

Alfalfa Salt Tolerance From Germination To Establishment

Tim McKimmie and Albert Dobrenz

INTRODUCTION

As Arizona's third most valuable crop, alfalfa is important to our large cattle industry. Since virtually all of the state's cropland is irrigated and irrigation water carries salts, salinity is a major concern for farmers. The opening of the CAP project may increase salinity problems. Development of salt tolerant crop plants may permit increased production from marginal soils and water supplies. The increased demand for water caused by urban growth in the Southwest makes it imperative that agricultural users are equipped with the knowledge necessary to ensure their survival. Research on salt tolerance may provide a tool to this end.

MATERIALS AND METHODS

Using AZ-Germ-Salt I, a germination salt tolerant alfalfa released in 1983, selections have been made for salt tolerance beyond germination. Selections were made in a greenhouse on the U of A campus and seed production was at the university farm in Marana.

A specially designed irrigation box containing nursery flats was planted in the greenhouse with about 7000 alfalfa seed. A Hoaglands/NaCl solution of -0.8 MPa was used to irrigate the flats daily. The most vigorous plants which germinated, emerged and established over a 6-week period were selected for transplanting and seed production in the field. Approximately 1 seedling out of 1000 seed sown was selected.

Individual clones from Cycle I were harvested separately in August 1985; seed from these and AZ-Germ-Salt I were sown under the same saline conditions (-0.8 MPa) in the greenhouse.

Selections from these were also made and Cycle II was harvested in July, 1986.

RESULTS AND DISCUSSION

Clones varied greatly in survival and vigor scores (Fig. 1 and 2). Seedlings from clones with greater survival and vigor than AZ-Germ-Salt I (24 and 3%, respectively) were selected for Cycle II. This represented about 50% of the Cycle I clones. Such screening of individual clones not only permits a measure of the variation in the population but ensures that selections are made from the maximum number of parent plants.

Cycle II will be compared to Cycle I and AZ-Germ-Salt I as well as other southwestern cultivars both in the greenhouse and on salinized land in Safford, Arizona. Preliminary results are promising because of the variability which exists in plant response to salinity during establishment. This is necessary for a successful breeding program.

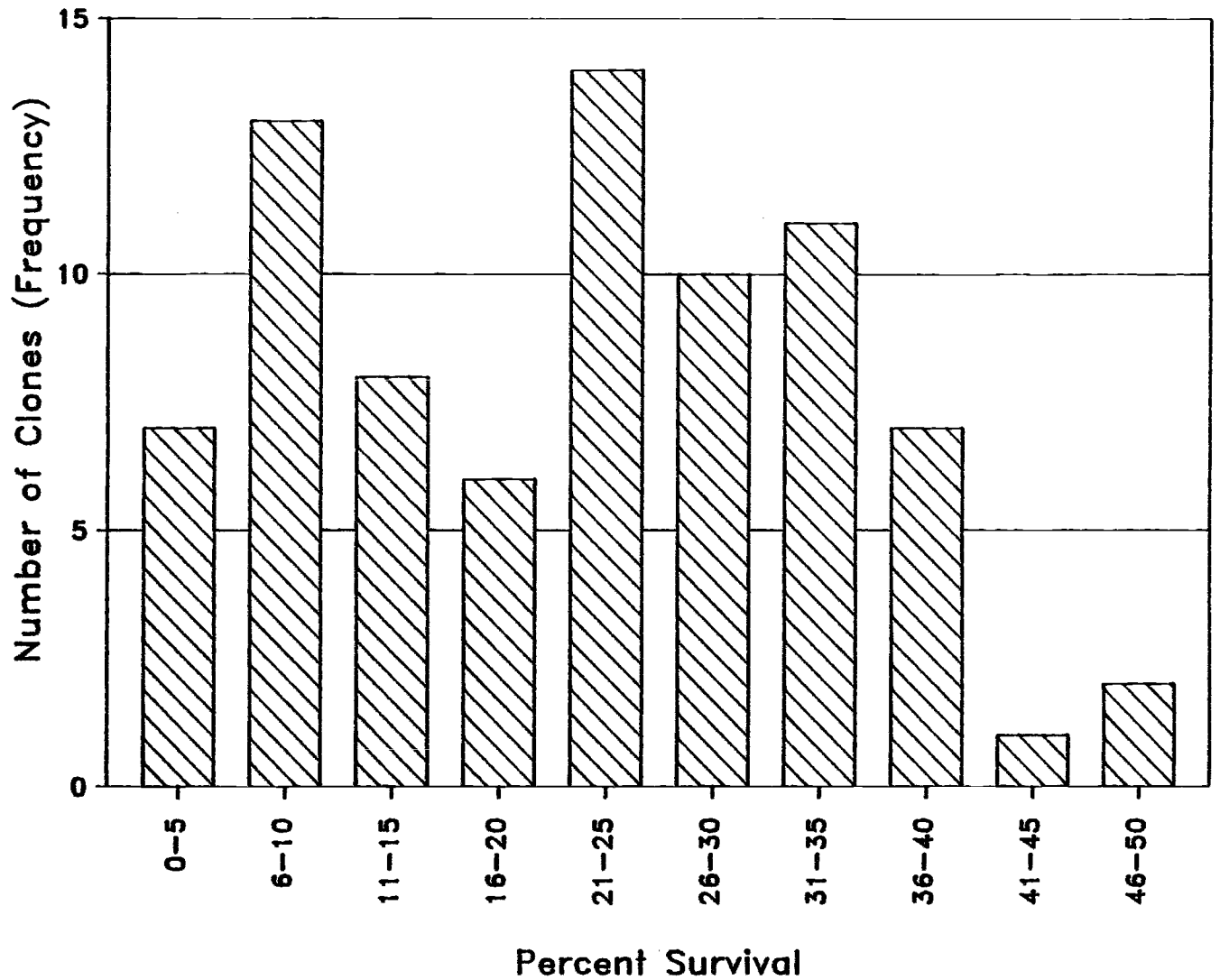


Fig. 1: Survival percentage for clones selected for germination, emergence, and establishment.

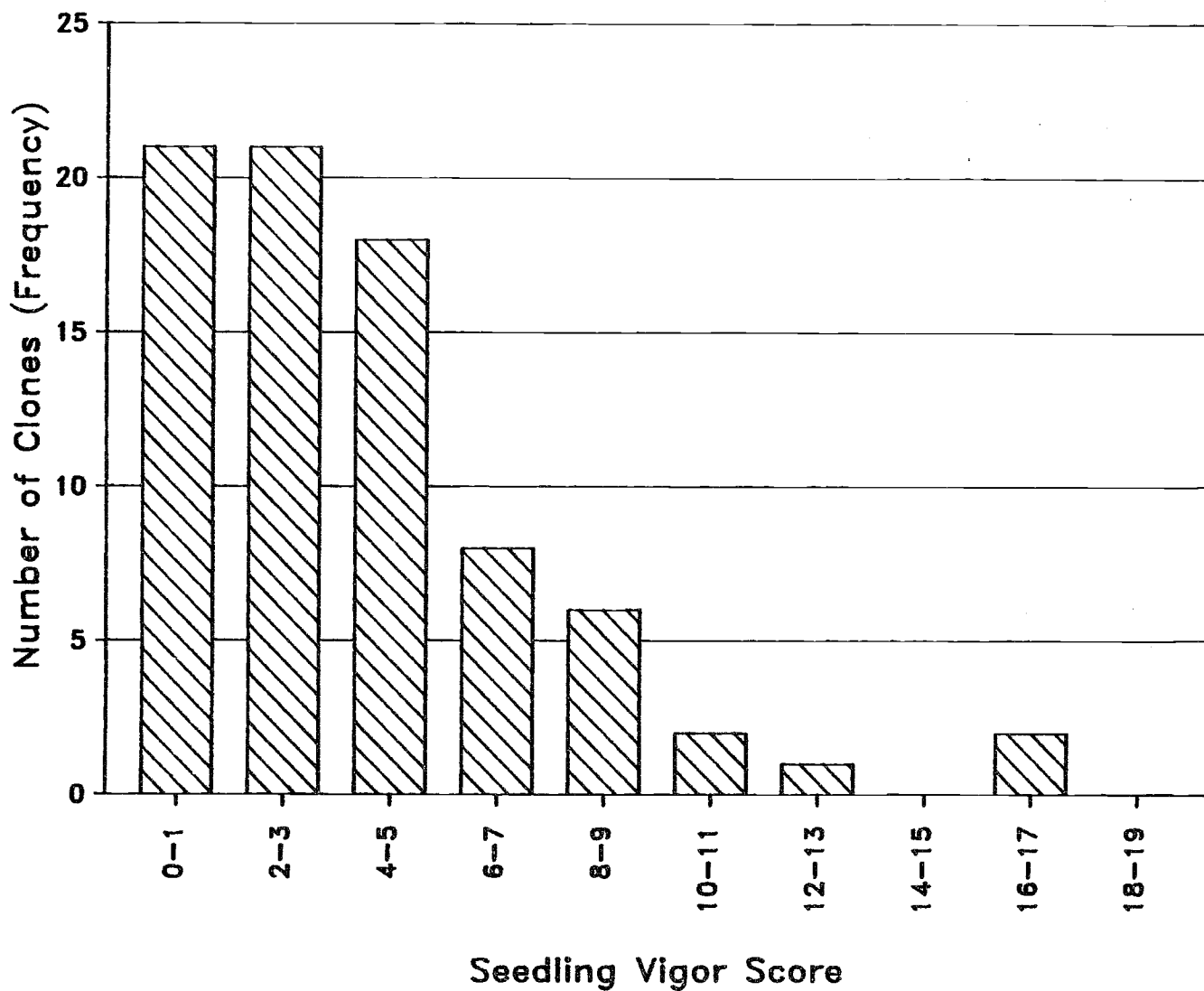


Fig. 2: Vigor scores for clones selected for germination, emergence, and establishment.