RESEARCH REPORT
TO
OREGON PROCESSED VEGETABLE COMMISSION
FOR 1987

1. Title: Transfer of Genetic Resistance via Interspecific Hybridization and Tissue Culture Manipulation of Beans.

2. Project Leaders: David Mok and Machteld Mok, Dept. of Horticulture, OSU

3. Project Status: Continuing, Projected completion date: 1991

4. Project funding for this period: $5,000

Funds were used for undergraduate student help, chemicals, equipment and travel; also supported by a $150,000 grant from AID.

5. Objectives:

(1) Transfer disease resistance and other desirable traits from runner beans, tepary beans to common beans using interspecific hybridization.

(2) To study the redifferentiation of plants from bean tissue cultures.

6. Progress

(1) Interspecific hybrids have been generated in the past using embryo culture techniques. In order to increase the efficiency of recovering hybrids and to test more genotypic combinations, we hope to devise procedures that may substitute the long process of embryo culture and hydroponic conditioning of plantlets. In the past year, pod culture was tested as an alternative. Interspecific hybrids of common bean and tepary bean were successfully obtained using this approach. Rooting of germinating hybrid embryos can be achieved by the addition of auxins. It appears that the new procedure will eliminate the long process of embryo culture and many more genotypic combinations can be used in obtaining interspecific hybrids with diverse backgrounds.

Another interesting phenomenon relating to interspecific hybridization is the reversion of F_2 and F_3 progeny populations to parental types when planted as seeds. Such occurrence decrease the chance of genetic exchange between species which is the objective of interspecific crosses. One of the possible reasons for such reversion is the failure of seeds containing abnromal embryos to germinate. It would be advantageous to identify embryos that contain the hybrid genomes at early stages of embryo growth to preserve individual with characteristics of both species for further selection. In the past year, we used isozyme patterns as biochemical markers to examine common bean and runner bean hybrids (F_1s and F_2s) for this purpose. Four enzyme systems, acid phosphatase (Aph), malate dehydrogenase (MDH), esterase (Est) and 6-phosphogluconate dehydrogenase (PGD) were found to be suitable markers. Immature embryos in the F_1 and F_2 generations can

be clearly identified using isozyme patterns. Moreover, abnormal and normal embryos can be associated with a particular pattern. Thus using these isozyme systems, immature embryos containing the desired genetic combination (intermediate banding pattern of the two parents) can be detected and maintained in future generation.

The new cytokinin metabolite, O-xylosylzeatin, was chemically synthesized and the biological activity was tested in callus bioassys. It was found to be more active than its parent compound, zeatin in common bean tissues. Its effects on stimulating redifferentiation of plants from cell cultures and cotyledons is being examined.

7. Summary

The pod culture methods will shorten the time of obtaining interspecific hybrids from six months to appropximately two months by eliminating the need of embryo culture and hydroponic conditioning. More parental combinations can now be used to generate different hybrids for selection purpose. Using biochemical markers, immature embryos containing the desired hybrid combination can be detected and preserved in later progeny populations.

Redacted for Privacy

8. Signatures:

Redacted for Privacy

Project Leaders:

D

D

Redacted for Privacy

C. J. Weiser, Head Date: