

Naturalized Big Trefoil (*Lotus pedunculatus* Cav.) Ecotypes Discovered in Crawford County, Indiana

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Abstract

In 1964, eight naturalized ecotypes of big trefoil, (*Lotus pedunculatus* Cav.; formerly *L. uliginosus* Schkuhr., *L. major* Sm.) were discovered growing in a tall fescue (*Festuca arundinacea* Schreb.) meadow on the Clarence E. Kaiser farm in Crawford County. Subsequent evaluations show three of the ecotypes superior in forage and vegetative characteristics for use in tall fescue pastures on fragipan soils in southern Indiana. The environmental model under which the big trefoil ecotypes have become naturalized is described.

Big trefoil (*Lotus pedunculatus* Cav.), where adapted, is a long lived perennial forage legume. It is of European origin and is a recognized forage plant in France, Italy, Denmark, Germany and other countries.

It is not definitely known when big trefoil was introduced into the United States. However, it has been grown in this country for over 95 years (5). It has become naturalized in western Oregon, western Washington and northwest California where it is used for pasture and hay. It has shown good adaptation on wet soils in Georgia, North Carolina and Florida (3, 4).

In 1947, Roland McKee (personal communication), Senior Agronomist for the Bureau of Plant Industry, U.S. Department of Agriculture, reported, "... some work with *Lotus uliginosus* for the southern part of the Plains Corn Belt region would be justified as I am inclined to believe that by selection, a sufficiently hardy strain can be obtained for use in combination with some of the grasses." Several accessions of big trefoil were tested on the Southern Indiana Forage Farm, Dubois County, Indiana, in 1954-55 but failed to survive the winter.

Ecotypes Discovered

On August 13, 1964, Mr. Clarence E. Kaiser showed me big trefoil growing in eight different areas in a vigorous tall fescue (*Festuca arundinacea* Schreb.) field on his farm (Fig. 1). Mr. Kaiser thought the plants to be a particularly adapted form of birdsfoot trefoil (*L. corniculatus* L.) since the areas were gradually increasing in size. Upon examination of the rhizomatous and stoloniferous type of growth and spreading, I immediately recognized these plants to be big trefoil. Mr. Kaiser's farm is in Crawford County, Indiana, located 1 mile east and 1 mile south of the junction of Indiana Highways 164 and 145.

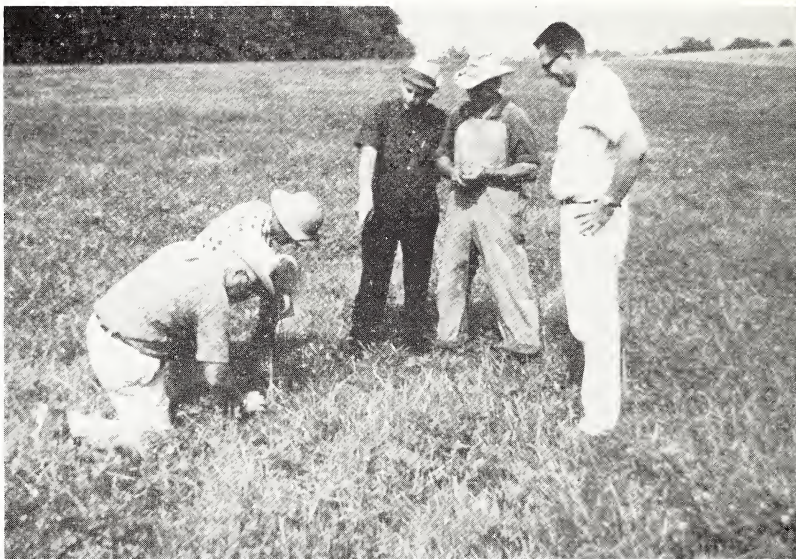


FIGURE 1. Naturalized big trefoil (*Lotus pedunculatus* Cav.) discovered August 13, 1964, growing on fragipan soils on Mr. Clarence E. Kaiser's farm in Crawford County, Indiana. Mr. Kaiser is second from the right.

Mr. Kaiser believes that the big trefoil was a contaminant in a grass-legume seed mixture he frost seeded over the field in the late winter of 1939. The seed mixture included:

Species	Rate per acre in pounds
Birdsfoot trefoil (<i>L. corniculatus</i> L.)	1
Ladino clover (<i>Trifolium repens</i> L.)	1
Alsike clover (<i>T. hybridum</i> L.)	1
Timothy (<i>Phleum pratense</i> L.)	4
Smooth brome grass (<i>Bromus inermis</i> Leyss.)	5
Redtop (<i>Agrostis alba</i> L.)	2

In 1941, five pounds per acre each of tall fescue and orchardgrass (*Dactylis glomerata* L.) seed were drilled into the meadow. Because of the excellent adaptation of tall fescue the field is now a heavy fescue sod.

How Field Was Managed

Each year since the 1939 seeding, the spring growth of grasses and legumes has been harvested for hay. The summer and fall growth has been used for beef cow pasture from late September following calf weaning until late January.

From 1939 to 1951, a mid-summer Ladino clover seed harvest was made annually. In 1964, red clover (*T. pratense* L.) was frost seeded in late winter. The red clover has been allowed to produce and shatter seed

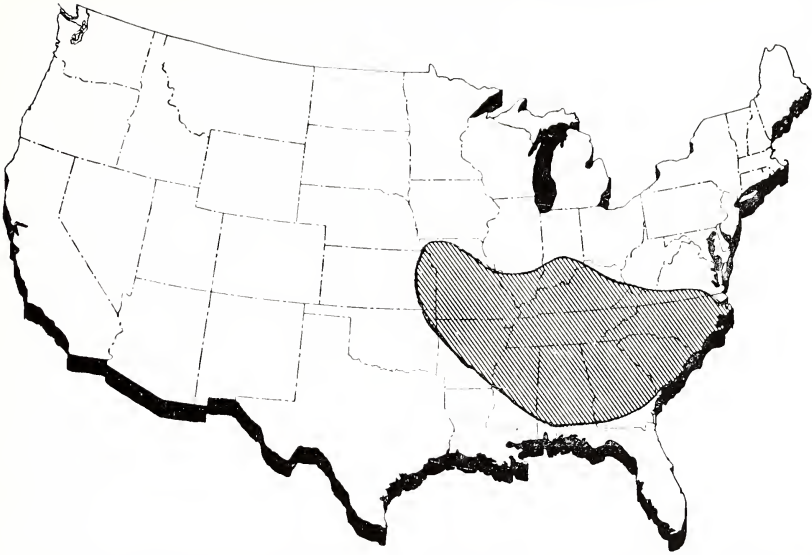


FIGURE 2. *Primary area of adaptation of tall fescue (Festuca arundinacea Schreb.) in the east humid area of the United States including the southern third of Indiana (1).*

on the ground every other year. Thus, the red clover has behaved as a reseeding biennial legume growing in the tall fescue sod. The meadow has been fertilized every other year with phosphorus and potassium according to soil test and limed as needed.

The Environmental Model (2)

The hill soils on Mr. Kaiser's farm belong to the Zanesville-Wellston soil association commonly found throughout the unglaciated sandstone shale region. The soil fragipan common to many of these soils restricts water movement and root penetration. The shallow root zone depth may range from 18 to 34 inches. Although rainfall averages 46 inches annually, 20 inches are lost as run-off, and droughts are common in mid-summer. The soils are often water-logged in winter and early spring. Severe winter-heaving is a common occurrence. The soil moisture is one of extremes from wet to dry. Tap rooted alfalfa is considered a high risk crop on these soils when compared to tall fescue and biennial red clover. The native pH of these soils ranges from 5.3 to 5.5.

Tall Fescue Adaptation

The southern third of Indiana is in the primary area of adaptation of tall fescue (Fig. 2). Since 1950, tall fescue has been increasingly grown on the fragipan soils of southern Indiana where it currently excels all other perennial grasses in adaptation.

It is believed that big trefoil may have its greatest promise for use in southern Indiana as a perennial pasture legume in combination with



FIGURE 3. One of the eight ecotypes of big trefoil observed to be associating compatibly with a heavy stand of tall fescue on the Kaiser farm (Photographed June 17, 1966)

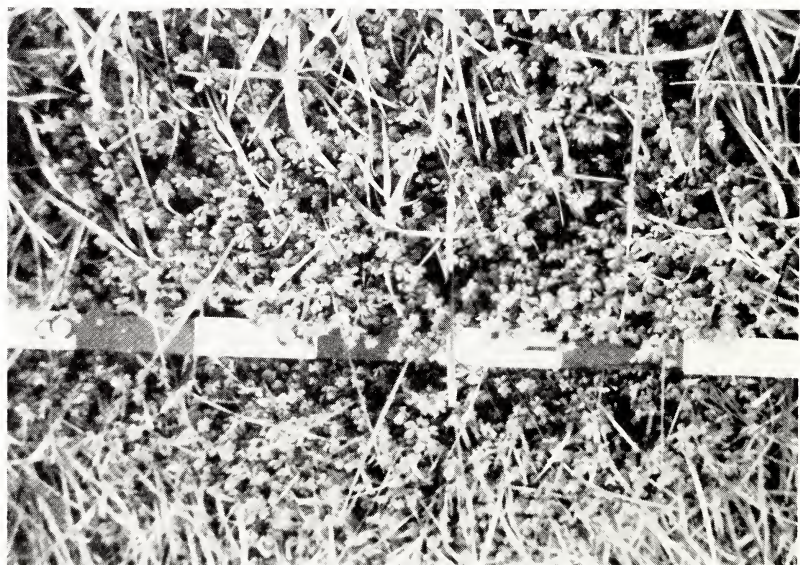


FIGURE 4. One of many big trefoil nursery plants growing on fragipan soils on the Southern Indiana Purdue Agricultural Center, Dubois County, Indiana. It has spread three and a half feet through a good stand of tall fescue during a period of three growing seasons without evidence of any heaving. Tall fescue was seeded when the big trefoil seedlings were transplanted from the greenhouse April 15, 1967 (Photographed October 3, 1969).

tall fescue on fragipan soils (Fig. 3). Big trefoil appears to be a very efficient supplier of readily available nitrogen. Tall fescue has a dark green vigorous growth during the spring season when growing with big trefoil.

Agronomic Progress

Approximately 15 two-inch plugs were obtained from each of the eight ecotypes in the fall of 1965 for propagation and evaluation purposes. These were planted on the Southern Indiana Forage Farm in the spring of 1966. Two years of observations showed three of the ecotypes to be superior in vigor of growth and seed production. A total of 10.3 pounds of seed of the 3 ecotypes were produced in 1968 for experimental purposes by special seed production facilities of the Minnesota Agricultural Experiment Station at Rosemont, Minnesota. Seed germination ranged from 85 to 90%. Excellent stands from seeding resulted in field plots at the Southern Indiana Purdue Agricultural Center (known as the Southern Indiana Forage Farm prior to 1969) in the spring of 1969. Seed produced from the three superior ecotypes (#1015, #1016 and #1019) equally blended together will be known as 'Kaiser' trefoil in honor of Mr. Clarence E. Kaiser who introduced, observed and nurtured these plants for many years on his farm.

Significance of Discovery and Summary

1. The naturalized ecotypes of big trefoil from the Clarence E. Kaiser farm in Crawford County, Indiana, are strongly perennial and appear to fit the environmental model of the hill land fragipan soils of the unglaciated sandstone shale soil region of southern Indiana.
2. Five years of observation have not shown any disease or heaving tendencies among the eight big trefoil ecotypes discovered.
3. Several of the big trefoil ecotypes compete aggressively and compatibly with tall fescue (Fig. 4) which is the dominant perennial grass of the unglaciated sandstone shale soil region.
4. The big trefoil ecotypes not only produce seed but they can also be readily established from seed.
5. It is hypothesized that the ruminant response from the tall fescue-big trefoil mixture will be superior to that of the ruminant response from tall fescue alone.
6. The seed produced from the three agronomically superior big trefoil ecotypes when equally blended together will be known as "Kaiser" trefoil in honor of Mr. Clarence E. Kaiser who introduced, observed and nurtured these plants for many years.

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