Kentucky Bluegrass Saline Germination Screening

Materials and Methods

Thirty-one Kentucky bluegrass (*Poa pratensis L.*) cultivars and experimentals were surveyed for germination under saline conditions. This study was conducted to test for differences among varieties in ability to germinate in high salt environments. Total germination and velocity of germination were measured on seeds sown in saline and non-saline conditions. The saline treatment consisted of tap water salinized with 5,250 ppm Instant Ocean Aquarium Sea Salt Mixture (United Pet Group, Blacksburg, VA 24060). The saline water treatment was approximately 15% of the salinity of seawater.

Seeds of each entry were germinated in both a saline water treatment and a non-saline water treatment; this trial had two replications. Germination paper in petri dishes was saturated with either saline or non-saline excess water was decanted off. Fifty seeds from each variety with good seed fill were selected and placed onto the saturated piece germination paper. Each dish contained one variety and one water treatment for a total of thirty-one dishes per replication for each treatment. Following seed placement a lid was placed on the dish and sealed with parafilm. Dishes containing seeds were placed under 24-hour light regime with daytime temperatures of 75° F and nighttime temperatures allowed to fall into the low 60°'s. Germination scoring was conducted daily by counting the number of seeds that had germinated. Germination was considered to have occurred when the coleoptile had extended at least 1mm. Once a variety had no new seeds germinate for four consecutive days that variety was considered fully germinated and was not counted further. The trial lasted for twenty-seven days; at which point all entries had gone at least four days without any new seeds germinating.

Mean length of incubation time (Czabator 1962) and velocity of germination (Throneberry and Smith, 1955) are two methods of quantifying germination over the entire germination period. Mean length of incubation time (MLIT) is used to quantify the average amount of time needed to achieve the maximum germination of a particular seed lot and is calculated as [MLIT= (G1T1+ G2T2+…. + GnTn+)/ (G1+G2+…. +Gn)], where G = count of newly germinated seeds; and T = time (in days). This MLIT measurement was used in this trial to quantify the amount of time it took for an entry to germinate; a higher value meaning that an entry took more time to germinate. Velocity of germination (VOG) is a measure of the vigor of a seed lot and is calculated as [VOG= (G_1/D_1) +(G_2/D_2) +…..+(G_n/D_n)], where G = count of newly germinated seeds ; and D = days after planting. This single measurement is able to summarize the rate at which a particular seed lot germinates over the entire trial into one number that can then be compared with other seed lots. As with other measurements in this trial it is important to compare a varieties performance in the saline water treatment to its own performance in the non-saline water treatment to properly asses its ability to germinate in saline conditions.

Results and Discussion

Saline water slows germination rate when compared to non-saline water. One week after seeding the combined germination of all entries in the non-saline water treatment was 40% compared to only 21% in the saline water treatment. After twenty-seven days germination in

the non-saline treatment of 73% was higher, though not significantly different, from the total germination in the saline water treatment of 68% @p=0.05. These results are shown in Figure 1.

Significant differences between varieties were observed with regards to total germination and velocity of germination in both the saline and non-saline treatments. Differences in germination in the non-saline treatment demonstrate the importance of comparing the difference in the saline performance to the non-saline performance of the varieties instead of directly comparing saline performance of one variety to the saline performance of other varieties.

Figure 2 and Figure 4 show germination percentage of Kentucky bluegrass varieties 7 and 14 days after seeding, respectively; and Figure 3 and Figure 5 show the same data but for experimental Kentucky bluegrasses. Germination at these two dates is also presented in Table 1 and Table 2. In these tables germination of each variety in the saline water treatment is presented as a percentage of that varieties germination in the non-saline treatment. The values here suggest how much a particular entry's germination was inhibited by the saline water treatment. A high value indicates little to no inhibition caused by the saline water treatment.

Table 3 presents MLIT for all entries in this trial as well as the percentage of MLIT of the saline treatment compared to the non-saline treatment for each variety. For example, a MLIT of 150% means that the MLIT for seeds in the saline water treatment is 1.5x greater than those in the non-saline treatment. MLIT for all entries was higher for seeds in the saline treatment compared to the non-saline treatment. Similarly, VOG for all entries was slower in the saline treatment compared to the non-saline treatment. Velocity of germination data for named varieties and experimentals are presented in Figure 6 and Figure 7, respectively.

Varieties such as Volt, Blue Coat, and Mazama, as well as experimentals KB11OT-31, A15-4, and A11-348 showed little difference between the saline and non-saline treatments throughout this trial. These findings suggest that these varieties have a superior ability to germinate in saline conditions. Conversely, varieties like Fahrenheit 90, Bolt, and Midnight and experimentals A10-280 and A11-47 exhibited a large decrease in their ability to germinate under saline conditions compared to the non-saline treatment.

Figure 1. Percent germination of Kentucky bluegrasses seeded into saline and non-saline water.

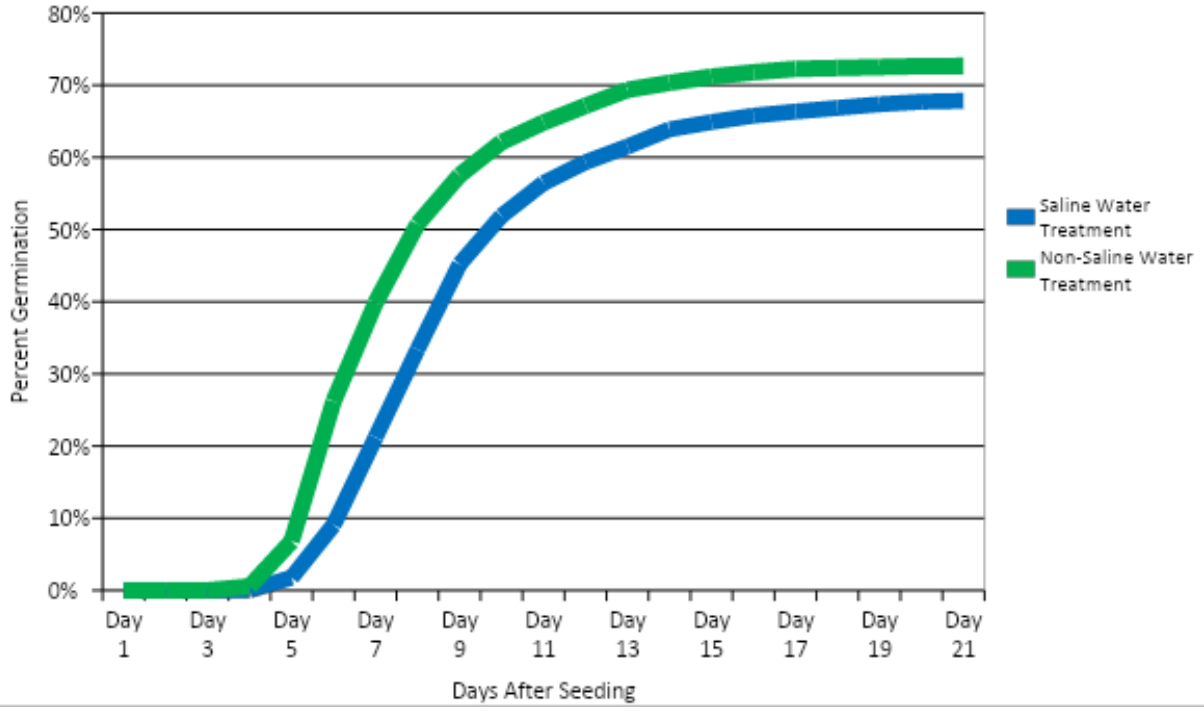


Figure 2. Germination percentage of Kentucky bluegrass varieties in saline and non-saline water treatments seven days after seeding.

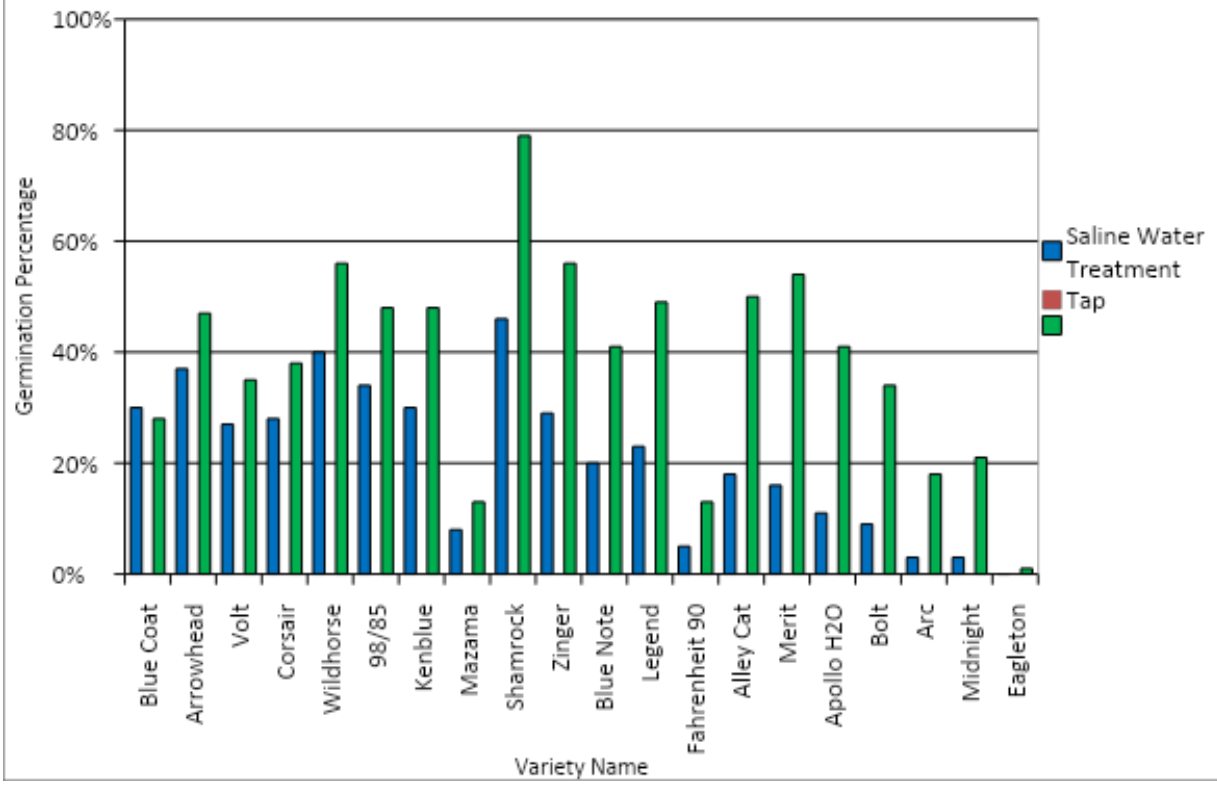


Figure 3. Germination percentage of Kentucky bluegrass experimentals in saline and non-saline water treatments seven days after seeding

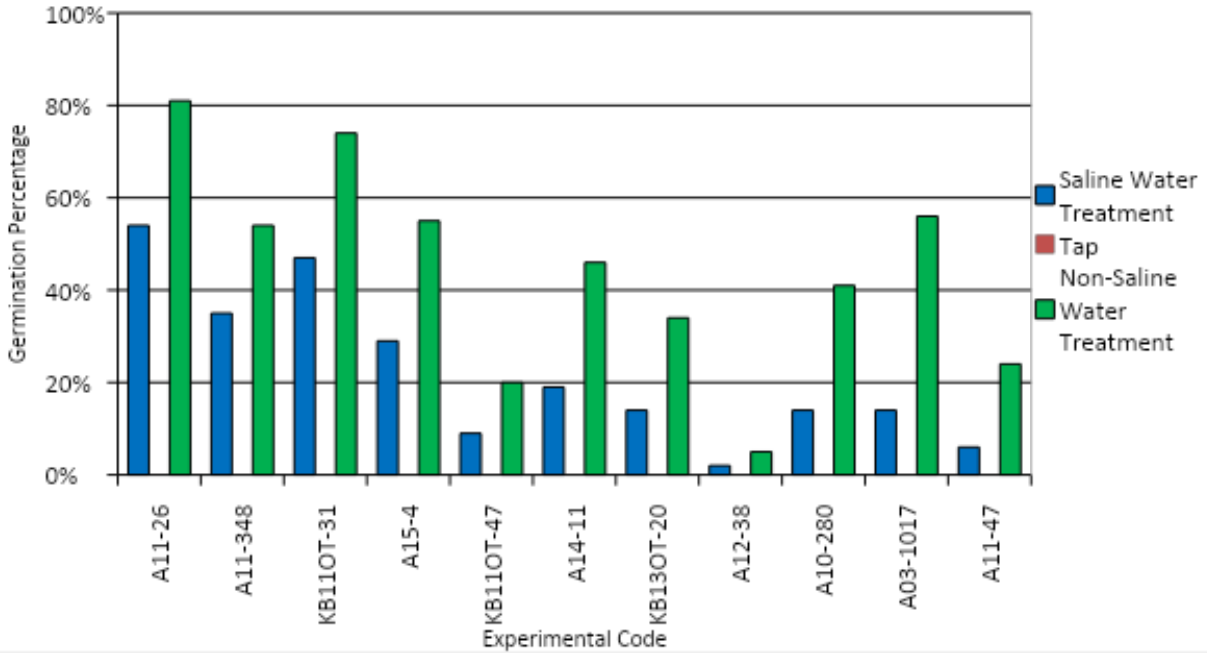


Table 1. Germination of Kentucky bluegrass entries in saline water expressed as a percentage of the varieties germination in non-saline water seven days after seeding.

Entry	Saline Germination as Percentage of Non-Saline Germination	LSD Groupings
Blue Coat	111.5%	
Arrowhead	78.4%	
Volt	77.3%	
Wildhorse	72.3%	
Corsair	72.2%	
98/85	72.1%	
A11-348	68.2%	
A11-26	68.1%	
Mazama	65.3%	
Kenblue	64.3%	
KB11OT-31	63.5%	
Shamrock	58.3%	
Zinger	55.7%	
A15-4	52.7%	
Blue Note	49.8%	
Fahrenheit 90	48.3%	
Legend	47.5%	
KB11OT-47	43.9%	
KB13OT-20	42.5%	
A12-38	41.7%	
A14-11	40.6%	
Alley Cat	40.0%	
A10-280	34.0%	
A11-47	31.3%	
Merit	29.9%	
Apollo H2O	29.9%	
A03-1017	24.9%	
Bolt	24.2%	
Midnight	20.0%	
Arc	17.5%	
Eagleton	0.0%	
LSD	42.8%	
CV (%)	41.9	
Trial Average	49.9%	

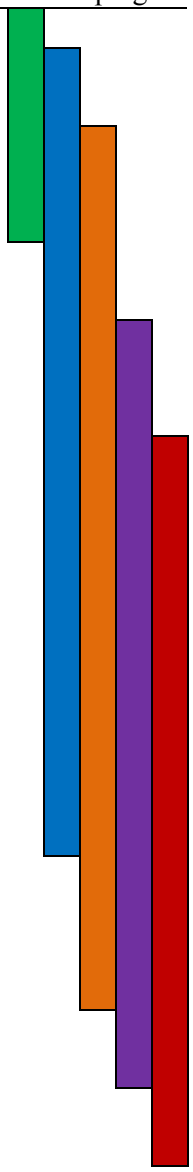


Figure 4. Germination percentage of Kentucky bluegrass varieties in saline and non-saline water treatments fourteen days after seeding.

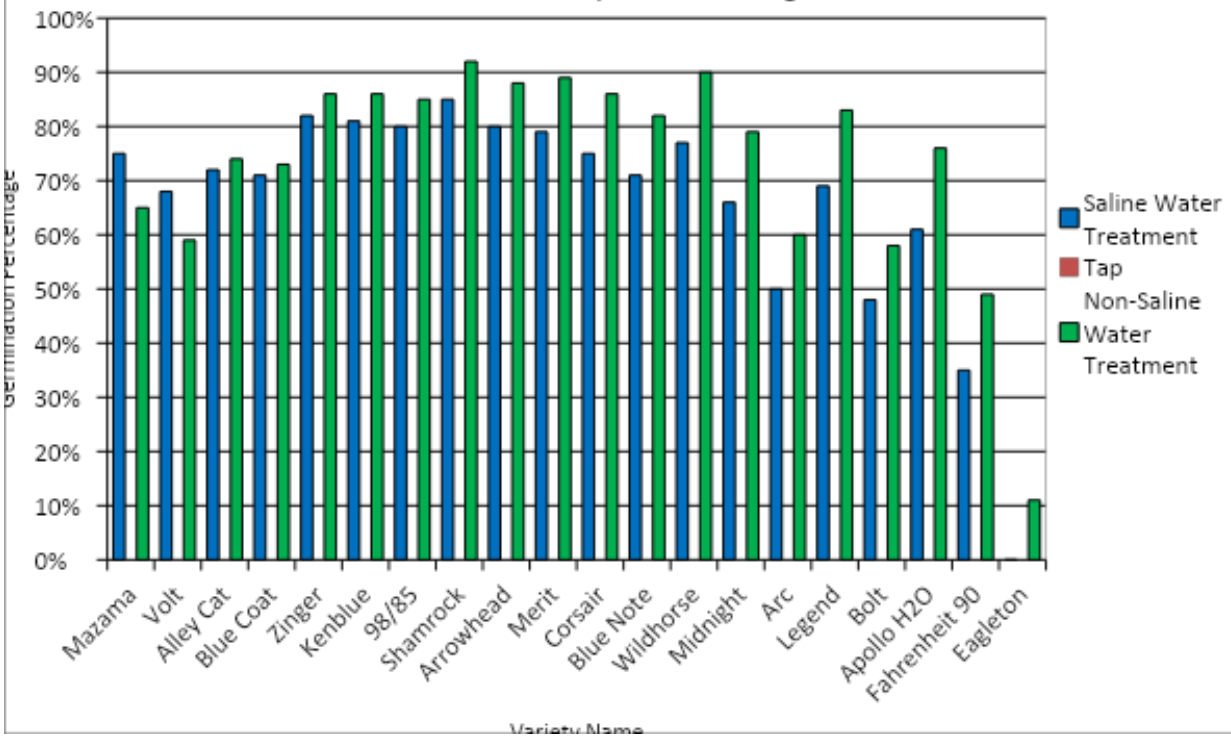


Figure 5. Germination percentage of Kentucky bluegrass experimentals in saline and non-saline water treatments fourteen days after seeding.

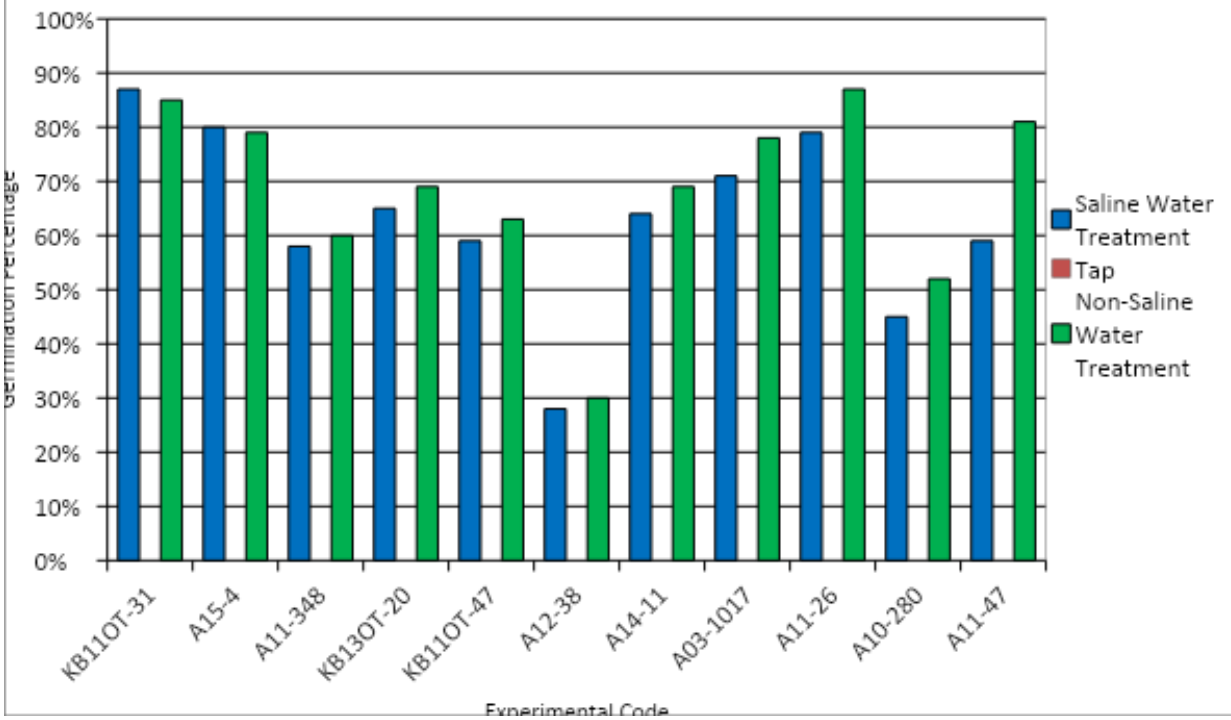


Table 2. Germination of Kentucky bluegrass entries in saline water expressed as a percentage of the varieties germination in non-saline water fourteen days after seeding.

Entry	Saline Germination as Percentage of Non-Saline Germination	LSD Groupings
Volt	115.8%	
Mazama	115.0%	
KB11OT-31	102.3%	
A15-4	101.2%	
A11-348	98.7%	
Alley Cat	98.2%	
Blue Coat	97.4%	
Zinger	95.3%	
98/85	95.2%	
Kenblue	94.8%	
KB13OT-20	94.1%	
KB11OT-47	93.8%	
A12-38	92.9%	
Shamrock	92.5%	
A14-11	92.3%	
Arrowhead	91.2%	
A03-1017	91.1%	
A11-26	90.9%	
Merit	88.9%	
Corsair	87.4%	
Blue Note	86.6%	
A10-280	86.5%	
Midnight	86.3%	
Wildhorse	85.6%	
Arc	84.6%	
Legend	83.0%	
Bolt	82.8%	
Apollo H2O	82.1%	
A11-47	72.8%	
Fahrenheit 90	71.6%	
Eagleton	0.0%	
LSD	28.1%	
CV (%)	15.4	
Trial Average	88.7%	

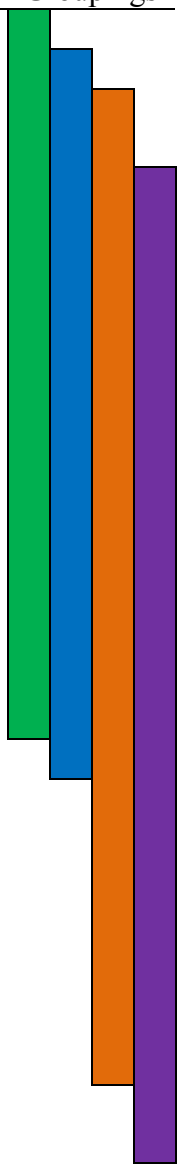


Table 3. Mean Length of Incubation Time (MLIT) in days of Kentucky bluegrass varieties and experimentals in days.

Variety	*Saline*	*Non-Saline*	Saline % of non-Saline
Mazama	10.8	10.2	105%
Blue Coat	8.6	8.1	106%
Volt	8.6	8.0	107%
Corsair	8.7	8.1	108%
Wildhorse	8.3	7.7	108%
A12-38	13.1	12.2	108%
Blue Note	9.2	8.3	110%
Fahrenheit 90	11.5	10.3	111%
KB11OT-47	10.2	9.2	111%
Arrowhead	8.4	7.5	111%
Zinger	8.6	7.6	114%
KB13OT-20	9.1	8.0	114%
Midnight	11.0	9.6	114%
A11-348	7.4	6.5	115%
Kenblue	8.7	7.5	115%
A15-4	8.3	7.1	117%
98/85	8.7	7.4	117%
A14-11	9.1	7.6	119%
KB11OT-31	7.6	6.4	120%
Legend	9.4	7.8	121%
A03-1017	8.9	7.3	121%
A10-280	8.3	6.8	122%
A11-26	7.2	5.9	122%
Merit	9.0	7.3	123%
Shamrock	7.9	6.4	124%
Arc	11.6	9.3	125%
Alley Cat	8.8	7.0	127%
Bolt	10.1	8.0	127%
Apollo H2O	10.5	8.2	128%
A11-47	12.0	9.2	130%
Eagleton	22.2	14.3	155%
Crit T	2.04	2.04	
LSD	1.30	1.36	
CV (%)	6.57	8.12	

Figure 6. Velocity of germinationof kentucky bluegrass varieties in saline and non-saline water treatments.

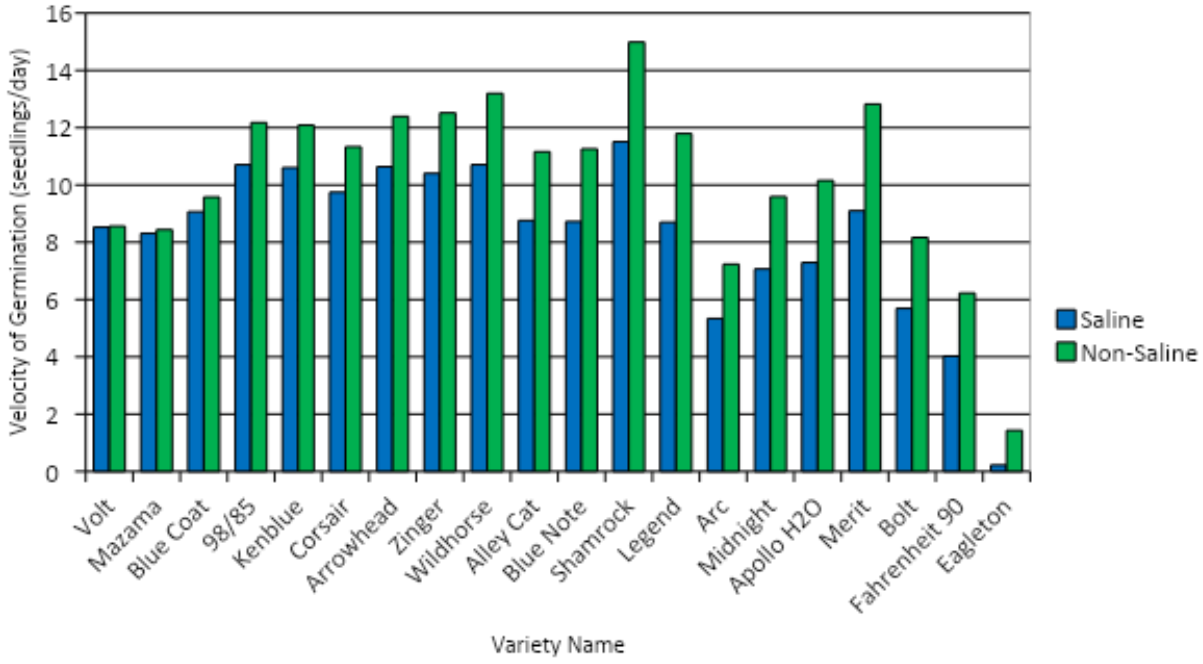
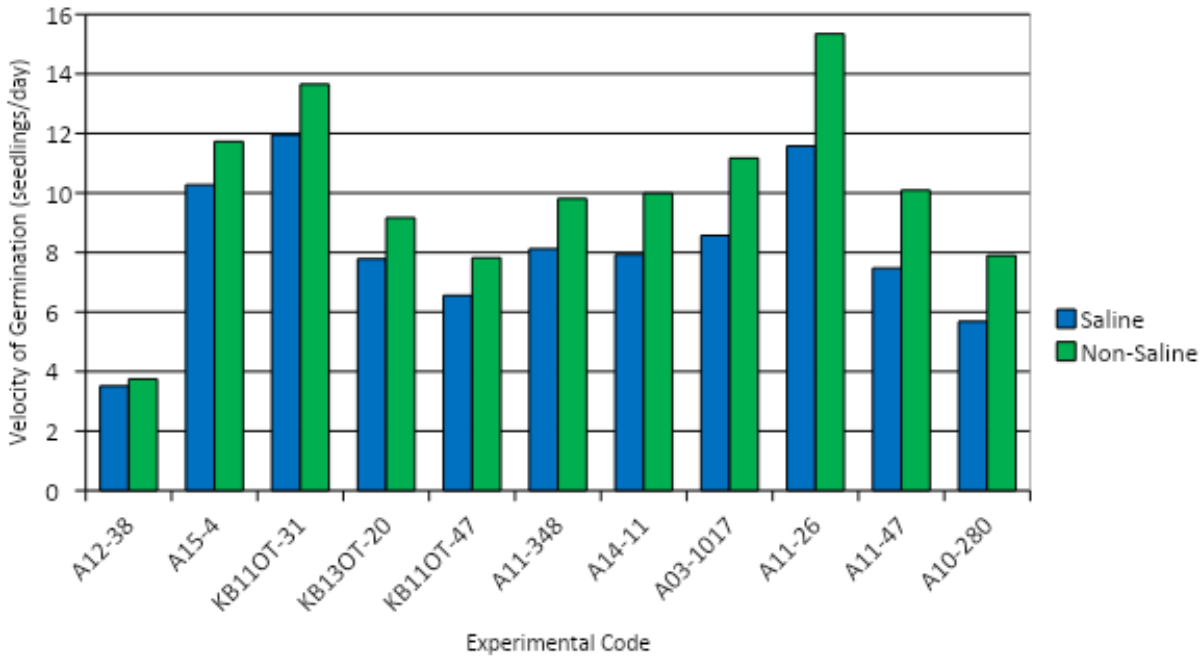


Figure 7. Velocity of germination of Kentucky bluegrass experimentals in saline and non-saline water treatments.



References

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