Open-Pollinated Seed Setting Among Self-Sterile Clones of Smooth Bromegrass

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Forage crop improvement is generally concerned with quality and quantity of vegetative production. Recent experience, however, in the introduction of improved varieties of forage crops has indicated that the seed producing ability of a new variety may well decide if it will be increased and distributed. The recent developments of producing seed of forage crops in areas of high seed production make it possible to put new varieties in use on farms very quickly. This can be done most effectively when the seed producing ability of new varieties is known at the time of release. In general, improved varieties should be equal or superior in seed production to the standard varieties in use at the time.

Information on plant characters associated with seed production and refined techniques for measuring these are needed in order to enable forage breeders to screen clones for seed production early in the breeding program. The objective of this study was to determine the association of certain characters of the inflorescence with seed producing ability for a selected sample of self-sterile clones of smooth bromegrass, Bromus inermis, Leyss.

The active growth period of most forage grasses consists of two phases—vegetative and reproductive. Although demarcation of the two phases is relatively distinct, both are constituent parts of the normal growth process. The reproductive phase which results in seed production is initiated by natural changes in environment. The developmental morphology for grasses has been described by Evans and Grover (6). A detailed description of the inflorescence in smooth bromegrass is given by Knobloch (10).

Smooth bromegrass enters the reproductive phase only under long day length. Its photoperiodic response has been extensively investigated (1, 5, 7, 11, 12). Induction of tillering and degree of heading are also influenced by temperature. Maturity types and strains within the species have been shown to differ slightly as to optimum temperatures for seed production (5). Soil nutrients, particularly nitrogen, have been shown to have a marked effect on seed production. Watkins (12) and Evans and Wilsie (5) have reported increased shoot and panicle production with nitrogen application. Harrison and Crawford (8) found nitrogen fertilization to cause an increase in seed weight and number of florets per panicle.

Marked differences occur among clones of smooth bromegrass for amount of seed set. This may be attributed in large part to genetic factors affecting cross- and self-fertility. Hill and Myers (9) in an extensive study of North American smooth bromegrass material concluded that the normal chromosome number is 2n = 56. The species is classed by Elliot and Love (4) as partially allopolyploid. Their study indicated a high degree of meiotic irregularity and was unable to associate this with pollen fertility.

A study of the species for relationship of seed setting with pollen size, fertility, and chromosome behavior (5), indicated that male and female fertility were related and that low seed setting was associated with chromosome abnormalities.

Materials and Methods

Thirty clones of smooth bromegrass, previously selected for desirable vegetative characteristics, were used in the study. They were relatively self-sterile as determined by analysis under bag. Inflorescences collected for study were from a polycross nursery made prior to 1948 in a replicated polycross seed production nursery. The nursery was in its second harvest year. Information obtained during the initial seed harvest year made it possible to determine seed production for study clones which represented a wide range in seed setting ability.

The polycross nursery containing the clones was divided into replications of single plants spaced 3 feet by 3 feet. Each clone was bulked with other plants of the same clone so that the total seed production could be determined for each.

Individual heads were counted for number of spikelets, number of florets per head, number of seeds per spikelet, number of seeds per head, and percent fertile florets. The clonal means for each of the different characters were subjected to an analysis of variance to determine the clonal differences. Where missing plants occurred, the method of correcting for missing values was used.

Results and Discussion

The clonal means for each of the different characters are given in table 1. The analysis indicated highly significant differences among clone means for all characters. Least significant differences are given for comparison.