Embryo-cultured mutant seedlings grown under sterile conditions on an agar medium with mineral salts (including nitrate) and sucrose show good mutant expression under artificial lighting. Chlorophyll content was determined spectrophotometrically. Mutants contained roughly one-half as much chlorophyll, per fresh weight, as normal plants under the same conditions. The addition of ammonium ion, urea, or one of the common naturally occurring amino acids to the medium resulted in an increase in chlorophyll content of the mutants to various degrees - up to 44% above that of mutant controls. The greatest amount of greening resulted with the addition of L-alanine.

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1. Evaluation of root systems as measured by resistance to uprooting.

In the maize breeding program carried out at the University of Pretoria, South Africa, it has become increasingly apparent that root systems are of great importance in maize to be grown in a relatively dry climate. Casual observation had led us to believe that a good root system was strongly correlated to yield, but in order to test this hypothesis, it was necessary to devise some method of evaluating the root system of a plant.

An apparatus to measure the pull necessary to uproot individual plants was designed and found to be practical in field trials. The apparatus consists of a lever, mounted on two legs, which exerts a vertical pull (measured by an attached scale) on a clamping head. The head is clamped around the stalk of the plant to be pulled as close to the ground as possible and then a steady pressure exerted on the lever until the plant is uprooted. The maximum pull needed to uproot the plant is then read from the scale.

Since resistance to uprooting would be expected to vary for different soil types, moisture conditions, and plant growth stages, all preliminary trials were conducted

with plants of the same age (about 4 weeks before harvesting) and all pulling was done on the same day, thus under the same moisture conditions. Experiments to determine pulling differences due to soils, moisture and plant age are now in progress.

Resistance to uprooting was tested in a double lattice experiment with 64 entries and 4 replications. Yield data were taken from 40-plant plots and uprooting resistance data from the first 4 plants in each plot. The Coefficient of Variability for yield in this experiment was 6% while that of uprooting resistance was 5%. The Coefficient of Correlation of yield to uprooting resistance was +0.67. These results seem to bear out the following points:

1. A good root system as measured by resistance to uprooting is strongly correlated to yield under South African field conditions.
2. Four plants of each type give the necessary information on resistance to uprooting. Since this number of plants is so low, the uprooting can be carried out easily in field trials.

A preliminary unreplicated trial in which 10 plants of each type were uprooted gave the results shown in Table 1. The maximum pull needed to uproot a single plant in our experiments was of the order of 900 lbs.

Table 1

Maize type	Pull needed to uproot in pounds
South African Varieties	
Potchefstroom Pêrel	224
Pretoria Potchefstroom Pêrel	329
Natal Potchefstroom Pêrel	241
Peruvian	271
Sahara	278
Gobi	259
South African Hybrids	
SA 4	378
SA 100	332
SA 200	296
SA 60	355
SA 9N	376
SA 11	316
SA 33	301

Table 1 Continued

Maize type	Pull needed to uproot in pounds
Inbred Lines	
T15R	439
A17	96
K64	282
K64R	277
CI 64	236
Mexico 155	374
Mo 21 A	408
CI 90A	188
Miscellaneous	
Texan	438
American IV-1	317
Hooker B	245

Preliminary experiments on the mode of inheritance of uprooting resistance indicate a relatively simple form of inheritance. Since most of the South African types tested were low or intermediate in resistance to pulling it is hoped that good improvement in root systems can be made by selection for this characteristic.

Drawings of the apparatus used to measure resistance to uprooting will be furnished to interested parties on request.

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