Development of Germination Salt Tolerance in Pima Cotton

W. C. Hofmann, C. V. Feaster and A. K. Dobrenz

Summary

Two cycle of recurrent selection for germination salt tolerance has been completed on ten Pima cotton lines. Four of these lines displayed higher germination percentage at 15,500 PPM after the second cycle of selection. This increase in germination ranged from 4% to 8%. Although this appears to be a small increase we know that gene stabilization for a complex characteristic such as salt tolerance will require several cycles of selection.

****

Experimental lines of cotton obtained from Dr. Carl V. Feaster, USDA, SEA-AR Research Agronomist, were evaluated for salt tolerance in 1980 and 1981. These lines were E-13, E-14, E-15, E-16, E-17, PS-5, P-34, P-42, P-43 and P-44. During the first screening (1981) we subjected seed of each line to a wide range of NaCl concentrations (Table 1).

Seed from each line was germinated in plastic containers at 30 C. Seed were placed on filter paper moistened with the respective salt solution and then covered with a layer of filter paper saturated with the same NaCl solution to eliminate condensation. Trays were covered with black paper and placed in an illuminated growth chamber during the germination period.

Seedlings which survived the highest levels of salt were transplanted and established in individual containers in the greenhouse. These surviving seedling salt tolerant plants were transplanted into the field at the Cotton Research Center. Dr. Carl Feaster facilitated the crossing within each experimental line and harvested the seed to be evaluated in the second cycle of selection. In the Spring of 1981 we screened these seed for germination salt tolerance using NaCl ranging from -15.5 to -18 bars NaCl (Table 2).

Lines E-14 and P-43 had germination percentages of 9.5 and 6.3, respectively, at -17.5 bars NaCl (Table 2). Lines E-14, E-17, P-43 and P-44 showed the most progress in the germination salt tolerance from 1980 to 1981 (Fig. 1). Percent germination was 7.7, 6.9, 4.4 and 6.7 percent higher for these lines at -15.5 bars NaCl in 1981. Although this does not appear to be a very large percentage, this amount of progress is similar to the progress we observed in the development of germination salt tolerant alfalfa. Both Cotton and Alfalfa are tetraploid species and the progress will be much slower compared with diploid species.

Seedlings which survived the second cycle of screening were transplanted at the Cotton Research Center in the Spring of 1981, and Dr. Feaster crossed within each of the ten lines and has harvested that seed for our third cycle of selection.

Table 1. Germination of 10 Pima cotton germplasm sources obtained from Dr. Carl Feaster. Seed were germinated in salt (NaCl) solutions at 30 C in 1980.

	NaCl Bars		
	-13	-15	-16
E13	2.0	5.0	0.9
E14	12.0	3.0	0.4
E15	4.4	17.0	1.8
E16	11.4	3.0	1.0
E17	4.4	1.0	0.1
P34	7.8	10.0	1.2
P42	2.2	2.0	2.0
P43	11.0	10.0	0.9
P44	6.8	2.0	1.2
PS5	9.0	9.0	1.5

Table 2. Germination percentages of 10 cycle 2 salt tolerant Pima Cotton lines in 1981. Seed were germinated in several salt concentrations at 30 C.

	NaCl Bars					
	-15.5	-16	-16.5	-17	-17.5	-18
E13	3.7					
E14	9.0	7.3	4.0	6.0	9.5	
E15	4.5					
E16	2.4					
E17	7.3	3.0	0			
P34	1.3					
P42	1.3					
P43	9.0	6.0	5.0	5.0	6.3	1.7
P44	8.3	0				
PS5	1.0					

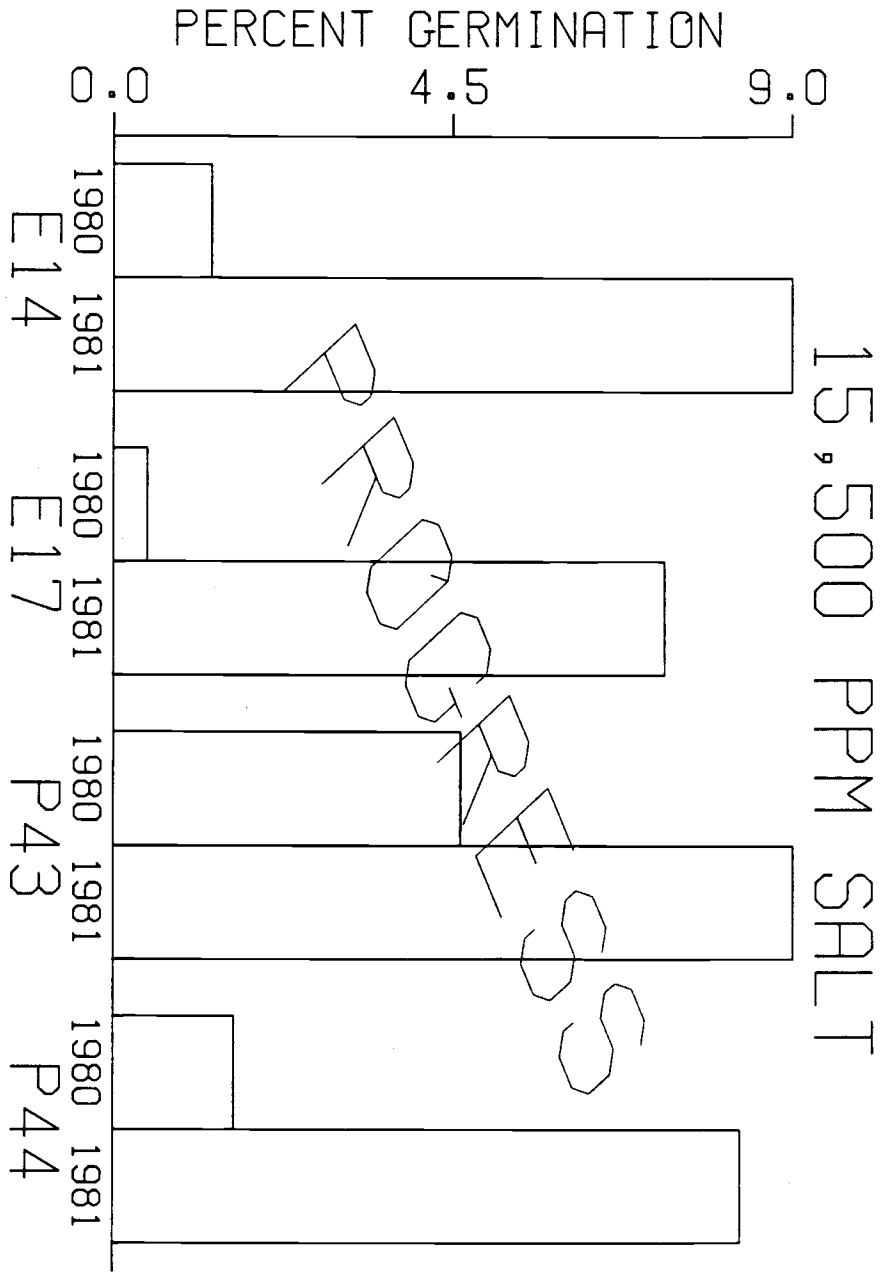

Figure 1. Progress in the germination percentage of 4 Pima Cotton lines. Seed were germinated at 30 C in a NaCl concentration of 15,500 ppm.