

Burton G W. Quantitative inheritance in pearl millet (*Pennisetum glaucum*).
Agronomy J. 43:409-17, 1951.
[US Department of Agriculture, Tifton, GA]

In this paper, measurements of nine quantitative characters on a total of 13,874 parent F_1 and F_2 plants of pearl millet were analyzed by 10 old and new statistical methods to explain their inheritance and assist the breeder in developing improved forage variety. [The SC1[®] indicates that this paper has been cited in over 105 publications since 1955.]

Glenn W. Burton
Georgia Coastal Plain
Experiment Station
Agricultural Research Service
US Department of Agriculture
Tifton, GA 31793

September 17, 1985

My research on the genetic improvement of pearl millet (now called *P. americanum* Leeke) began at the Georgia Coastal Plain Experiment Station, Tifton, Georgia, in 1936. Then it was called cattail millet because of its cattail-like heads and was widely used as a summer-growing pasture grass. Fresh out of Rutgers, I was assigned to breed better grasses for the South, and cattail millet was one of the grasses listed by my USDA boss.

Because nothing was known about the mode of reproduction of cattail millet, my first years were spent studying chromosomes and flowering habits, creating inbred lines, making hybrids, and trying to develop an improved variety. I soon learned that cattail millet was a cross-pollinated crop and that excellent selections in a population gave rise to inferior progeny when selfed. An extensive inbreeding program begun in 1937 had by 1944 produced lines varying widely in height, maturity, leafiness, and fertility, but none of them measured up to my ideal. My efforts to improve the crop by selection had failed miserably. Obviously, I needed to know how the quantitative characters that I wanted were inherited.

Therefore, in 1945 and 1946, I grew large F_1 and F_2 populations of crosses between some widely different inbred lines, along with their parents, in an effort to explain the inheritance of these characters. Measurements of nine quantitative characters on a total of 13,874 plants supplied a large amount of data. Methods to give the desired answers were limited in the late 1940s. Sewell Wright, in a letter, supplied a formula for estimating minimum gene numbers. Several years elapsed as I discussed our wants with men like H.F. Robinson and R.E. Comstock, before I had enough information to prepare my paper. A 1949 paper by these men was very helpful.¹ In a letter, Comstock suggested a method of eliminating some of the nonheritable effects confounded in correlations to produce a new, more useful statistic called "genetic correlations."

Finally, in 1950, I prepared a paper describing the methods, old and new, that I had used to analyze my pearl millet data. I also explained what I thought I had learned. Several friends suggested that the information presented in the *Agronomy Journal* should be presented in a more general way at the Sixth International Grassland Congress, which I did in 1952.² Information gained from this study helped us develop Starr pearl millet, a very popular variety that was more like our ideal than the old cattail and yielded up to 25 percent more forage.

Why has this paper become a *Citation Classic*? Perhaps because it brought together in one publication old and new quantitative inheritance methods and suggested how they might be used to help the plant breeder. Plant breeders with many crops other than pearl millet probably have found the methods described in the paper useful in their work.

Since the classic paper was published in 1951, the active research program with pearl millet has been continued.³ To date, this program has produced over 100 publications, released two forage varieties, three forage hybrids, cytoplasmic male sterility to permit commercial F_1 hybrids, and 15 inbred lines. My most recent paper will be published soon in *Crop Science*.⁴

1. Robinson H F, Comstock R E & Harvey P H. Estimates of heritability and the degree of dominance in corn. *Agronomy J.* 41:353-9, 1949. (Cited 60 times since 1955.)
2. Burton G W. Quantitative inheritance in grasses. *Proceedings of the Sixth International Grassland Congress*, State College, Pa., 1952. Washington, DC, 1953. Vol. 1, p. 277-83.
3. -----, Breeding pearl millet. *Plant Breeding Rev.* 1:162-82, 1983.
4. -----, Identifying heterotic blocks on pearl millet chromosomes with chlorophyll deficient mutants. *Crop Sci.* 26, 1986. In press.