

Salt Tolerance of Berseem Clover, Barley, Wheat and Beans

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Soil salinity may affect the germination of seeds by decreasing the ease with which seeds may take up water, and thereby decreasing the rate of water entry. When excess soluble salts accumulate in soils, sodium and chloride frequently become the dominant ions in the soil solution. These ions may restrict the growth of certain plant species.

Specific toxic effects, caused by excessive concentrations of these ions, are common in salt affected soils [1, 2, 3, 4].

Experimental

Soil samples were collected from different locations in the Abis area near Alexandria. These samples were taken from different areas to represent good, moderate, poor, and no growth of berseem clover, barley, wheat and beans. The samples were taken from both the surface and the second foot of soil beside growing plants. The samples were air-dried and analysed.

Soil Analysis

Determinations carried out on each sample include:

1. Saturation percentage of the soil paste.
2. Electrical conductivity of the saturation extract [6].
3. Gypsum requirement by SCHOONOVER method [5].
4. Determinations of calcium and magnesium, chlorides, carbonates, bicarbonates and sulfates [6].

Table 1

**Growth condition of berseem clover and beans affected by E. C.,
and soluble sodium percentage in the top foot of soil**

Growth condition	Berseem clover				Beans			
	E. C. $\times 10^3$ mmhos./cm.		Soluble sodium percentage		E. C. $\times 10^3$ mmhos./cm.		Soluble sodium percentage	
	Range	Average	Range	Average	Range	Average	Range	Average
Good	1.5-5.2	3.5	15.6-65.0	36.2	2.8-4.0	3.2	22-29	26
Moderate	—	—	—	—	5.0-5.8	5.4	53-61	57
Poor	6.5-8.9	8.0	42.8-58.0	49.3	5.5-10.0	8.5	48-67	58
No growth	>13	—	>60	—	>12	—	>67	—

Table 2

Growth condition of barley and wheat as affected by E. C.,
and soluble sodium percentage in the top foot of soil

Growth condition	Barley				Wheat			
	E. C. $\times 10^3$ mmhos./cm.		Soluble sodium percentage		E. C. $\times 10^3$ mmhos./cm.		Soluble sodium percentage	
	Range	Average	Range	Average	Range	Average	Range	Average
Good	1.0-8.1	3.3	30-60	48.5	1.2-5.4	2.8	27-69	47.7
Moderate	6.0-12	9.0	47-79	60.8	4.3-9.3	6.0	49-64	56.5
Poor	16-22	19.3	65-78	71.9	65.-9.5	8.1	51-67	59.0
No growth	>23	—	>79	—	—	—	—	—

Soluble sodium was calculated by subtracting $\text{Ca}^{2+} + \text{Mg}^{2+}$ in me./l. from the total anions.

The growth and yield of berseem, barley, wheat and beans are recorded in Tables 1. and 2.

Results and discussion

Tables 1. and 2. show the salt tolerance ranges for berseem clover, barley, wheat and beans as expressed in terms of condition of growth. Fig. 1. shows the relation between E. C., soluble sodium percentage and condition of growth of berseem clover.

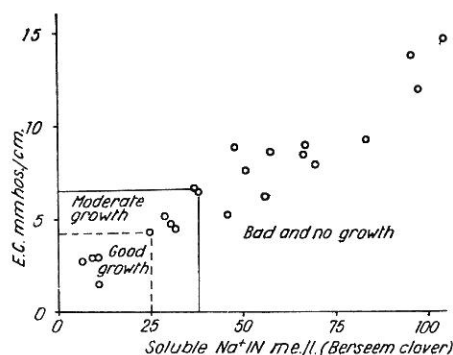


Fig. 1.

Relationship between soluble sodium in me./l. and the E. C. in the experiment with berseem clover

Soluble sodium percentage seems to affect the growth of berseem clover, barley, wheat and beans. In one case berseem clover growth and yield was poor at an E. C. of 6.1 mmhos./cm. Here, soluble sodium percentage was 81. In another case, poor growth of barley was observed at a relatively low E. C. of 8.0 mmhos./cm. but the soluble sodium percentage was high being 88. In a third case, poor growth of beans was noticed at an E. C. of 5.1 mmhos./cm. but the soluble sodium percentage was 81.

Summary

The salt tolerance of berseem clover, beans, wheat and barley under field conditions have been studied. It is concluded from the examination that growth under various salinity and soluble sodium percentage ranges as follows: barley is most tolerant followed by wheat, berseem clover and beans which seems to be the least tolerant of the four crops.

References

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Солеустойчивость клевера «Berseem», ячменя, пшеницы и фасоли

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Резюме

Солеустойчивость клевера «Berseem», фасоли, пшеницы и ячменя исследовалась в полевых условиях. На основе исследований развития растений при различном содержании растворимых солей и процентного содержания натрия, пришли к выводу, что наиболее высокой солеустойчивостью обладает ячмень, за ним следуют пшеница и клевер «Berseem», в то время как фасоль оказалась наименее солеустойчивой среди четырех культур.