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The Effect of Salinity and Bacteria on Wheat Emergence

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Introduction

- Wheat is a grass widely cultivated for its seed, a cereal grain which is a worldwide staple food.

- Salinity is one of the most brutal environmental factors limiting the productivity of crop plants because most of the crop plants are sensitive to salinity caused by high concentrations of salts in the soil, and the area of land affected by it is increasing day by day

- Salinity acts to inhibit plant access to soil water by increasing the osmotic strength of the soil solution

- To solve this problem with salinity we use two type of bacteria: Pesudomouns Florscens, Bacillus Megaterium on two cultivars of wheat White hetiah ,Yellow hetiah
- Under three concentration of salt 0,4,and 8 ds/m

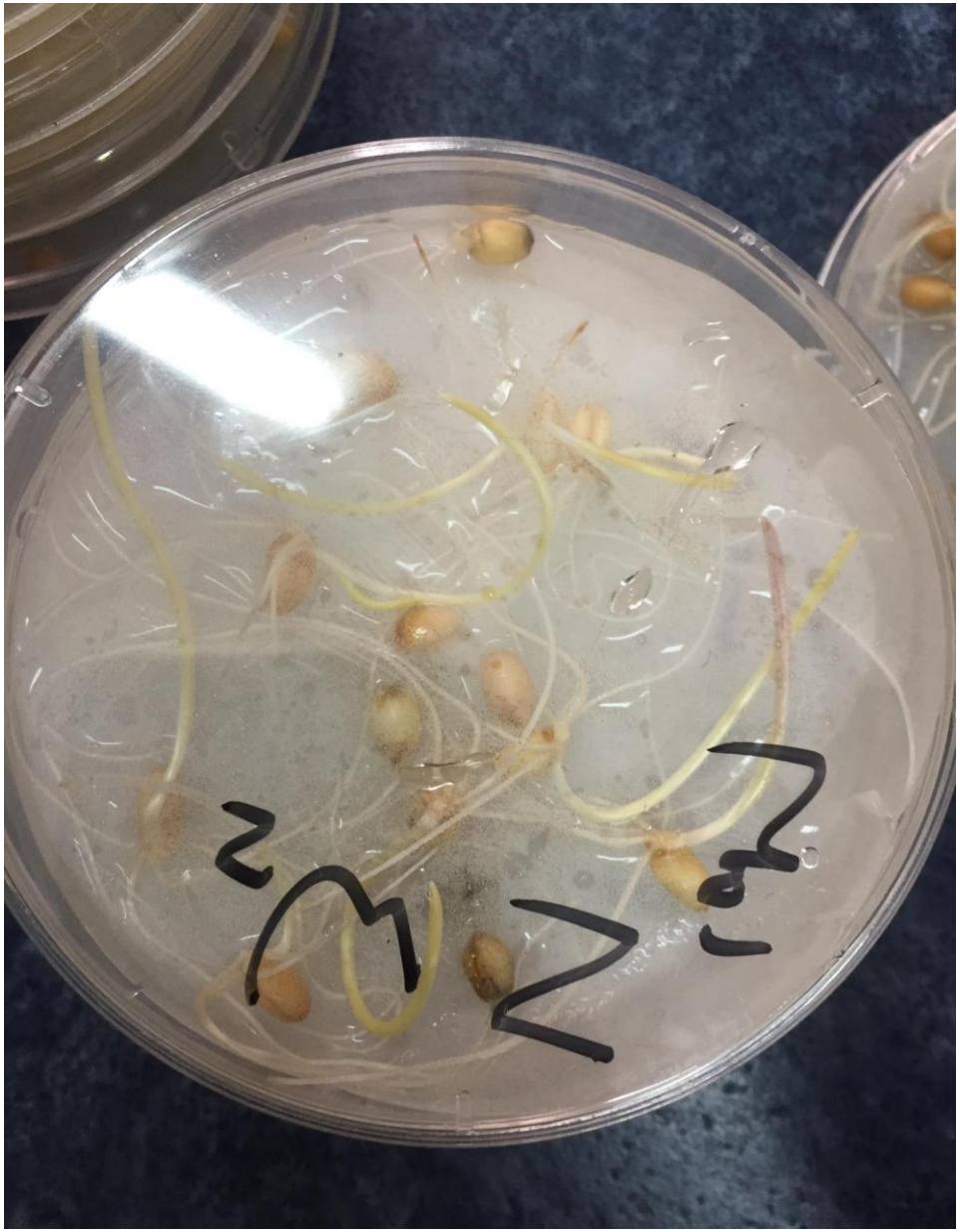
- **Objectives:**

The aim of this study's was to evaluate the impact of P. Florscens and B.Megaterium on germination of Wheat grown under wide salt range stress.

Material and methods :

- **Material:**
- Two varieties of Wheat seeds (white hetiah and yellow).
- Two bacteria (P. Florscens and B. Megaterium).
- NaCl three concentration:
- (0, 4, 8) ds/m
- Plate.
- Paper filters.
- Distilled water

- **Experimental design:**
- The white hetiah seed was placed in plate number 15 and saline solution was added at a concentration of 4/ds and 2ml of Pesudomouns Florscens.
- The white hetiah seed was placed in plate number 15 and saline solution was added at a concentration of 8/ds and 2 ml of Pesudomouns Florscens.
- The white hetiah seed was placed in plate number 15 and saline solution was added at a concentration 0/ds and 2 ml Pesudomouns Megaterium.
- The white hetiah seed was placed in plate number 15 and saline solution was added at a concentration of 4/ds and 2 ml of Bacillus Megaterium.
- The white hetiah sees was placed in plate number 15 and saline solution was added at a concentration of 8/ds and 2 ml of Bacillus Megaterium .
- The white hetiah seed was placed in plate number 15 and saline solution was added at a concentration 0/ds and 2 ml of Bacillus Megaterium



- The yellow hetiah seed was placed in plate number 15 and added saline solution at a concentration of 0/ds and 2 ml of Pesudomouns Florscens.
- The yellow hetiah seed was placed in plate number 15 and added saline solution at a concentration of 4/ds and 2 ml of Pesudomouns Florscens.
- The yellow hetiah seed was placed in plate number 15 and added saline solution at a concentration 8/ds and 2 ml Pesudomouns Florscens.

- The yellow hetiah seed was placed in plate number 15 and added saline solution at a concentration of 0/ds and 2 ml Bacillius Megaterium.
- The yellow hetiah seed was placed in plate number 15 and added saline solution at a concentration of 4/ds and 2 ml Bacillius Megaterium .
- The yellow hetiah seed was placed in plate number 15 and added saline solution at a concentration of 8/ds and 2 ml Bacillius Megaterium

- The white hetiah seed was placed in plate number 15 and added saline solution at a concentration 0/ds without bacteria.
- The white hetiah seed was placed in plate number 15 and added saline solution at a concentration 4/ds without bacteria.
- The white hetiah seed was placed in plate number 15 and added saline solution at a concentration 8/ds without bacteria.

- The yellow hetiah seed was placed in plate number 15 and added saline solution at a concentration 0/ds without bacteria.
- The yellow hetiah was placed in plate number 15 and added saline solution at a concentration 4/ds without bacteria.
- The yellow hetiah seed was placed in plate number 15 and added saline solution at a concentration 8/ds without bacteria.

- Each step repeated three times.

Data Analysis

All data were subjected to analysis of variance(ANOVA) by using SAS software.

Effect=salinity Method=Tukey-Kramer(P<.05) Set=2

salinity	Shoot WT	Standard Error	Letter Group
0	1.9650	0.1196	B
4	2.4362	0.1170	A
8	1.0759	0.1218	C

Effect=Bacteria*salinity Method=Tukey-Kramer(P<.05) Set=3

Bacteria	salinity	Shoot length	Standard Error	Letter Group
0	0	2.3950	0.1985	A
0	4	2.4330	0.1861	A
0	8	1.3155	0.1861	CD
1	0	2.0399	0.2233	ABC
1	4	2.3917	0.1985	AB
1	8	0.6967	0.1985	D
2	0	1.4600	0.1985	BCD
2	4	2.4839	0.2233	A
2	8	1.2154	0.2443	CD

Effect=VW Method=Tukey-Kramer(P<.05) Set=4

VW	shootwt	Standard Error	Letter Group
1	0.9476	0.09630	B
white hetiah	2.7038	0.09878	A

Effect=VW*Bacteria Method=Tukey-Kramer(P<.05) Set=5

VW	Bacteria	Shoot length	Standard Error	Letter Group
1	0	1.0456	0.1621	B
1	1	1.0578	0.1621	B
1	2	0.7394	0.1759	B
2	0	3.0502	0.1488	A
2	1	2.3610	0.1759	A
2	2	2.7002	0.1900	A

Effect=VW*salinity Method=Tukey-Kramer(P<.05)
Set=6

VW	salinity	Estimate	Standard Error	Letter Group
1	0	1.2022	0.1621	C
1	4	1.3578	0.1621	C
1	8	0.2827	0.1759	D
2	0	2.7277	0.1759	B
2	4	3.5146	0.1689	A
2	8	1.8691	0.1689	C

ANOVA analysis for the effect of salinity and bacteria on Root length

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
rep	2	32	0.44	0.6504
Bacteria	2	32	3.32	0.0489
salinity	2	32	5.38	0.0097
Bacteria*salinity	4	32	1.91	0.1328
VW	1	32	54.32	<.0001
VW*Bacteria	2	32	1.51	0.2361
VW*salinity	2	32	0.12	0.8830
VW*Bacteria*salinity	4	32	0.42	0.7935

Mean separation for the effect of different salinity level on wheat root length

salinity	Estimate	Standard Error	Letter Group
0	2.6732	0.2684	A
4	2.5578	0.2627	A
8	1.5328	0.2733	B

Effect=VW Method=Tukey-Kramer(P<.05) Set=4

VW	Root length	Standard Error	Letter Group
1	1.1144	0.2162	B
2	3.3948	0.2217	A

Effect=VW*Bacteria Method=Tukey-Kramer(P<.05) Set=5

Bacteria	salinity	Estimate	Standard Error	Letter Group
0	0	3.7350	0.4456	A
0	4	2.6708	0.4177	AB
0	8	1.9888	0.4177	AB
1	0	2.5280	0.5013	AB
1	4	2.6783	0.4456	AB
1	8	0.7600	0.4456	B
2	0	1.7567	0.4456	AB
2	4	2.3242	0.5012	AB
2	8	1.8496	0.5484	AB

Effect=VW*Bacteria Method=Tukey-Kramer(P<.05) Set=5

VW	Bacteria	Estimate	Standard Error	Letter Group
1	0	1.4211	0.3638	BC
1	1	1.2178	0.3638	BC
1	2	0.7042	0.3947	C
2	0	4.1753	0.3341	A
2	1	2.7597	0.3947	AB
2	2	3.2494	0.4264	A

Effect=VW*Bacteria*salinity Method=Tukey-Kramer(P<.05) Set=6

Obs	VW	Bacteria	salinity	Estimate	Standard Error	Letter Group
30	1	0	0	1.9933	0.6302	BCD
31	1	0	4	1.5933	0.6302	BCD
32	1	0	8	0.6767	0.6302	BCD
33	1	1	0	1.7700	0.6302	BCD
34	1	1	4	1.6433	0.6302	BCD
35	1	1	8	0.2400	0.6302	D
36	1	2	0	0.5067	0.6302	CD
37	1	2	4	1.1900	0.6302	BCD
38	1	2	8	0.4159	0.7799	BCD
39	2	0	0	5.4767	0.6302	A
40	2	0	4	3.7483	0.5485	AB
41	2	0	8	3.3008	0.5485	ABCD
42	2	1	0	3.2859	0.7799	ABCD
43	2	1	4	3.7133	0.6302	ABC
44	2	1	8	1.2800	0.6302	BCD
45	2	2	0	3.0067	0.6302	ABCD
46	2	2	4	3.4583	0.7796	ABCD
47	2	2	8	3.2833	0.7796	ABCD

fresh wt

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
rep	2	34	1.61	0.2144
Bacteria	2	34	4.65	0.0164
salinity	2	34	35.02	<.0001
Bacteria*salinity	4	34	2.96	0.0336
VW	1	34	25.22	<.0001
VW*Bacteria	2	34	2.98	0.0643
VW*salinity	2	34	1.21	0.3103
VW*Bacteria*salinity	4	34	1.05	0.3980

Effect=salinity Method=Tukey-Kramer(P<.05)

Salinity	Dry wt	Standard Error	Letter Group
0	1.6420	0.03422	A
4	1.7126	0.03494	A
8	1.3252	0.03494	B

Effect=Bacteria*salinity Method=Tukey-Kramer(P<.05)

Bacteria	Salinity	fresh wt	Standard Error	Letter Group
0	0	1.8210	0.05926	A
0	4	1.7310	0.05555	AB
0	8	1.3703	0.05555	DE
1	0	1.5950	0.05926	ABCD
1	4	1.7050	0.05926	AB
1	8	1.2033	0.05926	E
2	0	1.5100	0.05926	BCD
2	4	1.7018	0.06665	ABC
2	8	1.4018	0.06665	CDE

Effect=VW Method=Tukey-Kramer(P<.05)

VW	FW	Standard Error	Letter Group
1	1.4593	0.02794	B
2	1.6606	0.02875	A

Effect=VW*Bacteria*salinity Method=Tukey-Kramer(P<.05)

Obs	VW	Bacteria	salinity	Estimate	Standard Error	Letter Group
30	1	0	0	1.7000	0.08381	ABC
31	1	0	4	1.6333	0.08381	ABCD
32	1	0	8	1.2933	0.08381	CDE
33	1	1	0	1.4900	0.08381	BCDE
34	1	1	4	1.6067	0.08381	ABCD
35	1	1	8	1.2867	0.08381	CDE
36	1	2	0	1.3467	0.08381	CDE
37	1	2	4	1.5533	0.08381	ABCDE
38	1	2	8	1.2233	0.08381	DE
39	2	0	0	1.9420	0.08381	A
40	2	0	4	1.8286	0.07294	AB
41	2	0	8	1.4473	0.07294	BCDE
42	2	1	0	1.7000	0.08381	ABC
43	2	1	4	1.8033	0.08381	AB
44	2	1	8	1.1200	0.08381	E
45	2	2	0	1.6733	0.08381	ABC
46	2	2	4	1.8503	0.1036	AB
47	2	2	8	1.5803	0.1036	ABCDE

Dry weight

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
rep	2	34	0.17	0.8449
Bacteria	2	34	1.23	0.3056
salinity	2	34	1.22	0.3091
Bacteria*salinity	4	34	0.45	0.7721
VW	1	34	546.17	<.0001
VW*Bacteria	2	34	1.46	0.2458
VW*salinity	2	34	1.94	0.1600
VW*Bacteria*salinity	4	34	0.41	0.8004

Effect=salinity Method=Tukey-Kramer(P<.05)

salinity	Dry wt	Standard Error	Letter Group
0	0.5531	0.008658	A
4	0.5652	0.008842	A
8	0.5721	0.008842	A

Effect=Bacteria*salinity Method=Tukey-Kramer(P<.05)

Bacteria	Salinity	Dry wt	Standard Error	Letter Group
0	0	0.5442	0.01500	A
0	4	0.5649	0.01406	A
0	8	0.5522	0.01406	A
1	0	0.5480	0.01500	A
1	4	0.5592	0.01500	A
1	8	0.5820	0.01500	A
2	0	0.5670	0.01500	A
2	4	0.5715	0.01686	A
2	8	0.5821	0.01686	A

Effect=VW Method=Tukey-Kramer(P<.05)

Obs	VW	Dry wt	Standard Error	Letter Group
16	1	0.6820	0.007069	A
17	2	0.4449	0.007274	B

Effect=VW*Bacteria*salinity Method=Tukey-Kramer(P<.05)

VW	Bacteria	Salinity	Dry wt	Standard Error	Letter Group
1	0	0	0.6630	0.02121	A
1	0	4	0.6913	0.02121	A
1	0	8	0.6707	0.02121	A
1	1	0	0.6640	0.02121	A
1	1	4	0.6987	0.02121	A
1	1	8	0.7103	0.02121	A
1	2	0	0.6633	0.02121	A
1	2	4	0.7033	0.02121	A
1	2	8	0.6730	0.02121	A
2	0	0	0.4253	0.02121	B
2	0	4	0.4384	0.01846	B
2	0	8	0.4337	0.01846	B
2	1	0	0.4320	0.02121	B
2	1	4	0.4197	0.02121	B
2	1	8	0.4537	0.02121	B

Conclusion

In our experiment we found that the response to bacteria and salinity is better in the (Yellow Hetiah) than the (White Hetiah) .

Recommendations

We recommend to use PF bacteria at salinity Level 4/ds , compared to B.Megaterium it’s better in seeds germination .