Unopened Anthers Increase Hybridization Efficiency

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Under normal winter greenhouse conditions (70-75°F.) our hybridization efficiency as measured by the percent of successful crosses among various Phaseolus vulgaris parent lines is normally in the range of 50-60%. We are using the cellophane tape technique described by H. R. Hikida in the 4th Bean Improvement Report put out February, 1961.

However, instead of pollinating the emasculated female flower by rubbing the pollen-laden distal portion of the pistil of a freshly opened flower from the selected staminate parent against the stigma of the emasculated bud, we use unopened anthers from the staminate parent. The anthers are placed in the vicinity of the female plant stigma, the flower is closedwith cellophane tape, and pollination occurs when the anthers rupture naturally. Using this technique, our hybridization efficiency now normally runs in the neighborhood of 80 to 85%. The specific reasons for this improved efficiency have not been studied in detail, but it is felt the increase in hybridization efficiency is possibly due to a higher percentage of viable pollen. Pollen from ruptured anthers has been exposed for various periods of time to a certain amount of heat, dessication, and aging, even in the protective environment of a flower. Whatever the reason, we feel there is a definite advantage to be gained from using unopened anthers as a pollen source, since their use has increased our hybridization efficiency by 20-30%.

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Bean Protein Studies

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Work has been initiated to screen all available bean materials on a Udy Protein Analyzer for gross protein content. Protein content variation from 17-30% has been found in Phaseolus vulgaris. The ultimate objective of this program is to improve both the quantity and the quality of bean protein as a human dietary protein source.

Concerning quality, the essential amino acids that are most lacking in beans, according to FAO reports, are methionine plus cystine, and tryptophan. Current efforts are centered around establishing some of the environmentally-influenced perameters that affect over-all protein content in beans, such as location, water stress, photoperiod, fertilizer, etc. A breeding program has also been initiated to hybridize high X high, high X low, and low X low protein containing lines to try to establish to what extent protein content is genetically controlled.

At present we are still attempting to find rapid, inexpensive assay techniques for screening large numbers of bean lines for the methionine and tryptophan content. Any help we can obtain from anyone knowing of such techniques that we could use would be greatly appreciated.

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