

Mutagenesis in Birdsfoot Trefoil *Lotus corniculatus*

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A study on artificial mutagenesis in birdsfoot trefoil, cv. Mirabel, which commenced in July, 1976, has recently been completed. Seed was treated in 1976 with a wide range of dosages of X-rays, ethylmethanesulfonate (EMS), 8-ethoxycaffeine (EC), n-hydroxyurea (HU), and 2-aminopurine (AP). A total of 65 selfed, partially inbred, and open-pollinated lines were generated over four generations, comprising some 22,000 plants. Mutagenic effects were assessed in parents and progeny on germination and survival rates, cytological (meiotic aberrations, and pollen abortion. All plants were tested for mutagenic effects on forage and seed yields, pod dehiscence, cyanoglycoside content in leaves, plant height, winter hardiness, and flowering cycle. The mutagenic effects on the gene frequency of the brown floral keel tip color character were also studied.

It is considered that germination and survival rates are good indicators of overall mutagenic effects, but these could not be used to predict the mutation rates in progeny of affected plants. Meiotic aberration and pollen abortion rates were also shown to be independent of mutation rate. Dose effects, resulting from mutagenic treatments, were largely confined to the parental (M_1) generation.

Mutagenic treatments significantly altered forage and seed yields, as well as cyanoglycoside content in the leaves, for partially inbred and open-pollinated M_2 and M_3 generation plants derived from X-ray, EMS and HU treated parental lines. Both significantly high and low values were obtained, with some lines being obtained that could prove useful in future

breeding. Time of flowering was significantly lower for EMS derived lines in the M_4 generation open-pollinated progeny (early flowering vs. control). Pod dehiscence, winter hardiness, plant height and gene frequency of brown floral keel tip color were not significantly altered by mutagenic treatments.

The mutagen showing the highest level of effectiveness in inducing mutation was EMS; next, in decreasing order, were HU, EC, AP, and X-rays. The only mutagen showing a significant increase in mutation rate was AP, for a single dose, in the third, open-pollinated generation. Despite an increase in mutation rate vs. control for most treated progeny, no other treated lines were significant owing to a very low mutation rate, and average four mutants per 1,000, compared to a background (control) rate of approximately 0.5 mutants per 1,000.

The majority of the characters under study were inherited in a complex manner, being largely under polygenic or multigenic control, in a tetrasomic background. No disomically inherited mutant characters were found; all qualitative mutants were governed by a single, tetrasomically inherited recessive gene.