

Natural Selection of Tetraploids in a Mixed Colony of

Tripsacum dactyloides

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A year ago, the author reported the occurrence and origin of twin and triplet embryos in the tetraploid races of *Tripsacum dactyloides* (1). The one colony of this species which has been found in Indiana is located in Spencer County near the town of Santa Claus and shows a frequency of polyembryony exceeding 50%. The $2n$ chromosome number of this race has been reported by Anderson (2) as 72 but recent cytological studies of more than one hundred plants indicate that other ploidy levels are also present.

For example, of a group of seedlings collected in May, 1951, 21 pairs of twins were separated and chromosome counts obtained from root tip cells. In 10 pairs, one plant had 72 chromosomes and one had 36; in 5 pairs—72, 72; in 1 pair—36, 36; 1 pair—108, 72; and in 4 pairs—72, ?. In many cases it is possible to guess correctly which plant of a pair will have a chromosome number other than 72, for such a plant is frequently smaller and weaker than its 72-chromosome twin (Fig. 1). Root tip rather than meiotic counts are utilized because of the several years required to bring many of these plants into flower.

In the case of twins which were not separated, over one-third of the pairs lost one member within the first few months. If neither twin died in the first year, both plants appeared to be capable of existence indefinitely. It was suspected that the 72-chromosome plants were the ones surviving. This proved to be true in all 7 surviving twins from which counts were obtained. Of 10 plants single when collected, all 10 had a $2n$ number of 72. This points to the conclusion that, although plants with chromosome numbers other than 72 are produced, competition or genetic factors are such that many of these fail to survive. If this is true of material given greenhouse care, it is likely to be more so in nature where conditions are less ideal.

Some plants with somatic chromosome numbers other than 72, however, do survive in nature past the seedling stage. In the Santa Claus material this has been inferred partly from triploid seedlings, the most reasonable explanation of their origin being a cross between a tetraploid and a diploid. I have obtained several triploids ($2n=54$) from this location which are difficult to distinguish morphologically from tetraploids. Triploids have also been synthesized in the greenhouse from $4n \times 2n$ and $2n \times 4n$ crosses.

The $2n$ numbers of 36, 54, 72 and 108 which occur in the Indiana material, have also been found in collections of plants from a number of places in Florida. In addition to these chromosome numbers, somatic counts of 45 and 90 have been obtained there. Certain regions of Florida such as the Everglades and Pinellas Peninsula have shown a great deal of this sort of variation. In at least one locality, triploids outnumber the tetraploids and are more vigorous in appearance. This variation occurs



Figure 1.

Upper left : Triplet seedlings.

Upper right : Twin seedlings, one pair with embryos of unequal size.

Lower : Twin plants : $2n=36$ on left, $2n=72$ on right.

in races previously assumed to be tetraploid, an assumption probably based on one or very few actual counts. It emphasizes the need of counting the chromosomes in more than one plant of an area before deciding on the number. This is especially true when dealing with species where polyploidy and apomixis are suspected or are known to occur as they do in this species.

Because a good method of obtaining well spread chromosomes is essential when dealing with chromosome numbers as high as exist in *tripsacum*, the technique I have used is summarized here. It was adapted from information obtained in large part from Dr. Beal Hyde who compiled it from various sources.

In order to obtain clean root tips, potbound plants are removed from the flower pots and suspended in a cheesecloth bag over a beaker containing water. The roots grow through the cheesecloth into the moist air and when they are of sufficient length, $\frac{1}{2}$ inch tips are removed and placed for one hour in a saturated, aqueous solution of paradichlorobenzene. This tends to hold the dividing cells at metaphase. The roots are then fixed in 3:1 absolute alcohol-acetic acid and left in the fixative for several days. This length of time in a strong fixative may seem excessive, but grass roots require it. The roots may be transferred to 70% alcohol for temporary storage but it is preferable to smear them without storing. When ready to smear, the extreme tip of the root is placed in a 1:1 HCl-95% alcohol solution for 5-10 minutes which causes the cells to be separated more readily. The tip is transferred to Carnoy's fixative for 5-10 minutes which tends to harden the chromosomes. The root tip is then smeared in a drop of iron acetocarmine.

Literature Cited

1. FARQUHARSON, L. 1953. Peculiarities in the Embryology of *Tripsacum dactyloides*. Proc. Indiana Acad. Sci. 62:104.
2. ANDERSON, EDGAR. 1944. Cytological Observations on *Tripsacum dactyloides*. Ann. Mo. Bot. Gard. 31:317-323.