treated seeds were germinated on sterilized 1% sucrose agar and the root tips took 2 weeks after treatment. These seedlings were grown to maturity.

Of the numerous stains tried, the best preparations were obtained by placing the root tips in alcoholic hydrochloric acid carmine stain as described by Snow (6) for 18 to 18 hours. The heavy staining in the cytoplasm could be partially cleared by placing the stained root tips in 45% acetic acid for 10 to 15 minutes before the smears were made. The stained root tips were placed on a slide cut into several pieces in a drop of 45% acetic acid and a coverslip added. A better spread of cells and additional clearing of the cytoplasm was obtained by heating the slide over an ethyl alcohol flame to bring the acetic acid nearly to boiling before tapping the coverslip with a pencil.

Results

The results for each pH level are summarized in Table 1. The numbers represent individual seedlings, each being based on cytological observations made on smears of three root tips.

For seedlings classed as 2n or 4n, all cells that were in division stages were in that category. It is possible that only part of the nondividing cells belong in the same category. Those classed as 2n and 4n (mixoploid) had both types of cells.

All the checks showed an occasional lagging chromosome, and the normal chromosomes number which is 14. In the early to mid-prophase stages, three chromosomes were usually associated with a single nucleolus. Occasional cells were observed with two nucleoli, i.e., a larger nucleolus with two prochromosomes, and a smaller one with one prochromosome. None of the 274 check plants examined showed any abnormalities listed in Table 1. Germination of the check material was 93 to 98%.

Treatments at the lower pH levels were much more effective in producing seedlings for which the dividing cells in three root tips examined were all tetraploid. Table 2 emphasizes the fact that pH 4 produced a higher frequency of seedlings classed as tetraploid and a lower frequency of seedlings classed as mixoploid, whereas at pH 6.5 or 7.6, the frequency of the tetraploid class was low and that of mixoploid was high.

Some seedlings had fragments of chromatid in all the dividing cells. In addition certain cells showed longer and shorter chromosomes which might be the result of chromosome breakage followed by fusion. In others there was a diffuse appearance which suggested that the chromatid had become uniformly dispersed.

A few aneuploid cells, one with four and several with two extra chromosomes were observed after treatment at pH 5 and pH 8.

Damage to the cell produced by the colchicine treatment was evidenced also by other effects, e.g., reduction of mitotic activity, clumping of the chromosomes at prophase and a greater tendency for the chromosomes to be stuck together at metaphase. Later prophase stages seemed to be most susceptible, but the effect persisted through anaphase. Finally, treatments with colchicine also seemed to produce a disturbed pattern of the structure of the secondary cell walls. Also there were clusters of other cells which were greatly elongated, and palisade-like in appearance. The origin and the meaning of these is unknown.

Five plants from Experiment No. 3 which had shown chromosome fragmentation in their root tips were sampled again 9 months after treatments. Two of them had a high frequency of cells with chromosome numbers ranging from 4 to 14. Flow cells with lower numbers were able to survive is not known.

The techniques developed have been found very useful in creating tetraploid red clover plants and are being used rather extensively in our laboratory.

LITERATURE CITED


STALK STRENGTH OF STRAINS OF MAIZE OF COLOMBIA, ECUADOR, AND VENEZUELA AS MEASURED BY RIND THICKNESS1

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The importance of the development of lodging resistant maize (Zea mays L.) to minimize harvesting difficulty and loss is widely recognized. Current U.S. hybrids have strong stalks in comparison with the open-pollinated varieties which they replaced, but there is need for further improvement. The rate at which this improvement can be accomplished and possibly the strength level which can be attained may depend on the identification of new sources of stalk strength for breeding material.

Maize strains of Ecuador, Venezuela, Colombia, and other Latin American countries were collected and stored by the Rockefeller Foundation in collaboration with government organizations of the various countries. These collections have been described, classified, and catalogued in a series of monographs (1, 2, 4) and show the diversity of Andean maize.

The primary object of this work was to identify promising sources of stalk strength in maize.

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