Ethyl methanesulfonate produced the greatest seedling mutation yield (28%). The 0.2M EMS solutions applied to both 24 and 48 hour old proembryos yielded 7 to 9 times their respective D-$H_2O$ controls and about 3 times the treatments which gave the highest rate of loss of genetic markers in each of the DES, EI, and DEB chemical treatments. The latter treatments were 2 to 3 times greater in mutation yield than their respective controls. All of the EMS and DES treatments were significantly better than control when applied to both 24 and 48 hour old proembryos. However, the DEB solutions at all concentrations used were only significantly greater than control when applied to the 24 hour old proembryos. The 0.2M solution was the only EI treatment which was significantly greater than control. With the exception of the 0.1M EMS treatments, there were no significant differences in mutation yield between the 24 and 48 hour old proembryos treated with the alkylating agents at each of the treatment concentrations. For each of the chemical treatments where there was a concentration gradient, in general there was an increase in the rate of loss of genetic markers with an increase in concentration.

It was particularly noted that EMS produced a high proportion of 1/2 to 1/16th part leaf sectors showing the genetic loss for $\underline{Yg}_2$ and $\underline{Gl}_2$ in addition to the small streaks. The larger sectors produced in proembryo treatments encourage the use of this type of treatment for screening for true gene mutations since the chance of survival against diploidal elimination of mutant sectors seems greater. The induction of several single locus whole seedling mutations by EMS for either $\underline{Yg}_2$ or $\underline{Gl}_2$ and 3 multiple locus whole seedling mutants for both $\underline{Yg}_2$ and $\underline{Gl}_2$ strengthens the suggestion that perhaps EMS is producing "true" gene mutations at the substructural level of the chromosome.

D. V. Glover

## 3. Further tests for the location of small plant (spl) on chromosome 6.

The location of a small plant (spl) character has been shown to be on chromosome 6 near the Y locus (MGCNL 39:152, 1965). Further evidence that it is on chromosome 6 comes from the following testcross data in the presence of a series of waxy and chromosome-nine translocations.

Small plant (spl) mutant stocks were crossed to stocks homozygous for the waxy marked chromosome-nine translocations. The $F_1$ plants were backcrossed to a small plant waxy line. The starchy and waxy seeds from each translocation cross were planted out separately and the plants were classified for small plant (spl) segregations. A chi-square test for independence, utilizing fourfold contingency tables with one degree of freedom, was used to determine if the populations from the two classes of seeds

were different. A significant value was found only for the cross involving T6-94505-4 at the one per cent level. The data from the progenies involving T6-94505-4 (6L.13 and 9 ctr.) were as follows: starchy seeds gave 55 normals and 49 spl; waxy seeds gave 77 normal and 23 spl giving a $x^2$ = 11.94 and a P-value of less than .01. Within the waxy class there was a significant deviation from the expected (50%) ratio of small plants ($X^2$ = 29.16, $P < .01$).

D. V. Glover

4. The effects of dimethylsulfoxide (DMSO) upon germination in Zea mays L.

Dimethylsulfoxide (DMSO) is known as a universal solvent for protein and carbohydrate materials. Biological materials are very permeable to this solvent and reports have indicated that DMSO is an effective carrier for some systemic herbicides. These characteristics of DMSO suggested the possibility of using it as a carrier for alkylating mutagen agents in treating mature seed of Zea mays.

In chemical mutagen experiments using mature seed it is desirable to obtain rapid absorption and uptake of mutagen solutions and subsequent interaction with active groups. Some alkylating agents possess a short half-life and therefore soon lose their potency as a mutagen if not incorporated rapidly by the seed.

A small experiment was initiated to determine the effects of DMSO on seed germination prior to using it as a carrier in mutagen experiments. Mature corn seeds of the single cross W23/L317 were soaked for 4, 12 and 24 hours in C, 5, 10, 15, 20, 25, 50, 75 and 100 per cent by volume concentrations of DMSO in phosphate-buffer solutions. Fifty ml treatment solutions were used. The pH ranges varied from 6.1 for buffer solutions without DMSO to 11.4 for 100% DMSO solutions. Each treatment consisted of 20 seeds. After treatment the seeds were washed with deionized water for 3 minutes and germinated for 7 days on folded blotter germination paper.

The results of the treatments are shown in table 1. Treatments at concentrations greater than 50% V/V for 4 hours or more were completely lethal to the mature seed. The data suggested an increasing lethal effect with increased treatment time; however some of this effect may have been confounded with oxygen effects on germination. The control showed decreased germination with increased treatment time, suggesting the effect of insufficient oxygen. The results of mutagen treatments of mature seed using DMSO as a carrier are being analyzed.

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