

References

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1) A possible alternate explanation for light green spots on yellow leaves in the soybean $y_{11}y_{11}$ test system.

Soybean has a gene y_{11} which is involved in chlorophyll synthesis and is incompletely dominant. This means that the homozygous recessive ($y_{11}y_{11}$) is yellow and seedling lethal, the homozygous dominant ($Y_{11}Y_{11}$) is dark green, and the heterozygote ($Y_{11}y_{11}$) is medium green (a yellowish green) and viable. Because a crossover in the heterozygote would produce a dark green/yellow twin spot on a medium green background, the system has been extensively exploited by Vig and Paddock (1968 and 1969) and Vig (1971, 1972, 1973 and 1975) as a tester system for chemicals suspected of mutagenic activity. As a further refinement of the test system, Vig has suggested that light green spots on yellow leaves can only arise from a back mutation of y_{11} to Y_{11} , and that such spots therefore offer a means of detecting point mutations (Vig, 1973 and 1975).

While this is a logical explanation, the occurrence of a large number of these light green spots on yellow leaves of seedlings which had been treated as seeds with .01% mitomycin C (a drug known for its ability to produce somatic crossing over via chromosome breakage and reunion [Cohen and Shaw, 1964; Huttner and Ruddle, 1976; and Holliday, 1964], but not reputed to produce point mutations) was difficult to understand.

An explanation for this apparent discrepancy between the above observation and the known activity of the drug may reside in the work of Sears (1953). He found that in some cases in wheat the loss of a locus on one chromosome

through monosomy resulted in the homologous recessive allele expressing a dominant phenotype. Sears called this class of genes "hemizygous ineffective recessives" and postulated that the effect might be related to the polyploid nature of wheat.

Since soybeans may also be polyploid and therefore possibly subject to the same phenomenon, it seems appropriate to call it to the attention of those who may be planning to use the $Y_{11}Y_{11}$ test system. Situations which might be expected to give rise to a hemizygous ineffective recessive expressing a dominant phenotype would include deletions or monosomy arising through nondisjunction. Therefore, while light green spots on yellow leaves may indeed result in some (or perhaps in all) cases from point mutations, it is suggested that the alternate interpretation of Y_{11} as a hemizygous ineffective recessive gene should also be taken into consideration.

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