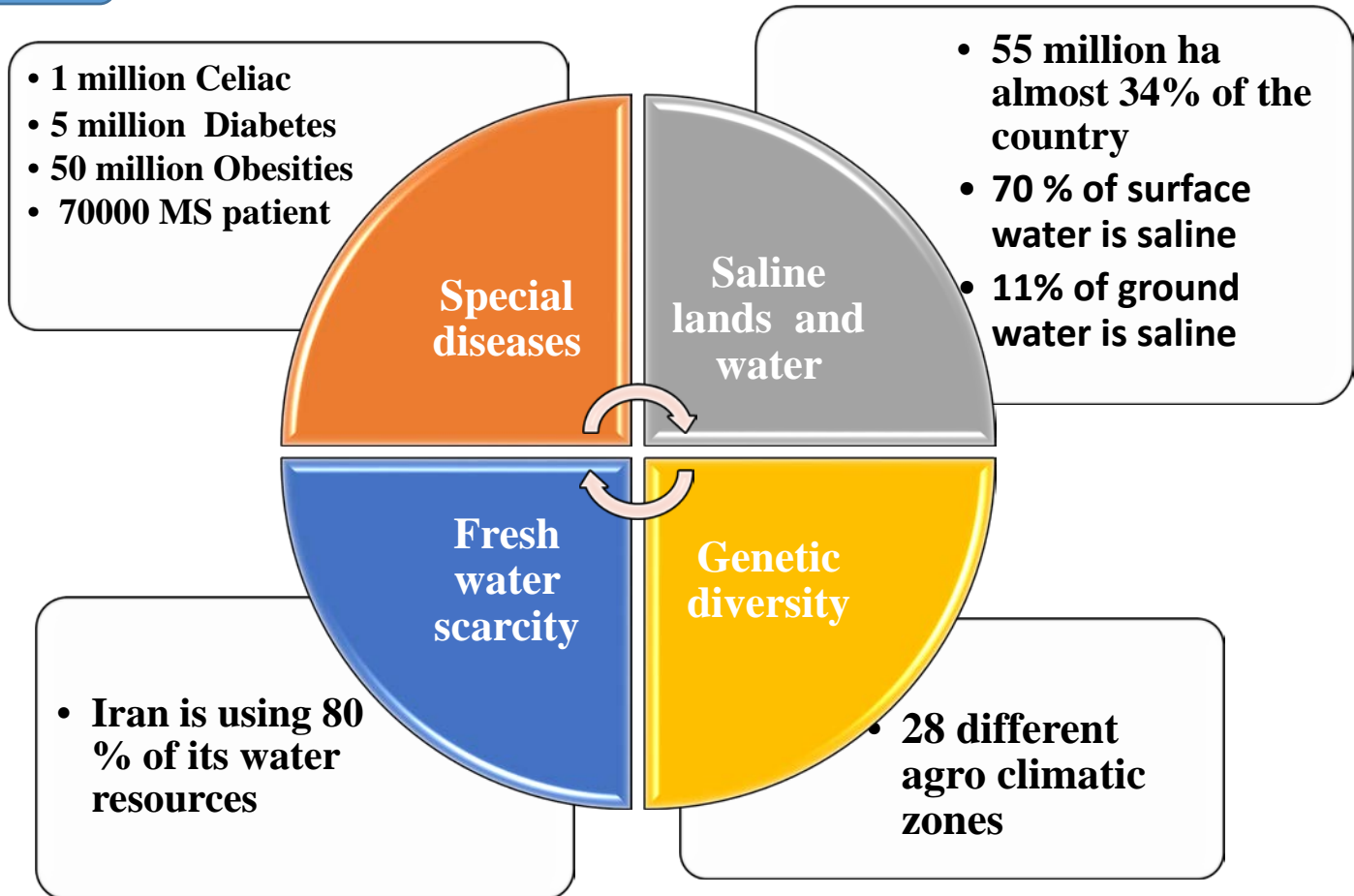
Effect of sowing date on phenological stage and seed yield of quinoa irrigated with saline water

By: Masoumeh Salehi
National Salinity Research Center
Presenter email: salehimasomeh@gmail.com



Problematic

Key challenges



This project explored the possibility of quinoa production with saline water in central plateau

Materials and Methods

Experimental site

Field experiment was carried out at National Salinity Research Farm located in Yazd in Central Plateau of Iran (54.2 E, 32.05 N).

Climate condition was arid with hot summer (44 °C max temperature) and cool winter (-6 °C min temperature) with 50 mm rainfall.

Soil texture of the field was sandy loam with 10 dS m⁻¹ electrical conductivity of saturated extract (EC_e).



Applied treatments

Emergence

- A pot experiment was conducted with 5 levels (0, 4, 8, 12 and 16 dS m⁻¹) of saline ground water and four replications
- Pot filled with sandy loam soil with 10 dS m⁻¹ ECe.

Sowing date

- Quinoa seeds (Titicaca cv.) were planted in eight sowing dates (22 Aug, 6 Sep, 26 Sep, 7 Oct, 24 Oct, 24 Feb, 7 March and 30 March)
- After emergence irrigated with 14-16 dS m⁻¹ saline ground water

Measurment

- Growing degree day of different growth stage was calculated by dent-like function
- In each sowing date phenological stages (emergence, floral initiation, flowering, colour change and harvesting) were recorded

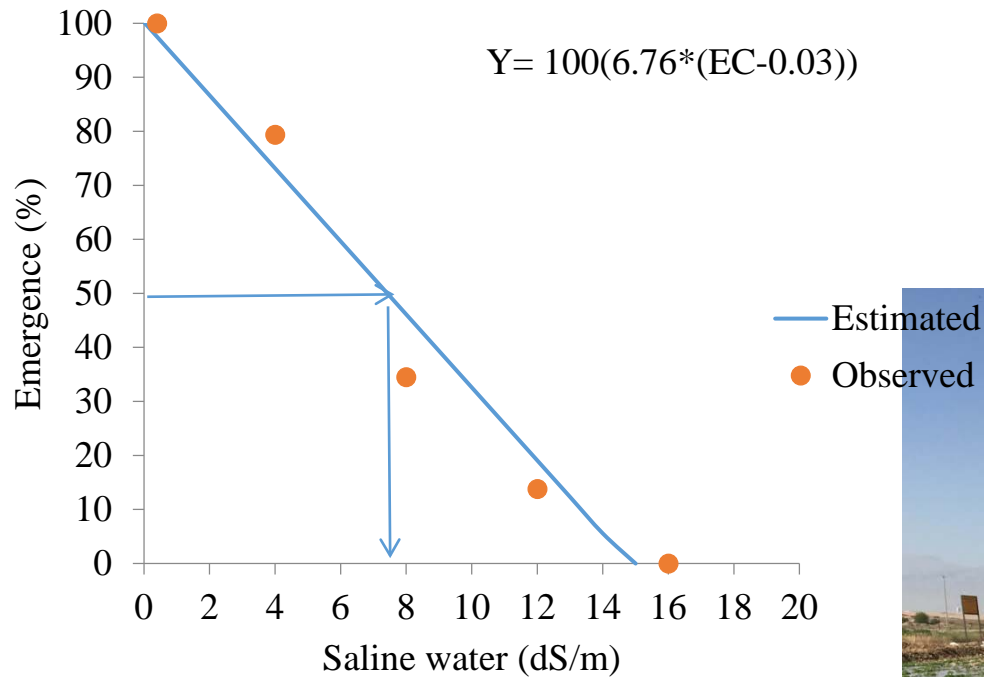


Spodoptera exigua



Results

Saline water effect on Quinoa seedling emergence



Effect of sowing date on phenological and agronomic traits of quinoa



Sowing date					
6 Sep	7 Oct	24 Oct	24 Feb	7 March	30 March
6	7	9	7	6	7
37	frost		41	41	39
77	damage		75	61	74
frost			112	105	94
damage					

-4.5 °C

No seed No

-

Plant height (cm)	91.53 a	-	-	-
Biomass (g plant ⁻¹)	41.55 b	-	-	-
Lateral stem number	18.13 ab	-	-	-
Seed protein content	18	-	-	-
Protein yield (Kg ha ⁻¹)	421.74	-	-	-



Different genotypes comparison
on 24th Oct sowing date

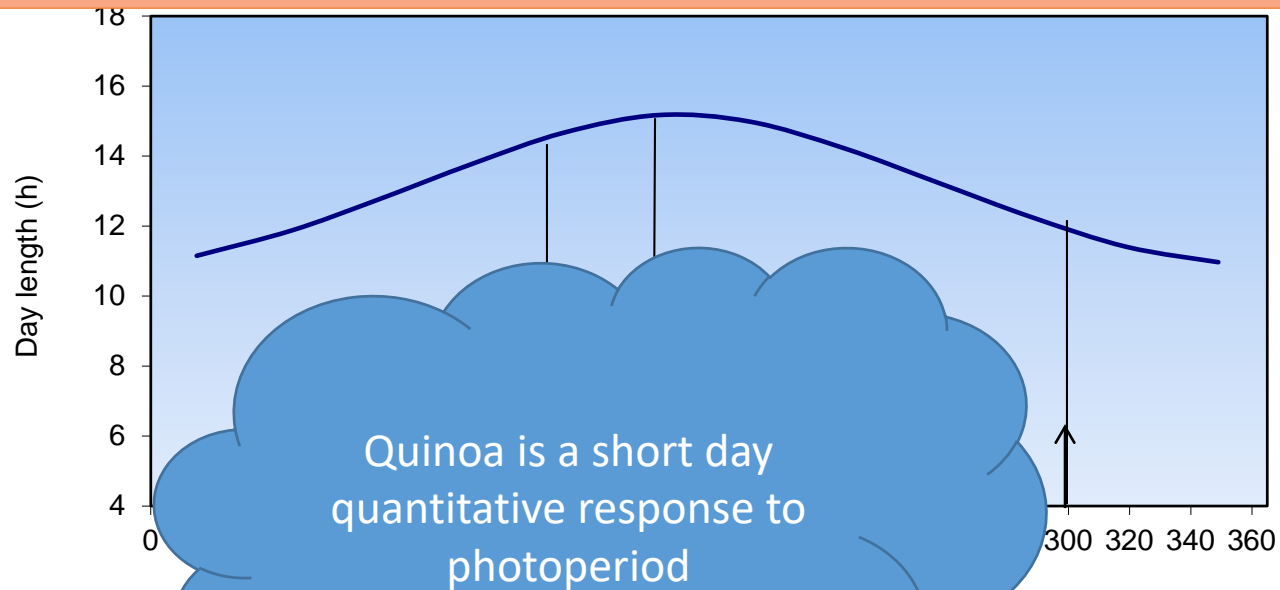
Late mature
genotype



Early mature
genotype

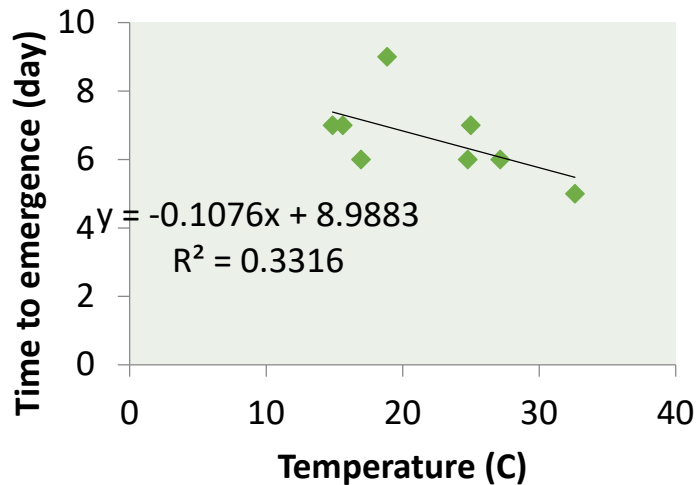
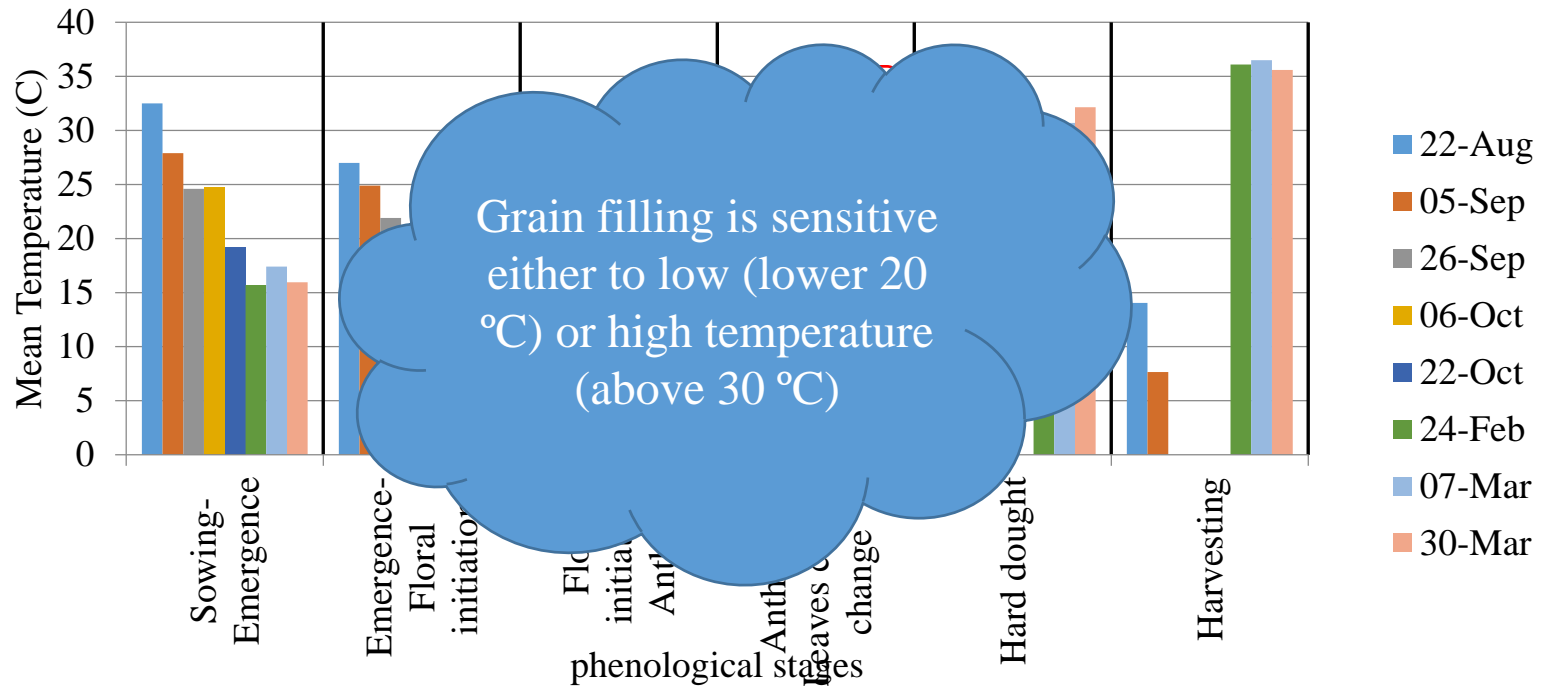


GDD and day length requirement at different growth stage and sowing date

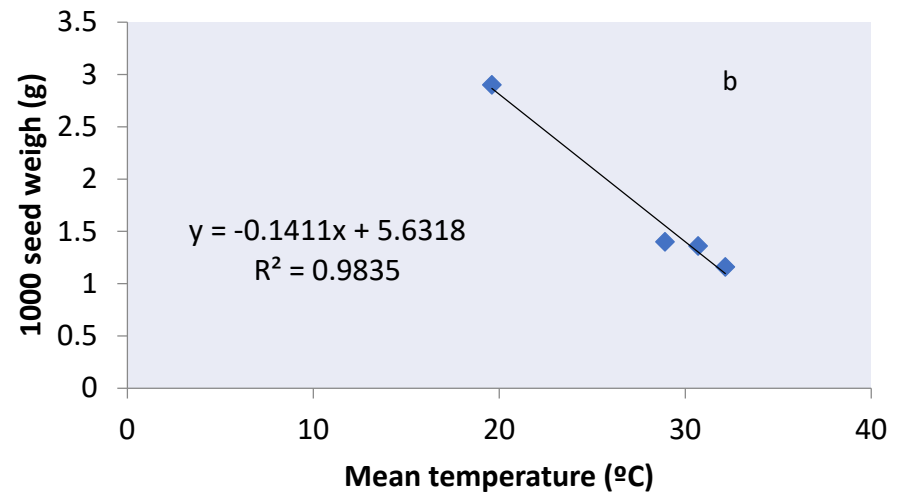
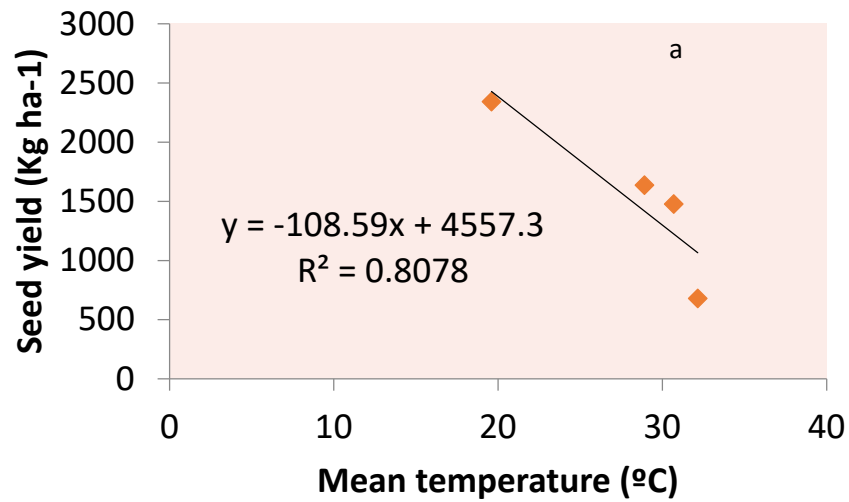


Sowing date	Emergence	Seedling	Flowering stage	Colour change	harvesting
22 Aug	135.0	639.00	523.00	201.91	394.40
6 Sep	147.8	656.93	348.11	147.03	369.51
26 Sep	128.3	-	-	-	-
7 Oct	150.4	-	-	-	-
24 Oct	142.7	-	-	-	-
24 Feb	83.0	477.29	653.26	893.59	513.80
7 March	83.6	526.49	402.78	1121.51	529.60
30 March	87.3	615.79	890.46	524.50	383.65

Mean temperature during each phenological stages of quinoa at different sowing date



Effect of temperature on time to emergence of quinoa in field experiment



Effect of mean temperature (°C) during seed filling period on seed yield (Kg ha⁻¹) (a) and 1000 seed weight (b)

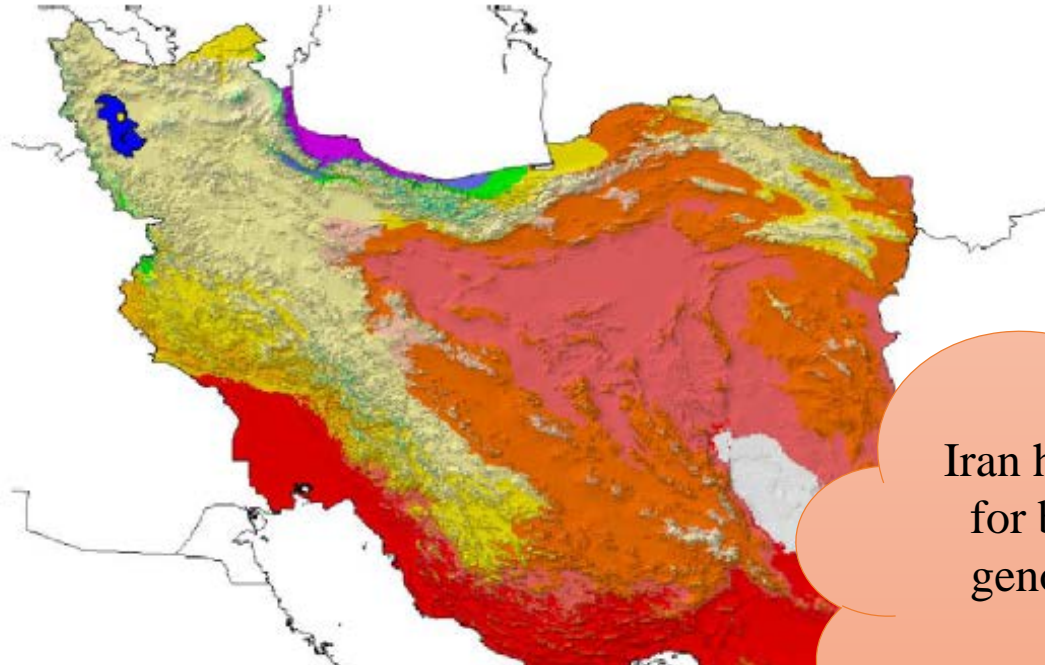
Conclusions

Quinoa is sensitive to saline water during emergence stage and should think on alternative method for establishment with saline water

Grain filling is sensitive either to low (lower 20 °C) or high temperature (upper 30 °C)



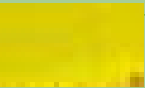

Evaluation of photoperiod sensitivity of quinoa showed that quinoa is quantitative short day for flowering and longer day in spring cropping extent growth stage duration

Lower water requirement with high yield obtained in Aug sowing date (with 560 mm saline water (14-17 dS m⁻¹) was applied in Yazd)



Agro climate zone

Iran has potential to be a site for breeding and selection genotype in different agro climate condition

Colour	Moisture regime	Aridity	Temperature regime winter	Range winter	Range Summer			Km ²	Quinoa cropping system
	Arid	0.03-0.2	Mild	10-20	Very warm	>30	16.7	286822	Rainfed or irrigated winter crop
	Arid	0.03-0.2	Cool	0-10	Very warm	>30	18.7	305814	Sowing in Aug
	Semiarid	0.2-0.5	Cool	0-10	Very warm	>30	1.6	26454	Rainfed winter crop or spring crop*
	Arid	0.03-0.2	Cool	0-10	warm	20-30	18.7	305814	Spring crop or Aug. sowing

On going work (2017-2018)

new region

ion

1. Demonstration farm in Central Plateau
2. Possibility of transplanting quinoa in saline lands and water
3. Selection of the best genotypes for rainfed area up to -10 °C during winter.
4. Fertilizer requirement of quinoa under saline area of Central Plateau.
5. Selection of the best herbicide
6. Mechanization of quinoa production
7. Winnowing and processing

strategies of
government

Seed production field for demonstration farm





Support requests

- 1. Starting breeding program**
- 2. New germplasms with freezing tolerance** for rainfed area
- 3. Early mature and heat tolerance genotypes** for saline area as spring and summer cropping.
- 4. Data on quinoa phenology and weather:** modeling and prediction of phenological stages and yield and selection the best Agro climate zone.

Thanks

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