Evaluation of ten strains of bromegrass prior to their use in a breeding program
by Alexander Haburchak

A THESIS Submitted to the Graduate Division in partial fulfillment the requirements for the degree of Master of Science in Agronomy
Montana State University

Abstract:
The amount of cross compatability was determined by crossing the ten strains of bromegrass, Bromus inermis Leyss, in as many combinations as the number of flowers would permit. Several panicles of each strain were selfed to determine the amount of self sterility.

It was found that the ten strains used, varied slightly in the number of days between panicle emergence from the boot and anthesis. The ones that exhibited a greater time length between these two periods appeared to have a larger percent seed set under field conditions In 1948.

The photoperlod of 18 hours, which was used in this study, did net produce the large number of panicles as reported by previous workers, however a large amount of vegetative growth was obtained, A highly significant positive correlation was found between the number of seeds per So panicle and the mean height of the seedlings established from the S0 seed, The mean height of the seedlings and the mean height of the So seedlings also were positively correlated.

The chromosome number of each of the seven strains counted was estimated to be 2n = 56.

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ABSTRACT

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It was found that the ten strains used, varied slightly in the number of days between panicle emergence from the boot and anthesis. The ones that exhibited a greater time length between these two periods appeared to have a larger percent seed set under field conditions in 1948.

The photoperiod of 18 hours, which was used in this study, did not produce the large number of panicles as reported by previous workers, however a large amount of vegetative growth was obtained.

A highly significant positive correlation was found between the number of seeds per S_0 panicle and the mean height of the seedlings established from the S_0 seed. The mean height of the S_1 seedlings and the mean height of the S_0 seedlings also were positively correlated.

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INTRODUCTION

Bromegrass is an important grass crop in Montana and in many areas of the United States. There is a large demand for this grass as a pasture crop and for soil conservation. This crop spreads by rhizomes making it particularly useful in the control of erosion.

The purpose of this study was to obtain all possible data on 10 strains of bromegrass which might be of value in a breeding program. Emphasis was placed upon the self sterility and cross compatability of each of the 10 strains. This was done to determine which strains would be most suitable in developing a synthetic variety. A synthotic variety possessing all or many of the desireable qualities of the selected strains may add additional value to this grass.

A chromosome count was made to see how these strains compared with other known strains in America.

REVIEW OF LITERATURE

Smooth bromegrass, Bromus inermis Leyss, was first introduced into the United States from Europe (7). The first known seed to be imported was from Hungary in 1884. This bromegrass was first known as Hungarian brome and currently consists of a group of strains referred to as the southern strains. Bromegrass proved well adapted in the United States, so in 1896 large amounts were imported. Most of the bromegrass imported at this later date came from Russia, and led to the development in this country of the northern strains.

Newell and Keim (7) found in an experiment performed in Nebraska, that the northern strains of bromegrass are generally shorter in height and less vigorous than the southern strains. When planted in the early spring or late fall under Nebraska conditions, the seedlings of southern brome were more vigorous. Preliminary tests, made by Newell and Keim, indicated that the differences become less pronounced when grown at higher altitudes. The southern strains appeared to be more tolerant to midsummer heat and drought than the northern strains. The southern strains in Nebraska grew vigorously during the shorter day period and flowered by May 18. The northern strains were later getting started in the spring and their flowering was not completed until May 30. The

southern strains grow well during the short days of spring and go into a dormant period during the hot dry weather while the northern strains continue their growth. The growth of the northern strains which continues throughout the dry period results in a smaller total amount of forage than does the discontinuous growth of southern strains. Under the conditions of their study, the designations "early" and "late" are suggested for the strains of southern and northern type, respectively.

Bromegrass is a naturally cross pollinated crop. White and McConkey (11) report that self sterility is "fairly marked" in bromegrass however, there is a wide variation between plants. Highly self fertile lines can be selected if desired. Tsiang (10) in a self fertility study of bromegrass reported that selfed lines were not as vigorous as open pollinated lines, but that there were wide variations. The selfed lines, on the average, were smaller in culm diameter and less vigorous in recovery than the open pollinated lines. Although reduction in the average forage yield of the selfed lines was significant, some selfed lines produced more than the open pollinated check.

The flowering of bromegrass is greatly influenced by the photoperiod. Evans and Wilsie (4) found in a photoperiod experiment on northern and southern strains of