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CULTIVARS AND EXPERIMENTAL LINES OF A PROMISING FORAGE LEGUME
 ASTRAGALUS CICER L.

I. EVALUATION FOR FORAGE YIELD IN FORT COLLINS (U.S.A.)

C.E.TOWNSEND

Abstract:

TOWNSEND C.E., 1983, Cultivars and experimental lines of a promising forage legume - Astragalus cicer L. s.l. Evaluation for forage yield in Fort Collins (U.S.A.). Not.bot.hort.agrobot., Cluj., XIII. 5-8.

An evaluation of some new cultivars and experimental lines of cicer milkvetch (Astragalus cicer L., Fabaceae) selected in last decade for forage yield, seedling vigour and recovery after harvest are briefly summarized. The examined samples are promising especially in grazing conditions. The new cultivars have a better stand establishment, a good average forage yield of 13,27 MT/ha (oven-dry basis) and a high protein content. No injuries in grazing animals have been reported till now. The variability in forage yield between the cultivars and experimental lines suggests further possibilities of breeding.

Key words: Astragalus cicer, forage yield, cultivars.

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Cicer milkvetch (Astragalus cicer L.), an European-Asiatic species, is distributed from the Caucasus Mountains through southern Europe to Spain. It is a long-lived perennial forage legume that spreads by rhizomes. It was introduced into the United States in the mid 1920's and was distributed widely in the Great Plains and Western States from 1929 to 1935. The species has potential in both irrigated and dryland plantings in these areas. Although cicer milkvetch is not as drought tolerant as

alfalfa (*Medicago sativa* L.), it is one of the most promising forage legumes for areas in the central and northern Great Plains that receive more than 400 mm of precipitation annually.

Cicer milkvetch is more of a grazing species than a hay species, and yields about 75 to 80 % as much as alfalfa when harvested for hay under irrigation. Most of the regrowth is initiated from axillary buds. Generally, highest yields are obtained under a three harvest regime. When harvested nine times annually in a simulated grazing study, the yield of cicer milkvetch compared favorably with alfalfa, most entries of birdsfoot trefoil (*Lotus corniculatus* L.), and most entries of crownvetch (*Coronilla varia* L.). It yields considerably more forage, but is less persistent than white clover (*Trifolium repens* L.) under frequent clipping.

Forage quality as measured by crude protein percentage, in vitro dry matter digestibility, and cell wall constituents has been similar to that of the more commonly grown forage legumes. No case of bloat has been reported from livestock grazing cicer milkvetch. It does not contain toxic levels of nitro compounds, tannins, oxalates, alkaloids, or selenium.

In North America, there was relatively little interest in cicer milkvetch until the 1960's. The increased interest was accompanied by the release of two cultivars: 'Lutana' in the United States and 'Oxley' in Canada. However, relatively poor seedling vigor and subsequent stand establishment restricted the usage of the species. 'Monarch', a new cultivar that was developed in the United States, has substantially better seedling vigor than the other two cultivars; hence, it has better stand establishment characteristics.

MATERIALS AND METHODS

In 1973 the cultivars Lutana and Oxley and five experimental lines of cicer milkvetch were established on the Agronomy Research Center, Colorado State University, Fort Collins, Colorado. Planting rate was 10 kg of scarified seeds per ha. It is very important to plant scarified seed because the hard seed coat prevents the imbibition of water necessary for the initiation of germination. Also, the seed was inoculated with *Rhizobium* sp. The five experimental lines were selected for high seed weight, or mature plant vigor, or both. The soil was classified as aridic Argiustoll. Soil tests indicated that fertility levels were satisfactory for forage legume production.

The experimental design was a randomized complete block with four replications. The nursery was irrigated three times in 1974 and

twice in 1975 and 1976 with about 12 cm of water per application. Plots were 1.5 x 6.7 m with a row spacing of 30 cm. Plots were cut to a stubble height of about 7.5 cm and total yield of forage determined for an area 0.9 x 6.1 m in size. The plots were harvested four times in 1974 and three times in 1975 and 1976. Forage yields were calculated on an oven-dry weight basis. Green forage of cicer milkvetch contains about 4 percentage points more water than that of most forage legumes.

In 1981 the cultivars Lutana, Oxley, and Monarch and eight experimental lines were established on the Agronomy Research Center. All procedures including the experimental design were similar to those described previously.

RESULTS AND CONCLUSIONS

Cultivars and experimental lines differed significantly in forage yield in each of 3 years (Table 1). Also, year of production influenced forage yield.

Tab. 1.

Forage yields of two cultivars of five experimental lines of *Astragalus cicer* for three harvest years, Fort Collins, Colorado.

Entry	Production Mt/ha (oven-dry basis)			
	Harvest year (1)	1974 (2)	1975 (3)	1976 \bar{x}_{1-3}
Lutana	9.6	14.0	15.9	13.1
Oxley	8.8	11.5	14.8	11.7
1	10.1	13.9	16.0	13.3
2	10.0	13.6	17.9	13.8
3	9.7	14.5	17.4	13.8
4	10.5	13.6	17.6	13.9
5	9.9	14.1	16.0	13.3
L.S.D. .05	0.7	1.2	2.0	13.27

The comparative low yields in 1974 can be attributed, in part, to harvest schedule because four harvests were taken in 1974 while three were taken in 1975 and 1976. Cool spring temperatures particularly during the month of May retard the initiation of spring growth

and reduce yields. High summer temperatures can reduce growth also.

The environmental conditions in 1981 were excellent for growth and establishment of cicer milkvetch as evidenced by the high forage yields (Table 2). The differences among entries in Table 1 and 2 suggest that it is possible to breed for improved forage yield.

Tab. 2.

Forage yield of three cultivars and eight experimental lines of Astragalus cicer during the year of establishment (Fort Collins, Colorado 1981)

Entry	MT/ha (oven-dry basis)
Lutana	6.46
Orley	5.02
Monarch	6.88
1 (selected for seedling vigor)	6.88
2 (selected for seedling vigor)	7.38
3 (selected for seedling vigor)	7.33
4 (selected for mature plant vigor)	7.26
5 (selected for initiation of spring growth)	6.39
6 (selected for initiation of spring growth and recovery after harvest)	7.35
7 (selected for seedling vigor)	7.11
8 C-9 germplasm pool	7.33
L.S.D. .05	0.67

Although much remains to be learned about the culture and management of cicer milkvetch, the prospects are promising that it will become an important forage legume.

CULTIVARS AND EXPERIMENTAL LINES OF A PROMISING FORAGE LEGUME
- ASTRAGALUS CICER L.

II. RESEARCH REGARDING THE SELECTION AND BREEDING OF CICER
MILKVETCH IN FORT COLLINS (U.S.A.) (BIBLIOGRAPHY)

Abstract:

Cultivars and experimental lines of a promising forage legume - Astragalus cicer L. II. Research regarding the selection and breeding of cicer milkvetch in Fort Collins (U.S.A.) (Bibliography). Not.bot.hort.agrobot., Cluj., XIII, 9-11. Research carried out by C.E.TOWNSEND, Fort Collins, USA, on cicer milkvetch (Astragalus cicer L.) resulted considerable new knowledge in the following topics: agronomic character, phenotypical diversity, and economic importance (1970, 1981b); cultivars and germplasm resources (79 a,d,e, 80 b); flowering (photoperiodical) behavior and vernalization (73, 80a, 81c), compatibility and pollination (71b, 72a); physiology of germination (72b, c, 78b); evaluation of productivity in different cutting regimes and geographical conditions (74b, 75c, 78a); - selection and breeding techniques (75a, 76a, 77a, 81a, 82a,b); seedling emergence, seedling vigour and stand establishment (72b, c,d, 74a, 78b, 79b, f, 81d, 82a); seed characters, seed production and handling (71a, 72a, 79b); vegetative growth and vigour for the crop (73, 75b) respectively. These results deserve attention from both theoretical and applied botanists, interested in (micro) evolution, taxonomy, cytology, genetics, economic and applied botany.

Key words: Astragalus cicer, biology, selection, breeding, forage legumes.

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In order to explore the potentialities of cicer milkvetch (Astragalus cicer L.) for forage production, research carried out in Fort Collins (USA) by C.E.TOWNSEND, important results were accumulated for the better understanding of the biology of this species. The publications arranged in a chronological sequence are as follows:

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- 1971a, Association among characters related to seed production in Astragalus cicer. Crop Sci. 11:307-308.
 - 1971b, Self-compatibility studies with Astragalus cicer L. Crop Sci. 11:769-770.
 - 1972a, Comparison of S_1 and open-pollination progenies of Astragalus cicer L. for certain agronomic characters. Crop Sci. 12:793-795.
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- 1980b, Registration of Monarch cicer milkvetch. Crop Sci. 20:670-671.
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- 1981b, Astragalus cicer L. (Cicer Milkvetch). In James A. Duke. Handbook of legumes of world economic importance. pp.22-24. Plenum Press, N.Y.
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