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1. Dual nucleoli at diakinesis.

A highly asynaptic plant occurred in a culture segregating for lower frequencies of asynapsis and normal. Failure of association was evident in all of the 113 cells scored at diakinesis. The number of disassociated pairs ranged from ten to two with an average of six per cell.

In contrast to the single nucleolus regularly present in normal material, 14 microsporocytes had two nucleoli at diakinesis. Chromosome 6 could be detected adjacent to each nucleolus in most of the cells. Although some of the cells had nucleoli of approximately equal size, one nucleolus was usually considerably larger than the other. Dual nucleoli are evident in somatic cells due to widespread separation of organizers resulting in failure of fusion. The dual nucleoli in the asynaptic microsporocytes presumably reflected greater than normal spatial separation of the homologues of chromosome 6 and organizers during nucleolar formation in the premeiotic division.

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1. The culture of sweet corn inbreds in the greenhouse.

A greenhouse is of inestimable value to most plant breeding programs and is no exception to a corn breeding project. For years Dr. D. F. Jones (2) in Connecticut, Dr. F. D. Richey (4) at the U.S.D.A. and others involved with corn breeding projects have made considerable use of greenhouses for growing "off season" crops.

While it is not feasible to conduct yield trials or practice selection for specific characters when selfing in the greenhouse, plants grown under these conditions can be used for making limited quantities of seed of experimental hybrids or more especially as a time saver when

proceeding with backcross programs. This includes the backcross transfer of specific genotypes into male sterile cytoplasm as well as the development of appropriate restorers used in the cyto-sterile technique.

When working with early to mid-season maturities of sweet corn in northeastern U.S., it is possible to grow one generation out-of-doors in the summer followed by two successive generations in the greenhouse. The seed can be harvested and dried in time for the next out-of-door spring planting. Hence, with this schedule, 6 to 10 backcrosses can be completed in 1/3 to 1/2 the normal time required. It should be noted that in the autumn, crops are not usually as satisfactory as those grown in the spring; in general, the earlier the fall crop is planted, the better are the results. The spring crop is generally planted by January 15 and benefits from the lengthening days as it develops.

Years ago Dr. D. F. Jones (2) recommended using a fertile field soil as the proper media for growing corn in the greenhouse. This alone did not produce adequate growth or production among early sweet corn inbreds. Subsequently we used a fertile Scarborough very fine sandy loam supplemented with manure and 5-10-10 commercial fertilizer. On several occasions it was evident that we "burned" the plants and soluble salts had become a problem. More recently, we have used the following soil mixture with excellent results: 7 parts soil, 3 parts peatmoss and 2 parts sand; 60 grams of superphosphate and 60 grams of ground dolomitic limestone are well mixed with each bushel of the mixture.

For several years plants were grown directly in ground beds but in the greenhouse it affords more control to grow them in buckets. Heavy duty 10-quart pails are used and six 5/8 inch holes drilled in the bottoms to provide for drainage of excess water. The soil is compacted gently in the buckets to about two-thirds full and seeds are planted 3/4 to 1 inch deep. From 7 to 10 seeds are planted in each bucket; after germination, when the plants are about four inches tall they are thinned, leaving the two sturdiest ones to remain. The plants to be discarded are carefully cut off at the base to avoid disturbing the remaining ones. Since the young plants are often weak stemmed and their roots develop near the soil surface, soil is gradually added until it is within 2 inches of the top of the buckets.

It is imperative to keep the soil uniformly moist and not allowed to dry out. A soluble fertilizer is first applied when the plants are approximately 6 inches tall. This is comprised of 30 grams of soluble 20-20-20 in 8 quarts of water. One quart of this nutrient is applied every 10 days to each bucket. This has sustained a vigorous, healthy, sturdy type of growth. The fertilizer treatments are terminated shortly after the time of pollination.

It is advisable to give some support to the plants since the stalks are more succulent and somewhat weaker than when grown out-of-doors. Securing the plants with twine or "Twistems" to bamboo canes or a wire trellis is a satisfactory means of protection from damage by workmen in the greenhouse.

Supplementary illumination is necessary to produce normal, healthy growth. Extra light is provided from seedling emergence until pollination time. We have used 30 lamps in a 400 square foot area which accommodates 70 to 80 buckets (up to 160 plants) as a maximum. Ordinary 200 watt Mazda lamps are fitted with 16 inch diameter reflectors. The lamps are suspended from overhead pipes at a position of about 30 inches above the plants by means of the electric cords attached to and supported by a light guaged chain. A small hook attached to the top of the reflector allows the lamp to be raised or lowered by inserting the hook in the chain at the height desired. The lights are regulated by an automatic switch which is turned on about 3:30 P.M. and off at 10:30 P.M. It also seems beneficial to switch them on during the dark winter days when the sun is not shining.

Traditionally it has been said that corn grows best during hot weather. Livingston (3) showed that the rate of growth of corn increased with increasing temperature up to 89°F. We have obtained very fast growth in the greenhouse with the temperature held constantly at 80°F. Under this condition, however, the plants become tall and slender with weak stalks; ears were often barren of seed or at best the yields were disappointing. Some improvement was noted when the night temperature was lowered 10 to 15°. At the suggestion of Dr. R. G. Creech (1) we have grown many crops maintaining the temperature constantly at 68°F. with extraordinary success. At this temperature plant growth has

been excellent with very satisfactory ear production and seed yields. Although seed size, yield and quality are inferior to seed grown out-of-doors, its germination and vigor are sufficient to produce extra generations in a given time and this allows for speeding the program.

Literature Cited

1. Creech, R. G. 1963. Personal communication.

2. Jones, D. F. 1945. Personal communication.

3. Livingston, Burton Edward. 1916. Physiological temperature indices for study of plant growth in relation to climatic conditions. Physiological Researches 1:399-420.

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1. Hybridization and parallel variation studies with the wild relatives of maize.

Genetic and cytogenetic studies of Tripsacum, teosinte, maize x teosinte hybrids, and maize from field collections made in Central Mexico (MGNL 44:188) are now under investigation. Previous studies have indicated that the maize grown in fields where teosinte was present as a weed often exhibited more variation than maize from fields some distance from a teosinte population; yet this variation was not as great as the segregation seen in experimentally produced maize x teosinte hybrids and subsequent backcross generations. A second observation, in fields where teosinte was present and did hybridize with maize, was the surprisingly low frequency of hybrids.

The frequency of maize x teosinte hybrids, which seems to be lower than what one might expect in certain fields, is under study to determine if there are in fact genetic isolating mechanisms operating between the two taxa. Previous studies have indicated the presence of the Ga_1 (Ch. 4) allele in teosinte and, since most maize is ga/ga, this gene might be operating as a barrier to gene exchange where teosinte is the maternal