Effect of salinity on germination and seedling growth of pumpkin germplasm

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Introduction

Salinity is undoubtedly one of the most severe environmental factors, leading to considerable yield and economic penalties to a wide range of cultivated crop species. Given that pumpkin is relatively sensitive to increased salinity, this study aimed at determining the seed germination and seedling growth potential of selected pumpkin germplasm under salt stress conditions as a means to identify salt tolerant cultivars at early growth stages.

Material and Methods

The genetic material consisted of one commercial variety (Fytro FS 243) and six local landraces, whereas salt stress was imposed by different concentrations of NaCl (0, 100, 200 and 300 mM). Stress tolerance was evaluated on the basis of germination percentage, seed water absorbance (WU %), root and shoot length, seedling vigor index (SVI) and the number of seedlings with abnormal phenotype.

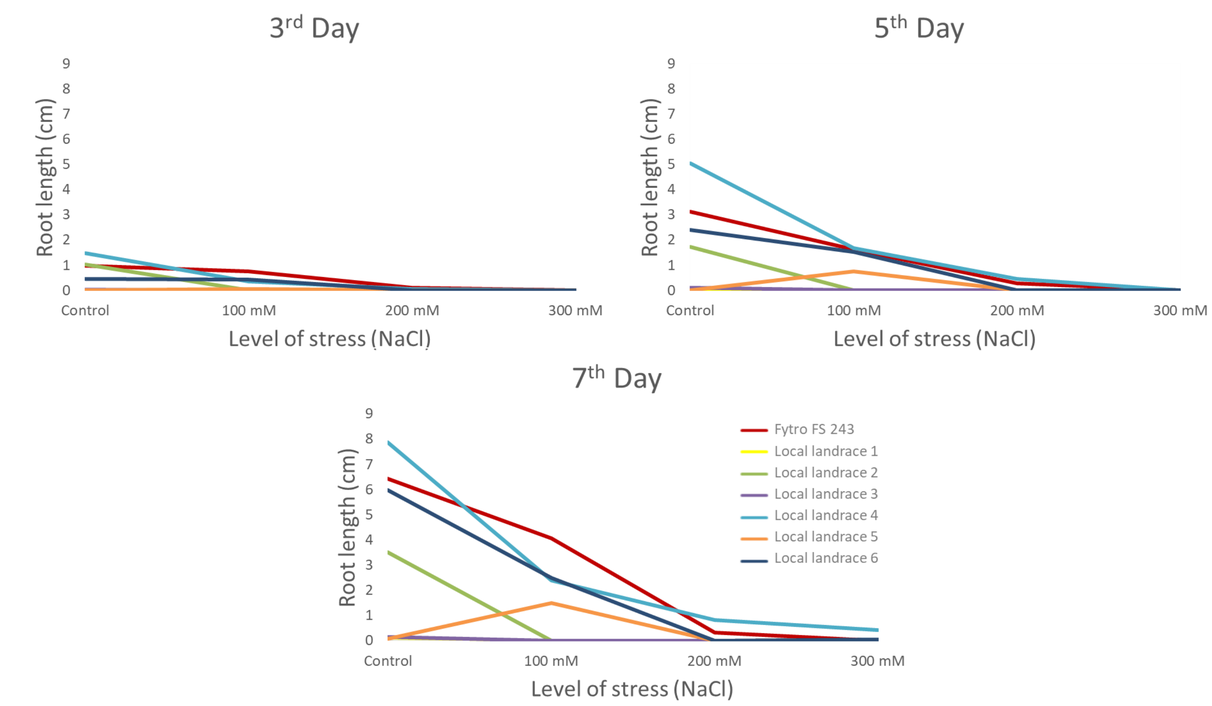
Results and Discussion

Salinity stress affected all traits related to germination and seedling growth, with its effects being analogous to the stress level applied. Nevertheless, the genotypes responded differently to the varying stress levels. Among varieties tested, FYTRO FS 243 and landrace 4 were the least affected varieties, in comparison with the controls, and showed an ability to grow even under conditions of high salinity. On the other hand, landraces 2 and 3 were incapable of germination at all stress levels, thus indicating their sensitivity even at mild salinity.

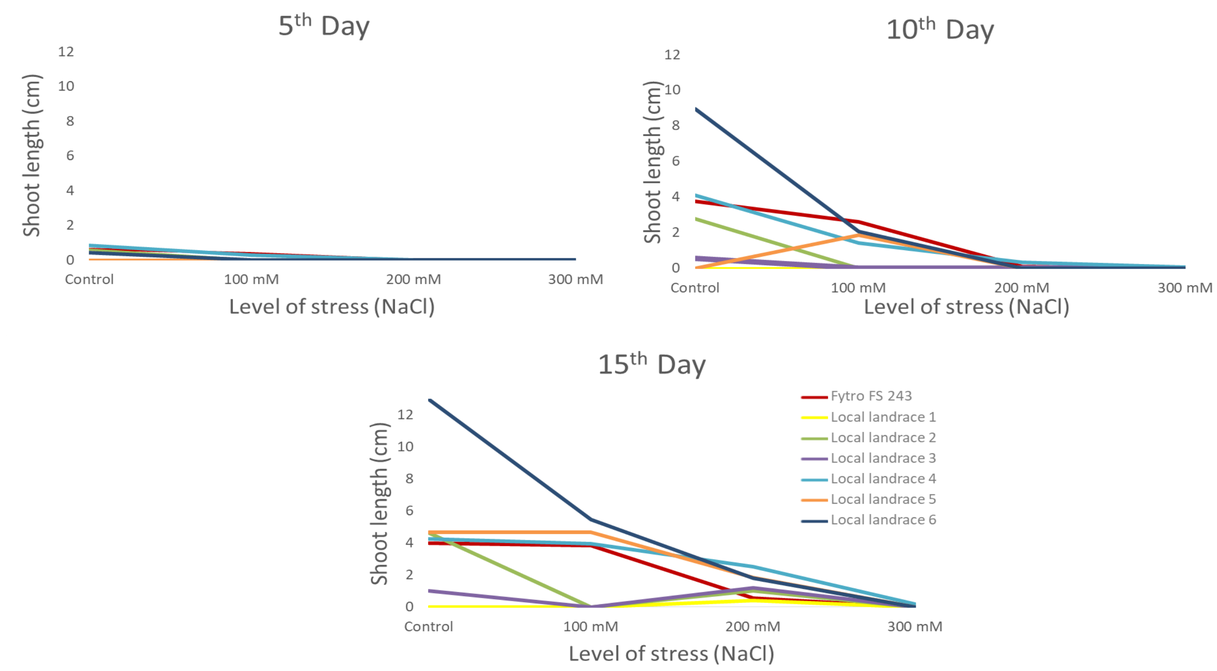
Germination percentage (GP %) of pumpkin genotypes (G) in relation to salinity stress (mM of NaCl) throughout the germination test.

Days	Genotypes (G)	NaCl (mM) (C)				
		0	100	200	300	
1st						Mean (G)
	FYTRO FS 243	12,50b	17,50a	-	-	**7,50ab**
	Local landrace 1	0,00c	0,00b	-	-	**0,00c**
	Local landrace 2	35,00a	0,00b	-	-	**8,75a**
	Local landrace 3	2,50c	0,00b	-	-	**0,625bc**
	Local landrace 4	35,00a	0,00b	-	-	**8,75a**
	Local landrace 5	0,00c	0,00b	-	-	**0,00c**
	Local landrace 6	5,00bc	0,00b	-	-	**1,25bc**
	Mean (C)	**12,85a**	**2,50b**	**-**	-	
3rd						Mean (G)
	FYTRO FS 243	62,50a	80,00a	7,50a	-	**37,50a**
	Local landrace 1	0,00c	0,00c	0,00b	-	**0,00d**
	Local landrace 2	77,50a	0,00c	0,00b	-	**19,375bc**
	Local landrace 3	10,00bc	0,00c	0,00b	-	**2,50cd**
	Local landrace 4	80,00a	47,50b	7,50a	-	**33,75ab**
	Local landrace 5	0,00c	2,50c	0,00b	-	**0,625d**
	Local landrace 6	22,50b	10,00c	0,00b	-	**8,125cd**
	Mean (C)	**36,07a**	**20,00b**	**2,14c**	-	
5th						Mean (G)
	FYTRO FS 243	82,50a	85,00a	10,00ab	-	**44,375a**
	Local landrace 1	2,50c	0,00b	0,00b	-	**0,625c**
	Local landrace 2	82,50a	0,00b	0,00b	-	**20,625b**
	Local landrace 3	12,50bc	0,00b	0,00b	-	**3,125bc**
	Local landrace 4	82,50a	75,00a	17,50a	-	**43,75a**
	Local landrace 5	0,00c	5,00b	0,00b	-	**1,25c**
	Local landrace 6	25,00b	12,50b	0,00b	-	**9,375bc**
	Mean (C)	**41,07a**	**25,35b**	**3,92c**	-	
7th						Mean (G)
	FYTRO FS 243	87,50a	90,00a	10,00b	0,00b	**46,875a**
	Local landrace 1	2,50c	2,50b	0,00b	0,00b	**1,25c**
	Local landrace 2	82,50a	0,00b	0,00b	0,00b	**20,625b**
	Local landrace 3	15,00bc	0,00b	0,00b	0,00b	**3,75bc**
	Local landrace 4	85,00a	80,00a	30,00a	15,00a	**52,50a**
	Local landrace 5	5,00bc	12,50b	0,00b	2,50b	**5,00bc**
	Local landrace 6	25,00b	15,00b	2,50b	2,50b	**11,25bc**
	Mean (C)	**43,21a**	**28,57a**	**6,07b**	**2,85b**	

Values followed by the same letter, within each factor, are not significantly different according to LSD (P ≤ 0.05).



Root length at day 3, 5 and 7 in relation to genotype (G) and salinity stress level (mM of NaCl, C).



Shoot length at day 5, 10 and 15 in relation to genotype (G) and salinity stress level (mM of NaCl, C).

Conclusion

Given the relatively small range of germplasm under study, overall findings point to the existence of considerable genetic variation related to salt tolerance at germination stage. Upon validation of their reliability, such evaluation criteria may serve for screening salt tolerant pumpkin genotypes to meet current and future challenges.

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Literature available upon request.