The genus *Andropogon* has long been recognized as important in American grassland flora. Big bluestem, *A. gerardi* Vitman, is an important dominant in the North American true prairie formation, whereas sand bluestem, *A. hallii* Hack., is an important component of the vegetation on upland sandy soils farther west. These two grasses appear morphologically and cytologically much more closely related to each other than to any other of the numerous species of *Andropogon* in the southern and eastern part of the United States.

The need for a better understanding of the interspecific relationship of *A. gerardi* and *A. hallii*, as related to the improvement of strains and varieties for propagation, instigated this study. Investigations of the breeding behavior and hybridization of selected types of these two grasses were begun in 1953 at the Nebraska Agricultural Experiment Station, Lincoln, Nebraska. The effects of hybridization of clones of divergent types selected from different regions were evaluated in the F$_1$ and F$_2$ generations. The results of these studies are described and discussed in relation to the natural intercrossing between these groups and the potential utilization of hybridization as a method of improvement.

**LITERATURE REVIEW**

The genus *Andropogon* has been observed in nature by many workers. The reports of Britton (4), Chase (6), Petersen (16), and Rydberg (19, 20) indicate that morphological characteristics and ecological requirements have been noted within *A. hallii* and *A. gerardi*. Church (7), Nielsen (15), and Brown (5) studied chromosome numbers of these two types. It was observed that most of the plants studied were hexaploids with 60 chromosomes.

Remberg (18) studied the genus *Andropogon* in Nebraska during 1950 to 1953. From his observations and collections he concluded that *A. gerardi* and *A. hallii* have interbred to such a degree that he could interpret them either as hybridizing species or as interbreeding subspecies. With a supposition of parental types which he describes, he found introgression so intense that the hypothetical parental types were rarely found.

Studies have been made of intergeneric and interspecific hybridization as well as hybridization of phenotypes within species. It is common to refer to the progeny of two plants which differ by only one gene pair as a hybrid. On the other hand, "introgressive hybridization," as used by Anderson (2), refers to the transfer of germ plasm from one species to another by hybridization. Many biologists consider the concept of the Linnean species to be based on the supposition that the plants of a given species are separate entities unable to cross with plants of other species, or at least unable to produce fertile hybrids.

In their early work, Clausen, Keck, and Hievey (6) indicate that the species concept is an abstraction. Their ecotypes correspond to, but are not always identical with, the taxonomic species. To a limited extent, ecotypes can exchange genes. If they were crossed, their offspring are hybrids. If such offspring are selfed, or if the second-generation plants selfed, their offspring are weak. The genetic barriers between ecotypes or species may be produced by differences in numbers of chromosomes. If there is only one geographic or ecological isolation, the units are considered ecotypes of one ecotype. Ecotypes differ by many genes and hybridize freely where they meet, but at a distance from the point of contact they may be entirely distinct.

Dobzhansky (10) proposed to define species, not as static units, but as stages in the evolutionary process, 'at which the once actually or potentially interbreeding array of forms becomes segregated into two or more separate arrays which are physiologically incapable of interbreeding.' Species, according to Hatch (14), is the concept that the taxonomist develops on the basis of his data, but with the important qualification that it is subject to modification as more data accumulate or as those data available are better understood. Bateson (3) expresses most concisely that the species are more definite entities than all other groups. He states that species cannot be strictly defined, but that they have properties which botanical varieties do not have. The work of Harland (13) has shown that stable complexes of interrelated genes are built up within each species. When such species are crossed, the "genetic balance" is disrupted in the $F_1$ generation, giving a maze of abnormal and unbalanced types.

Observations on artificial hybrids of *Elymus triticoides* Buckl. × *E. condensatus*, Precl., *Agropyron Parishii* Scribn & Smith × *E. condensatus* and *E. glaucus* Buckl. × *E. condensatus* led Stebbins and Walters (22) to conclude that the present system of classification is far from satisfactory as a means of portraying the natural relationship between certain species. Cytological evidence, when integrated with external morphology, gave them a much clearer insight into the taxonomic relationship and species origin than the present system. The morphological characteristics of two genera of grasses, *Festuca* and *Lolium*, as reviewed by Stebbins (21), led him to conclude that some of the species of different genera differ from each other no more than do different species belonging to the same genus in the Gramineae family.

The work of Clausen et al. (9) indicates that they are fully aware of the variability within species. Both geographically and ecologically isolated races of a species are developed through the interaction of many genes as a balanced system in harmony with their environment. They indicate that differences between natural races are apparent and that when crossings of contrasting geographic or ecological races occur, the number of new forms may far exceed that in the wild population of the species. Thus the importance of interspecific hybridization is seen in providing a wide range of genetic material upon which natural selection can operate and give rise to new forms of plants.

**PLANT MATERIALS AND METHODS**

Plant materials used in this study were assembled and grown from earlier collections made in Nebraska, Iowa, and Oklahoma. Clones of sand bluestem, *A. hallii*, collected in the Nebraska sandhills near Valentine and Atkinson, in 1949 were transplanted and maintained on the nursery stock at Lincoln, Nebraska. Clones of sand bluestem derived from advanced-generation progenies of sand bluestem from the Southern Great Plains Experiment Station, Woodward, Okla., also were maintained in space-planted nurseries. Selections were made from these two sources of sand bluestem as parental stocks. Clones of big bluestem, *A. gerardi*, had been selected from breeding material obtained at Iowa State University, Ames, Iowa, and moved to Lincoln in May 1950. Clones of big bluestem of a Nebraska type were also selected from an advanced generation of progenies of selected material from Pawnee County, in southeastern Nebraska.

In the spring of 1953, pieces of selected clones from these 4 sources were transplanted from nurseries to 10-inch clay pots and moved to the greenhouse. Before anthesis in July and August, the florets of sand bluestem were emasculated and a few days later pollinated with pollen from big bluestem. Pollination of the florets by an unknown source was eliminated by covering the inflorescences with paper sleeves. After pollination, florets were covered with paper sleeves and placed on the inflorescences of some of the selected plants in the late evening. Pollen...