Al Hassan, M.; López Gresa, MP.; Boscaiu Neagu, MT.; Vicente Meana, Ó. (2016). Stress tolerance mechanisms in Juncus: responses to salinity and drought in three Juncus species adapted to different natural environments. FUNCTIONAL PLANT BIOLOGY. 43:949-960. doi:10.1071/FP16007

LEGENDS OF FIGURES

Fig. 1 Changes in **(a)** longest shoot length (cm) **(b)** fresh weight (g), and **(c)** water content (%), in the three studied *Juncus* species, after treatment for eight weeks with the indicated NaCl concentrations (means ± SD, n = 5). Different letters indicate significant differences according to Tukey test ($\alpha = 0.05$).

Fig. 2 Ion contents (μmol g^{-1} DW): **(a)** Na^+, **(b)** Cl^-, **(c)** K^+, and **(d)** K^+/Na^+ ratios, in the roots of the three *Juncus* species under study, after eight-week treatments with the indicated NaCl concentrations (means ± SD, n = 5). For each species, different letters above the bars indicate significant differences according to Tukey test ($\alpha = 0.05$).

Fig. 3 Ion contents (μmol g^{-1} DW): **(a)** Na^+, **(b)** Cl^-, **(c)** K^+, and **(d)** K^+/Na^+ ratios, in the shoots of the three *Juncus* species under study, after eight-week treatments with the indicated NaCl concentrations (means ± SD, n = 5). For each species, different letters above the bars indicate significant differences according to Tukey test ($\alpha = 0.05$).

Fig. 4 Osmolyte contents: **(a)** proline (Pro), **(b)** glycine betaine (GB), and **(c)** total soluble sugars (TSS), in the shoots of the three *Juncus* species under study, after eight-week treatments with the indicated NaCl concentrations (means ± SD, n = 5). For each species, different letters above the bars indicate significant differences according to Tukey test ($\alpha = 0.05$).

Fig. 5 Levels of soluble sugars (μmol g^{-1} DW): **(a)** glucose, **(b)** fructose, **(c)** sucrose, in the shoots of the three *Juncus* species under study, after eight-week treatments with the indicated NaCl concentrations (means ± SD, n = 5). For each species, different letters above the bars indicate significant differences according to Tukey test ($\alpha = 0.05$).

Fig. 6 Changes in **(a)** longest shoot length (cm) **(b)** fresh weight (g), and **(c)** water content (%), in the three studied *Juncus* species, after eight weeks of water stress (means ± SD, n = 5). For each species, asteriks indicate significant differences between treatments according to Tukey test ($\alpha = 0.05$).

Fig. 7 Osmolyte accumulation: **(a)** proline (Pro), **(b)** glycine betaine (GB), **(c)** total soluble sugars (TSS), **(d)** glucose, **(e)** fructose, and **(f)** sucrose in the shoots of the three *Juncus* species under study, after eight weeks of water stress (means ± SD, n = 5). Glucose, fructose and sucrose (panels d-f) were separated, identified and quantified by HPLC. For each species, asteriks indicate significant differences between treatments according to Tukey test ($\alpha = 0.05$).

Fig. S1 Ion contents (μmol g^{-1} DW): (**a**, **d**) Na^+, (**b**, **e**) Cl^-, (**c**, **f**) K^+, in the roots (**a-c**) and shoots (**d-f**) of the three *Juncus* species under study, after eight weeks of water stress (means ± SD, n = 5). For each species, asteriks indicate significant differences between treatments according to Tukey test ($\alpha = 0.05$).

Table 1. Ions and organic osmolytes levels in the shoots of the three *Juncus* species under study, after eight-week treatments with the indicated NaCl concentrations. Sodium (Na^+), chloride (Cl^-), potassium (K^+), proline (Pro), glycine betaine (GB), glucose (Glu), fructose (Fru) and sucrose (Suc) contents are expressed as mM concentrations, on a tissue water basis (means ± SD, n = 5). For each compound and plant species, different lowercase letters following the concentration values indicate significant differences according to Tukey test ($\alpha = 0.05$)

Species	**Treatment (mM NaCl)**	**Na^+**	**Cl^-**	**K^+**	**Pro**	**GB**	**Glu**	**Fru**	**Suc**
J. maritimus	0	11a	53a	139a	1a	3a	15a	10a	4a
	100	82b	76a	93a	8b	6b	15a	13b	10b
	200	212c	146b	129a	10c	7b	18b	22c	26c
	400	390d	316c	215b	70d	13c	37c	34d	145d
J. acutus	0	8a	44a	158a	1a	3a	9a	9a	1a
	100	155b	155b	127a	9b	7b	9a	13b	1a
	200	260c	217b	124a	20c	10c	10a	15b	13b
	400	558d	586c	296b	57d	19d	20b	29c	84c
J. articulatus	0	17a	37a	170a	0a	2a	7a	8a	1a
	100	250b	422b	294b	1b	3b	17b	28b	10b
	200	382c	688c	403c	1c	5c	52c	49c	18c
	400	984d	1324d	665d	2d	10d	80d	87d	86d

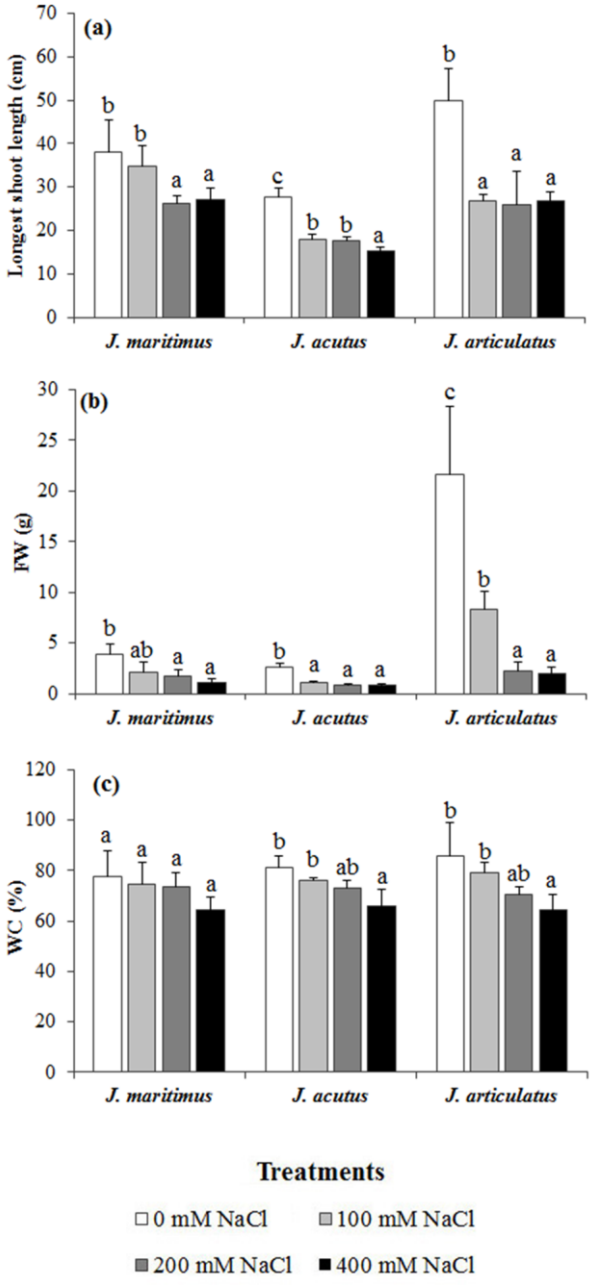
(a)
Longest shoot length (cm)
70
60
50
40
30
20
10
0
b b a a
c b b a
b a a a
J. maritimus
J. acutus
J. articulatus
(b)
FW (g)
30
25
20
15
10
5
0
b ab a a
b a a a
c b a a
J. maritimus
J. acutus
J. articulatus
(c)
WC (%)
120
100
80
60
40
20
0
a a a a
b b ab a
b b ab a
J. maritimus
J. acutus
J. articulatus
Treatments
0 mM NaCl
100 mM NaCl
200 mM NaCl
400 mM NaCl

Fig. 1

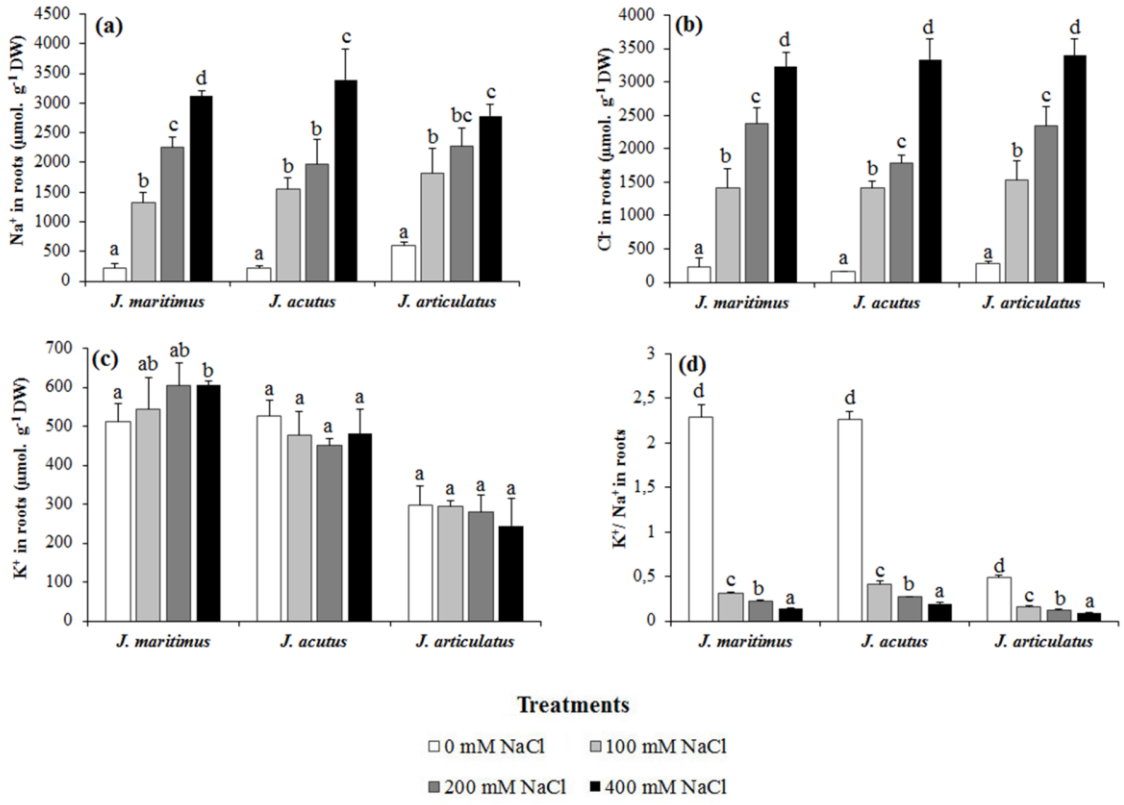
(a)
Na+ in roots (µmol. g-1 DW)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
a
b
c
d
a
b
b
c
a
b
bc
c
J. maritimus
J. acutus
J. articulatus
(b)
Cl- in roots (µmol. g-1 DW)
4000
3500
3000
2500
2000
1500
1000
500
0
a
b
c
d
a
b
c
d
a
b
c
d
J. maritimus
J. acutus
J. articulatus
(c)
K+ in roots (µmol. g-1 DW)
700
600
500
400
300
200
100
0
a
ab
ab
b
a
a
a
a
a
a
a
a
J. maritimus
J. acutus
J. articulatus
(d)
K+/ Na+ in roots
3
2,5
2
1,5
1
0,5
0
d
c
b
a
d
c
b
a
d
c
b
a
J. maritimus
J. acutus
J. articulatus
Treatments
0 mM NaCl
100 mM NaCl
200 mM NaCl
400 mM NaCl

Fig. 2

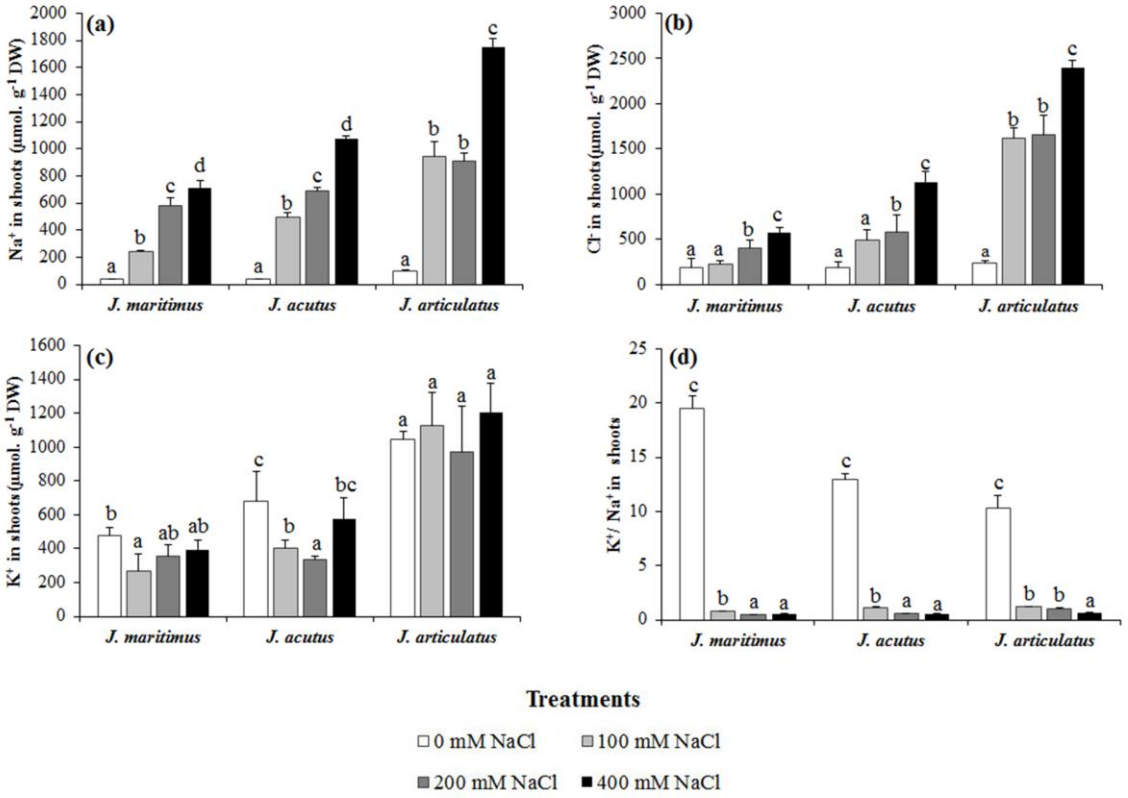
(a)
Na+ in shoots (µmol. g-1 DW)
(b)
Cl- in shoots(µmol. g-1 DW)
(c)
K+ in shoots(µmol. g-1 DW)
(d)
K+/ Na+ in shoots
J. maritimus
J. acutus
J. articulatus
Treatments
0 mM NaCl
100 mM NaCl
200 mM NaCl
400 mM NaCl

Fig. 3

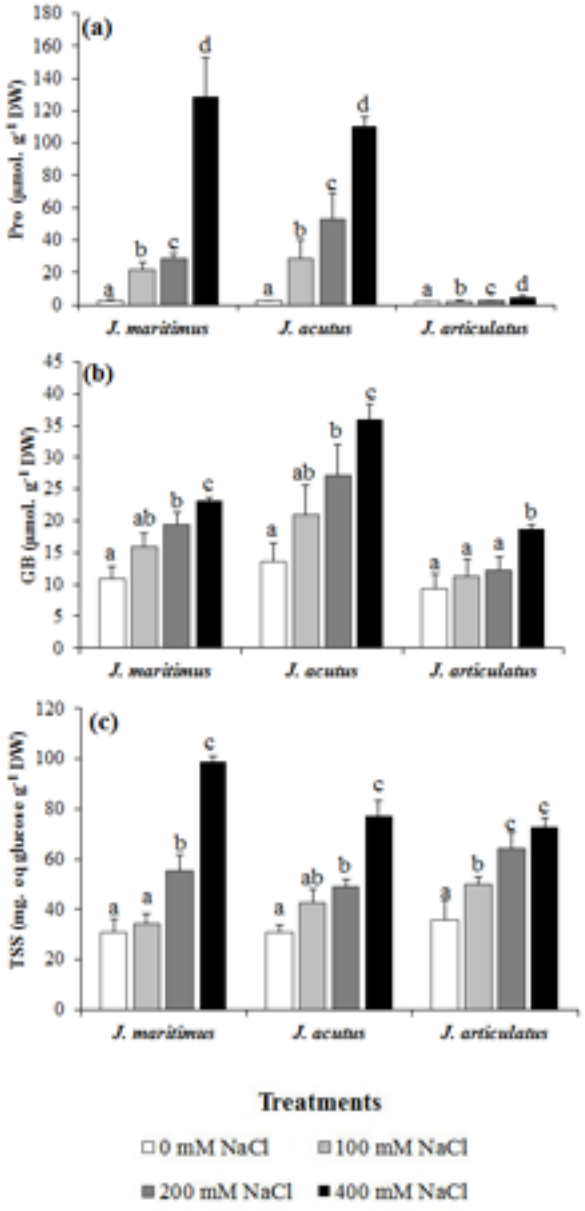
(a)
Pro (µmol. g⁻¹ DW)
J. maritimus
J. acutus
J. articulatus
(b)
GB (µmol. g⁻¹ DW)
(c)
TSS (mg. eq glucose g⁻¹ DW)
Treatments
0 mM NaCl
100 mM NaCl
200 mM NaCl
400 mM NaCl

Fig. 4

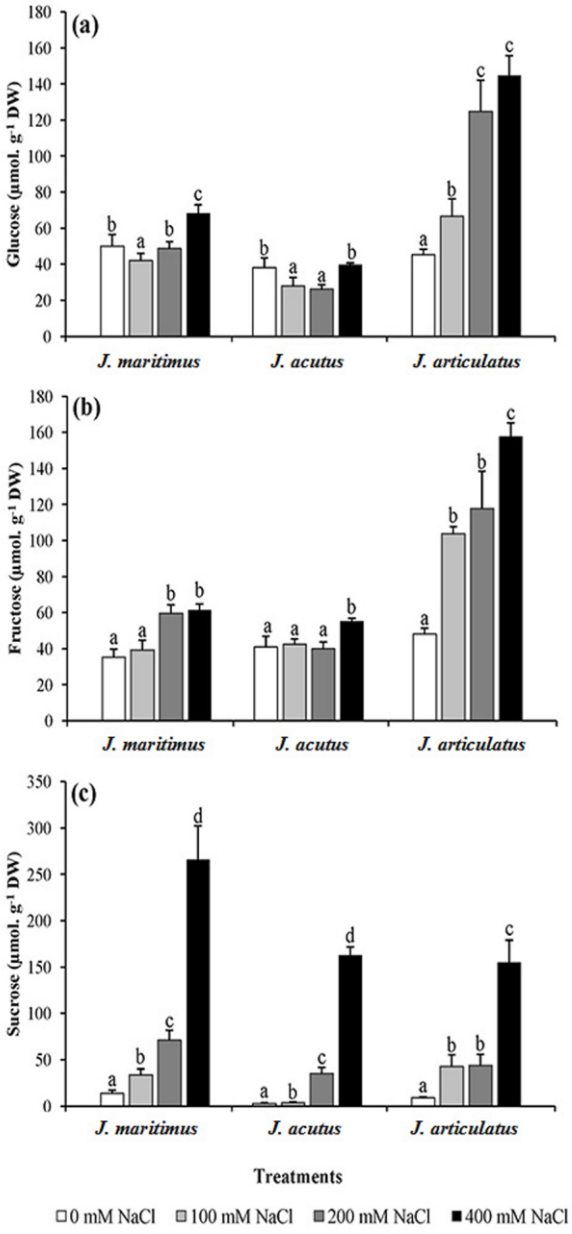
(a)
Glucose (µmol. g-1 DW)
(b)
Fructose (µmol. g-1 DW)
(c)
Sucrose (µmol. g-1 DW)
J. maritimus
J. acutus
J. articulatus
Treatments
0 mM NaCl
100 mM NaCl
200 mM NaCl
400 mM NaCl

Fig. 5

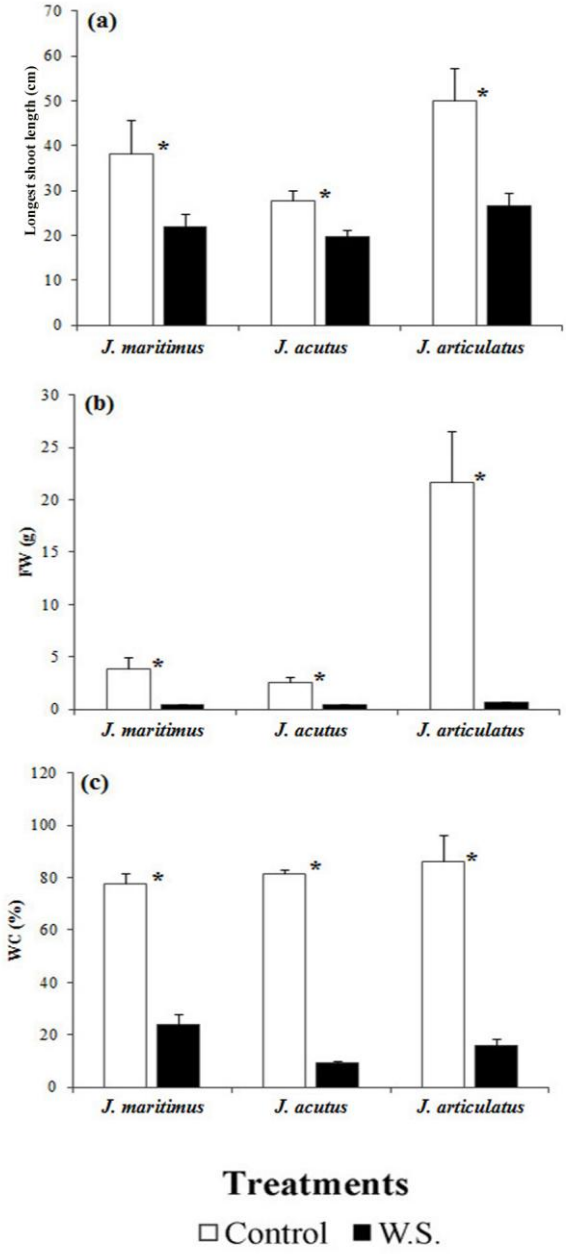
(a)
Longest shoot length (cm)
70
60
50
40
30
20
10
0
*
*
*
J. maritimus
J. acutus
J. articulatus
(b)
FW (g)
30
25
20
15
10
5
0
*
*
*
J. maritimus
J. acutus
J. articulatus
(c)
WC (%)
120
100
80
60
40
20
0
*
*
*
J. maritimus
J. acutus
J. articulatus
Treatments
Control
W.S.

Fig. 6

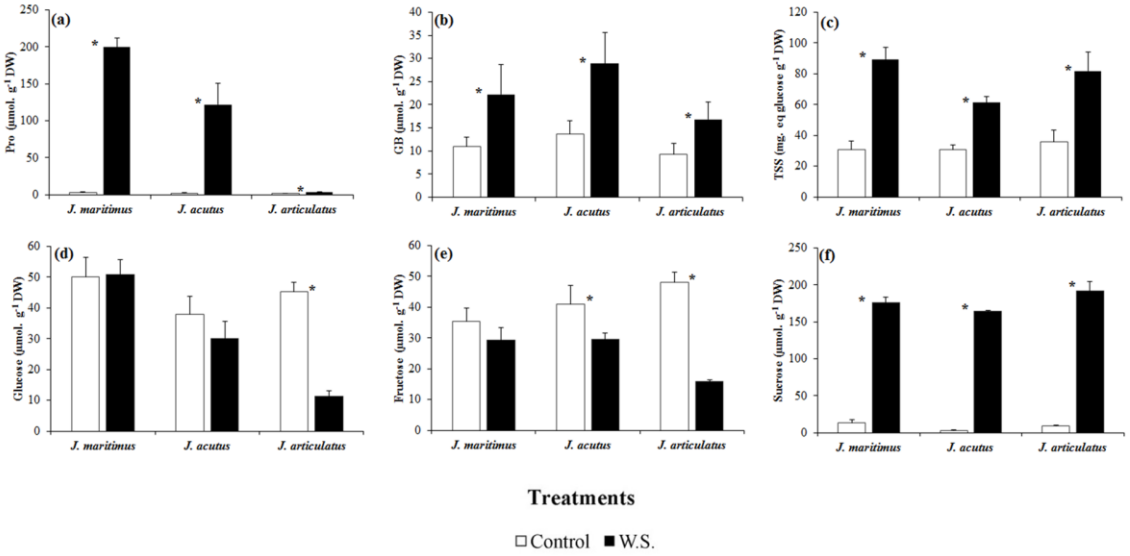
(a)
Pro (µmol. g-1 DW)
(b)
GB (µmol. g-1 DW)
(c)
TSS (mg. eq glucose g-1 DW)
(d)
Glucose (µmol. g-1 DW)
(e)
Fructose (µmol. g-1 DW)
(f)
Sucrose (µmol. g-1 DW)
J. maritimus
J. acutus
J. articulatus
Treatments
Control
W.S.

Fig. 7

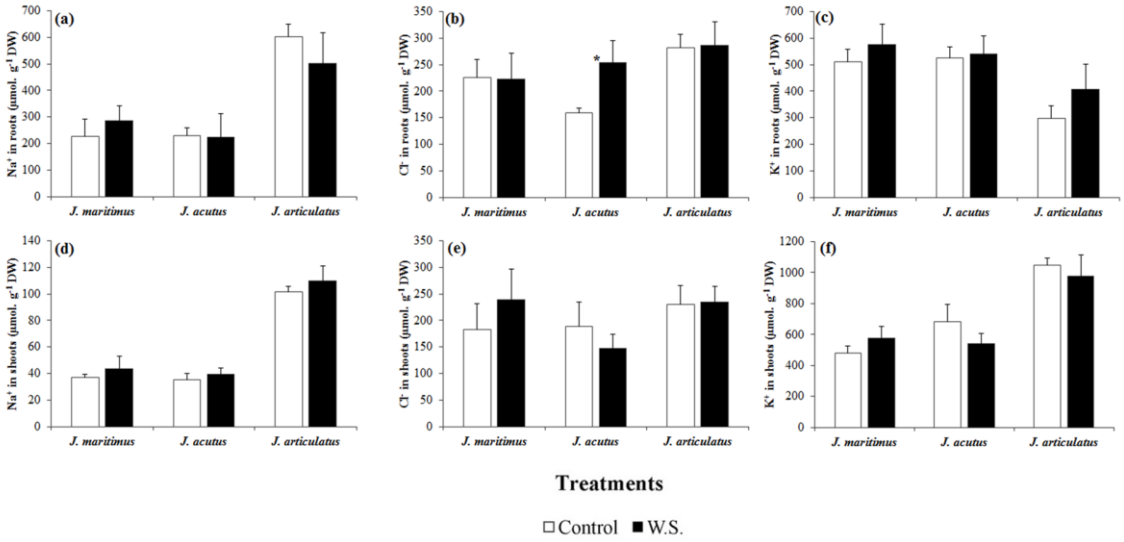
(a)
(b)
(c)
(d)
(e)
(f)
J. maritimus
J. acutus
J. articulatus
Treatments
Control
W.S.

Fig. S1