SWITCHGRASS, *Panicum virgatum* L., is a native tall prairie grass which offers much promise for utilization as a forage crop in the Great Plains and Prairie regions. The primary consideration in the choice of switchgrass for grazing is its growth during midsummer, when production of the cool-season grasses is low. It is important among the warm-season grasses because of its potentially good yields and relatively good seed quality and production, as well as for the ease with which seed is harvested and used in the establishment of stands, in contrast with chaffy-seeded grasses.

The desirability of establishing sound methods of improvement on the basis of the breeding behavior of the grass prompted this study. Estimates of heritability were thought to be of special interest as applied to a polyploid perennial grass. One objective of the study was to determine the magnitude of additive genetic variance among clones selected from endemic strains of the grass. In previous work (2) the authors showed the desirability of testing numerous strains from widely diverse habitats as potential sources for the selection of superior germ plasm. The present paper deals with studies of heritability among clonal selections within selected endemic strains of switchgrass obtained from diverse sources in the central plains and prairies.

**LITERATURE REVIEW**

In a previous paper the authors (2) reviewed certain earlier work with switchgrass and described the sources and types of switchgrass from which selections of clonal materials for this study were made. Switchgrass types found in the Central Plains region fall into two broad types: one consisting of relatively fine-stemmed, semi-deciduous, broad-based plants, usually blue-green, and typically occurring on sandy or loamy soils of northeastern and western Nebraska; the other consisting of erect, coarse-stemmed, light green plants, found on fine-textured soils of southeast Nebraska and northern Kansas. The authors estimated heritability in a broad sense for seven characters exhibited by endemic strains of switchgrass collected from a range of sources and predicted gains which might be expected for each of these characters from the use of the best collections. The preliminary study indicated the desirability of selection of clonal material from these superior strains.

Burton and DeVane (1) studied the genetic variation in a clonal population of tall fescue, *Festuca arundinacea*, in order to estimate the progress that might be expected in developing a variety better adapted to the Coastal Plains of Georgia. Six vegetative propagules of 49 clones were used to obtain data for heritability estimates in a broad sense by the method of variance components. Heritability estimates on a single plant basis ranged from 0.34 for seed yield to 0.59 for ratings of disease resistance. Other characters evaluated were green weight and ratings for plant yield, yield of dry matter, and the protein content of the leaves.

Frey and Horner (3) used *F*₁ and *F*₂ data from crosses to compare actual gains from selection with those based on the variance-component and parent-progeny methods of estimating heritabilities. They concluded that the method of parent-progeny regressions in their experiment tended to underestimate the true heritability while the method of parent components gave values which closely approximated the results obtained.

Using a biparental mating system with three or four hybrids, Robinson et al. (9) compared estimates of heritability in a narrow sense, calculated from the components of variance, estimates calculated from parent-progeny regressions. The method of parent-progeny regressions in this study was calculated on both the male and female parents. The results were then used to obtain the heritability estimates, since cross-pollination was the subject of study. Results were generally similar using the two methods. The estimates for plant height, ear height, and ear characters were relatively high, whereas the estimates for plant ear characters were relatively low.

Nielsen (8) studied plant variation and chromosome numbers of *Panicum virgatum* from an area extending from Arizona to northern Kansas. A polyploid series ranging from the diploid *Panicum virgatum* to the hexaploid *Panicum virgatum* was reported. He found no geographical segregation in chromosome numbers or the presence of tetraploid and hexaploid types in the same chromosome number. MacMillan and Willoughby (7) noted from collections of switchgrass in the Great Plains that new characters, such as the control of anthesis earlier than higher ploidy types within a representative sample of same chromosome number. Natural selection has favored tetraploid plants of short stature in the more northern areas, and in the areas progressively southward it has yielded hexaploid plants. There was a tendency for lower ploidy types of *Panicum virgatum* to have anthesis earlier than higher ploidy types within certain samples. They found the tetraploid number, 2n = 36, to be more frequent in the northern central states than the hexaploid number, 2n = 72, while populations with a preponderance of these types were found in Kansas. Hexaploid types occurred less frequently and were only in association with other types, suggesting their origin by hybridization.

In polyploids, unless chromosomes are known to occur as bivalents, the interpretation of heritability estimates may be affected. In diploids and allopolyploids, the parent-progeny variance includes one-half of the additive genetic variance, and in autopolyploids the parent-progeny covariance in autopolyploids includes some variance from the dominance type. Kemphorne (4) showed that with two and three genotypes, the parent-progeny covariance in autopolyploids includes some variance from the dominance type. He assumed no epistasis and determined the protein content of the leaves.

Eberhart and Newell (2) in their evaluation of the agronomic value of switchgrass used the combined data from two years to remove the strain × year interaction from estimations.