Proceedings of the Iowa Academy of Science

Volume 47 | Annual Issue Article 10

1940

Genetic Stability of Tomato Diploids and Tetraploids Derived from Haploid

E. W. Lindstrom
Iowa Agricultural Experiment Station

GENETIC STABILITY OF TOMATO DIPLOIDS AND TETRAPLOIDS DERIVED FROM HAPLOID

E. W. LINDSTROM

By doubling the chromosomes of a haploid tomato asexually (decapitation-callus technique) an absolutely homozygous diploid is produced. Ten generations of severe selection to "break" this pure line have resulted only in very minor changes, easily attributable to a normal mutation rate. Data on the effect of the selection pressure on dry weight of plants and on size and weight of fruits show no statistically significant effects in two selection lines and a barely significant (5 per cent point) effect in a third selection line. Only one major point-mutation was noted among the 12,000 experimental plants (a mutation to a recessive "wiry" form, different genetically from the original wiry mutant) and this occurred in the control lines. These results are directly opposed to the Russian worker, Lysenko's claims that the tomato "deteriorates in three to five generations." The original haploid, now carried on asexually for 12 years, has proved also to be remarkably stable, only one large bud-sport having been observed.

Seven generations of selection for fertility in the homozygous tetraploid, derived asexually from the above diploid, have also had no effect in a total population of over 400 plants. This pure autotetraploid is still highly sterile, being less than one per cent as fertile as its parental diploid. This experiment is important in demonstrating that breeding plans to select for uniformity and high fertility in tetraploid varieties, dependent upon reproduction by seed, are likely to end in sterility. Cytologically such a result might be expected if selection and inbreeding for uniformity tend to maintain the four chromosomes in each set as completely homologous, thus insuring gametic sterility as a result of disjunction from metaphase quadrivalents.

PROJECT NO. 249, GENETICS SECTION,
IOWA AGRICULTURAL EXPERIMENT STATION.