Planting Seed

Selecting for Cotton Seedling Emergence Under Cool and Saline Conditions

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ABSTRACT

A breeding program aimed at increasing the ability of long and short staple cotton strains to emerge in saline soils under cool springtime soil conditions has now completed the second cycle of selection. Cycle II emergence results show evidence of progress.

INTRODUCTION

One of the major problems associated with the accumulation of salts in the soil profile is poor stand establishment. Often the very region in which germination and emergence takes place, i.e. the soil surface region, is also a region of relatively high salt accumulation, particularly when management practices involve the use of saline irrigation water and/or drip irrigation.

A breeding progam to address this problem is now in its second year. This program, which is being run in conjunction with Ed Turcotte of the USDA and Larry Burdette of Delta Pine and Land Company, is directed toward improving the ability of cotton to emerge and establish under the cool and salty conditions which are typical of a springtime planting situation.

We are currently working with 16 strains of long staple cotton provided by the USDA-ARS and 7 strains of short staple cotton provided by DPL. Selections are made in the late winter months at the UA campus in Tucson. Long staple seedlings are then transported to the Maricopa Agricultural Center where they are transplanted and cross pollinated by the staff of the USDA-ARS.

Short staple field work is carried out in Casa Grande by the staff of DPL.

SEEDLING SELECTION PROCEDURES

Selection pressure involves two factors, saline irrigation water and controlled cool soil temperatures (around 20C or 68F). With the selection pressure targeted at 1% emergence, irrigation water salt concentration was determined by trial and error to be -12 bars.

The seeds were planted at a depth of 2 cm in a 7 cm-deep layer of vermiculite in plastic trays. Planting media was irrigated with a -12 bar NaCl solution 3 to 4 times weekly. Soil temperature was maintained as close to 20C as possible. Soil temperatures were monitored using electronic thermometers.

Seedlings that emerged and opened their cotyledons were carefully removed from the selection trays and transplanted into styrofoam potting cups. Transplanted seedlings were then maintained under normal greenhouse conditions (i.e. with tap water irrigation) until they were moved to the field.

RESULTS

In 1985, the emergence rate for 9 strains of long staple cotton averaged 1.64% (range = 0.2% to 3.7%; total number of seed = 6200; mean soil temperature = 20.4C; temperature range = 15.5 to 24C). In 1986 the emergence rate for seed from plants of the first selection (same 9 strains) was 5.82% (range = 0.9% to 17.7%; total number of seeds = 6200; mean soil temperature = 19.9C; temperature range = 17 to 25C).

A similar emergence rate increase was observed in the 7 strains of short staple cotton. Mean emergence rate in 1985 was 1.53% (range = 0.3% to 2.6%; total number of seed = 8000; mean soil temperature = 20C; temperature range = 16 to 24C). In 1986 seed taken from plants selected the first year averaged 6.47% emergence (range = 2.3% to 15.3%; total number of seed = 2100; mean soil temperature = 21.7C; temperature range = 19.5 to 23C).

Although these emergence rate increases cannot be taken as proof of increased salt tolerance, they do indicate progress and the need for further selection at higher salinity levels.