

AN EVALUATION OF MICROCOMPUTER-ASSISTED SELECTION TECHNIQUES IN A SUNFLOWER BREEDING PROGRAM. Freeman K. Johnson, Johnson Foundation Seed, 731 Homestead Ave, Moorhead, Minnesota 56560 USA

Selection procedures are major tools used by plant breeders in the development of improved parental lines and hybrids. Selection may be applied at four stages: (1) Evaluation of parental or starting germplasm (2) Evaluation during inbreeding or recurrent selection cycles (3) Evaluation of stabilized lines (4) Evaluation of experimental hybrids. Computers have long been used in analysis of hybrid data. This paper emphasizes the use of microcomputers during the first three evaluation stages.

Parental or starting germplasm may be evaluated on yield performance, specific genetic or agronomic characteristics, combining ability, and/or measures of inbreeding depression. Forty-two varieties and hybrids were evaluated in a F_1/F_2 yield trial to measure the degree of inbreeding depression. Reduction ranged from 0 to 57%. These materials, other varieties and hybrids, plus a number of directed crosses formed the starting base the sunflower breeding program. Directed crossing of materials selected on genetic criteria proved more successful in the development of superior male lines. Use of germplasm collection records is enhanced by computerization.

Selection on oil percent, plant yields, and other agronomic traits during the inbreeding cycle can be aided by the use of computerized information. Complex selection indices become feasible by this method. Flexibility can be obtained by the use of data base management software.

Selection of stabilized lines is based upon a combination of line and hybrid performance data. This data may become too voluminous and unwieldy for hand calculation. Microcomputers in the hands of the plant breeders rather than data processing departments allows meaningful manipulation of data thus bringing the "art" of plant breeding back into selection. Eighteen out of 452 advanced male lines were selected for increase and pilot hybrid production by the use of a series of complex selection indices. Some superior lines in hybrid combinations gave 2.5 times more oil per hectare than the check Hybrid 894.