*Indian J. Genet.*, **54** (1): 27–31 (1994)

# GENETIC VARIABILITY AMONG $S_1$ FAMILIES FOR OGI YIELD IN MAIZE (*ZEA MAYS* L.)

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**(Received: February 2, 1993; accepted: August 19, 1993)**

## ABSTRACT

**Variability among $S_1$ families, derived from an unimproved landrace (BC 63) of maize (*Zea mays* L.) was evaluated for ogi (a fermented cereal porridge made from maize) yield and kernel weight. Significant inter family variations were observed for both traits. Broadsense heritability estimates were substantially high as 55.4 and 52.0% for ogi yield and kernel weight, respectively. Genetic gains at 30% selection pressure for ogi yield and kernel weight were estimated to be 6.1 and 7.2%, respectively.**

**Key words:** Ogi, kernel weight, maize, heritability, genetic advance, $S_1$ family.

Ogi is a popular local Nigerian name used to describe a gelatinized starch thin porridge with a smooth, creamy and free-flowing texture. It is similarly used to describe a wet or dry starch prior to being used for the preparation of a porridge. Ogi is obtained by wet milling of fermented cereal grains, followed by sieving and drying [1]. In some cases the wet solid starch is preserved for use without drying. The ogi preparation from maize and sorghum are extensively consumed in Africa. Ogi is processed into both soft porridge (akamu) and stiff paste (agidi) and consumed by people of all age and economic status [2]. Ogi contains approximately 3–4% oil and 7–8% protein. However, the nutritive value of ogi after processing of steeped maize depends on the method of preparation [3].

There is practically no information on the genetic control of ogi yield. Similarly, very few breeding programmes are specifically aimed at the improvement of ogi yield in maize in spite of its high food value.

The research programme reported here was designed to assess genetic variability among $S_1$ families for ogi yield in an unselected landrace of maize. Estimates of heritability and genetic gain are also reported.

## MATERIALS AND METHODS

A locally adapted landrace maize cultivar, BC 63 with floury endosperm and high ogi yield [4], was used as the source material. In the second cropping season of 1990 (August-December), a crossing block was planted including BC 63. At the time of silking, 150 plants were selected and self-pollinated. As a result of severe damage and pilferage of fresh ears, only 41 self-pollinated plants could be harvested. Thus 41 $S_1$ ears were individually harvested, dried at 40°C in a Gallenkamp moisture extraction oven for 48 h, shelled, bulked and stored at 4°C in a refrigerator. In the first cropping season (April–August) of 1991, the 41 $S_1$ lines were evaluated at the Teaching and Research Farm of University of Benin. The trial was laid in randomized complete block design with two replications. Each $S_1$ line was planted in a 3-row plot of 5.0 m length. The rows were spaced at 75 cm and plants within the rows were raised at 25 cm.

The ears in the middle of each $S_1$ family were harvested at maturity, dried, shelled, bulked and stored at 4°C. Before storage, kernel weight, was recorded taking 100 random kernels from each $S_1$ family. From the stored seeds of each $S_1$ family, 100 g sample was taken and used to estimate ogi yield as per method described by [2]. Wet ogi extracted from steeped maize was dried at 60°C for 18 h in a Gallenkamp moisture extraction oven. Ogi yield was recorded on dry weight basis after adjustment for moisture content. Moisture content of dried ogi was determined by drying a 5.0 g sample in a moisture extraction oven at 130°C for 2 h.

Genetic variances and broad sense heritability were estimated for ogi yield and 100-kernel weight using the procedure of [5] for $S_1$ family selection method. Predicted genetic advance at 30% selection intensity was calculated using the formula of [6] and actual advance from selection was computed by the formula described by [7].

## RESULTS AND DISCUSSION

The frequency distribution of mean ogi yield among $S_1$ families is presented in Fig. 1. The distribution has a mean of 49.0% and range 33.9-56.5%. The mean distribution of 100-kernel weight among the $S_1$ lines is shown in Fig. 2. The distribution has an overall mean of 26.7 g and range 19.1–35.5 g.

Mean squares among the $S_1$ lines were significant ($P < 0.05$) for both ogi yield and 100-kernel weight which indicates that these $S_1$ families differed between each other for both the characters.

The estimate of broadsense heritability (Table 1) revealed that 55.4 and 52.0% of the total variability was accounted for by genetic variance for ogi yield and 100-kernel weight,

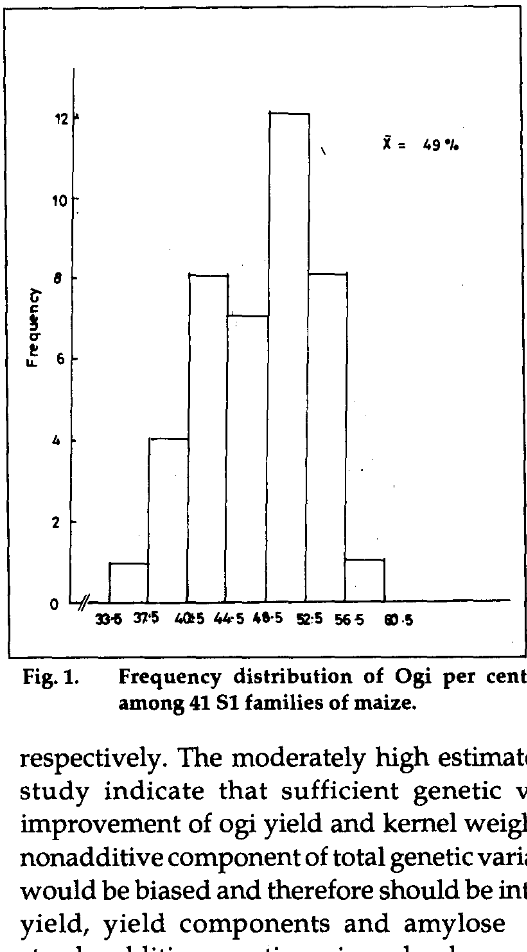


**Fig. 1. Frequency distribution of Ogi per cent among 41 S1 families of maize.**

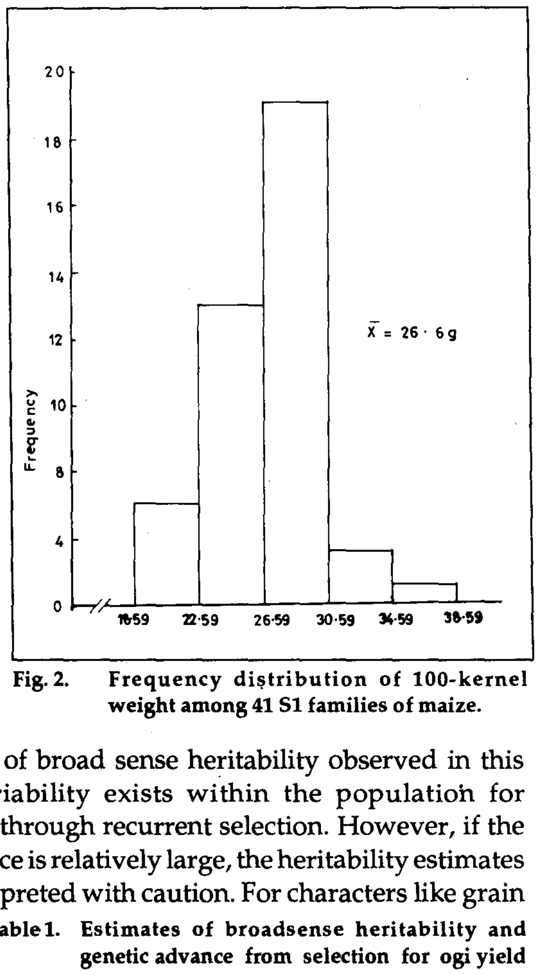


**Fig. 2. Frequency distribution of 100-kernel weight among 41 S1 families of maize.**

respectively. The moderately high estimates of broad sense heritability observed in this study indicate that sufficient genetic variability exists within the population for improvement of ogi yield and kernel weight through recurrent selection. However, if the nonadditive component of total genetic variance is relatively large, the heritability estimates would be biased and therefore should be interpreted with caution. For characters like grain yield, yield components and amylose starch, additive genetic variance has been reported to be more important than dominance variance among $S_1$ families [8, 9]. The relative efficiency of recurrent selection method for the improvement of oil content and amylose starch in maize has been discussed [9, 10].

**Table 1. Estimates of broadsense heritability and genetic advance from selection for ogi yield and kenel weight among $S_1$ families of maize**

| Trait | Heritability (%) | Genetic advance (% of mean) | |
|---|---|---|---|
| | | predicted | actual |
| Ogi yield | 55.4 | 6.1 | 9.6 |
| 100-kernel wt. | 52.0 | 7.2 | 13.6 |

The values for predicted genetic advance from selection expressed as per cent of population mean for ogi yield and kernel weight were 6.1 to 7.2, while the actual genetic advance was 9.6 and 13.6%, respectively. The difference between the observed and predicted genetic gain may be due to genetic drift. These moderate level of calculated genetic advance from selection based on 30% intensity further indicates the probable improvement that can be attained in ogi yield and kernel weight in the BC 63 population. Although genetic estimates from a population are considered to be population specific, response to selection could be maintained over several generations with only little change [11]. The mean ogi yield of the selected families was 53.7% compared to 49.0% over the entire population.

Positive nonsignificant correlation (r = 0.12) was obtained between ogi yield and 100-kernel weight. The low correlation between these parameters indicates that ogi yield cannot be improved on the basis of kernel weight in maize. Therefore, some grain characteristics having high correlation with ogi yield should be investigated to increase efficiency of selection for ogi output in large samples.

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