

Quantitative Analysis of Stover Quality in  
the Lancaster Variety of Corn

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INTRODUCTION

In the mid-1970's various studies began to stimulate interest in the genetic investigation of maize used specifically as forage. Gallais *et al.* (1) showed that the proportion of grain could not be employed as the sole criterion of quality. Hunter (2) reported that a selection directed towards a good yield of total dry matter and a high quality in the whole plant would be more promising than that aimed at grain yield. Deinum & Bakker (3) expressed the opinion that selection for the nutritive quality of the stover would be worthwhile. The present study evaluates the genetic potential in the production and quality of stover in two varieties of maize which have proved valuable as a base material for the production of grain.

MATERIAL AND METHODS

The varieties BS13(S2)C4 and Lancaster were chosen. The quality of the stover was estimated by means of the digestibility "in vitro" of the dry matter (dDM) in plants harvested with a percentage of DM ranging from 29 to 35%. Alternative methods were sought to simplify the determination of the DM. The best correlation found was with neutral detergent fibre according to the equation  $dDM = 105.37 - 0.93NDF$ , ( $r = -0.91$ ). Other traits considered are indicated in Table 1.

A total of 63 families of half-sibs and 187 families of full-sibs were analyzed according to the model proposed by Comstock & Robinson (4). The traits were studied in 20 individuals per family of full-sibs, with the exception of NDF for which three individuals were selected at random from each family.

RESULTS

The Lancaster variety yielded 15% more total digestible dry matter, and showed greater variability than the variety BS13(S2)C4. Therefore, it was decided to continue the study with the Lancaster variety only.

The estimated heretability of the stover NDF was 0.32, with a response to selection (R/i) equal to 1.70% (Table 1).

search for variables which may positively influence  
tion of high quality dry matter, a study of the

additive genetic and phenotypical correlations among the considered traits was done (Table 2). The negative correlation between NDF and the yield parameters is especially interesting.

Table 1: Heretability and response to selection of the following traits: PS= days to pollen shedding, PH= plant height (cm), TN= total nodes, SY=stover yield (g), EY= ear yield (g), TY= total yield (g), NDF= neutral-detergent fibre (%), and EH/PH= ear height/plant height.

|                      | PS   | PH    | TN   | SY    | EY    | TY    | NDF  | EH/PH |
|----------------------|------|-------|------|-------|-------|-------|------|-------|
| $h^2(\%)$            | 72   | 51    | 90   | 34    | 26    | 37    | 32   | 88    |
| R/i                  | 1.67 | 11.15 | 1.20 | 10.32 | 10.35 | 22.58 | 1.70 | 0.06  |
| $100[(R/i)/\bar{X}]$ | 2.69 | 4.63  | 7.86 | 9.00  | 8.31  | 9.44  | 2.63 | 11.21 |

Table 2: Additive genetic correlations (above the diagonal line) and phenotypical genetic correlations (below the diagonal line) for the distinct parameters studied.

|       | PS    | PH   | TN    | SY    | EY   | TY    | NDF   | EH/PH |
|-------|-------|------|-------|-------|------|-------|-------|-------|
| PS    | ----  | 0.56 | 0.62  | 0.30  | 0.47 | 0.41  | 0.02  | 0.85  |
| PH    | 0.23  | ---- | 0.50  | 0.72  | 0.83 | 0.80  | 0.06  | 0.41  |
| TN    | 0.43  | 0.45 | ----  | 0.33  | 0.53 | 0.45  | 0.08  | 0.52  |
| SY    | 0.17  | 0.42 | 0.32  | ----  | 0.90 | 0.97  | -0.50 | 0.35  |
| EY    | 0.13  | 0.48 | 0.31  | 0.48  | ---- | 0.98  | -0.50 | 0.46  |
| TY    | 0.16  | 0.52 | 0.36  | 0.82  | 0.90 | ----  | -0.50 | 0.42  |
| NDF   | -0.22 | 0.06 | -0.03 | -0.44 | 0.24 | -0.10 | ----  | -0.33 |
| EH/PH | 0.37  | 0.01 | 0.30  | 0.09  | 0.10 | 0.12  | -0.04 | ----  |

DISCUSSION

According to the results, it can be concluded that the Lancaster variety, which has traditionally been employed to obtain grain material, could also be used as a starting point in the breeding of productive highly digestible forage corn. The negative correlation of NDF with grain and stover production would be very favourable. One point of departure for selection might be the search for taller plants though this implies a relative increase in ear height with the consequent risk of lodging.

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