Recurrent Selection for Seed Size in Birdsfoot Trefoil, *Lotus corniculatus* L.

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**BIRDSFOOT** trefoil, *Lotus corniculatus* L., is a perennial forage legume of increasing importance in the United States. In Iowa, it is valued for its high level of productivity and persistence in pastures, but it does lack seedling vigor. The poor competing ability of young seedlings often has caused difficulty in obtaining good stands. Considerable research with this crop has been directed toward methods of reducing weed competition, and some measure of success has been realized by grazing new seedlings and by using herbicides. Another approach to the problem is to increase seedling vigor of birdsfoot trefoil by breeding.

Investigators have shown certain advantages for large seed in many crop species. Black (1) summarized a number of inferences drawn from studies of seed size. Seed size exerts an influence on germination, emergence, early vegetative growth, and productivity. In general, the incidence of hard-seededness tends to be higher in small seeds. Large seeds have a greater emergent force and are able to emerge from greater depths. Early vegetative growth is proportional to seed size, and this is attributed to larger cotyledonary or photosynthetic area.

Henson and Tayman (3) examined seedling growth of six strains of birdsfoot trefoil in the greenhouse. Three were erect, 'Cascade', 'Tana', and 'Viking', and three were prostrate, 'Empire', 'Iowa Empire', and 'North Dakota Empire'. Seedlings from large seeds produced more top growth, more root growth, and earlier basal shoots. Also, erect strains were superior to the prostrate strains in all characters measured.

Shibles and MacDonald (7) studied the cause of differential growth rate of seedlings of the erect and prostrate (Viking and Empire) types of trefoil. Seed was used to eliminate seed size differences. Net photosynthetic rate per unit area of cotyledon was higher in the two varieties to a differential rate in photosynthetic area. Viking apparently used more photosynthetic area production and less in axis growth than did Empire.

According to Stickler and Wassom (10), seed size, planting depth, and variety of birdsfoot significantly influenced seedling vigor. They concluded that breeding should be directed toward increasing seed size.

The effectiveness of recurrent selection method has been demonstrated by many workers. Sprague and Brimhall (8) and Sprague et al. (9) compared recurrent selection and selection during inbreeding for increasing the oil percentage in the corn kernel. The recurrent selection method was found more effective, ranging from 1.3 to 3.0.

Johnson and El Banna (4) reported the effectiveness of 4 successive cycles of phenotypic recurrent selection for growth habit and plant vigor in the sweetclover (*Melilotus alba*) variety, Madrid. Consistent progress was made, and the change per cycle was greater for a character highly heritable, than for plant vigor, which showed lower heritability.

Recurrent selection procedures were used in bromegrass by Christie and Kalton (2). Based on the evaluation of top cross seed of 203 clones, 10 clones having the highest and 10 clones having the lowest seed weights were selected and intercrossed with unrelated polycross blocks. Polycross progenies and two checks were compared. Mean seed weight per 50 seeds was .206 g. for the 10 highest, .145 g. for the 10 lowest progenies, and two checks. It was suggested that sufficient genotypic variance remained to permit further progress by selection.

Peacock and Wilsie used recurrent selection for resistance to seed pod shattering (5).