

NUMBER 77
JULY 1980

**NORTH DAKOTA
RESEARCH
REPORT**

**A Summary
of the Synonymy
of Leafy Spurge**

Donald S. Galitz
Professor of Botany North Dakota State University

NORTH DAKOTA
STATE UNIVERSITY

NOV 5 - 1980

SERIALS DEPT.
LIBRARY



AGRICULTURAL EXPERIMENT STATION
NORTH DAKOTA STATE UNIVERSITY
FARGO, NORTH DAKOTA 58105

A SUMMARY OF THE SYNONYMY OF LEAFY SPURGE

Donald S. Galitz

Professor of Botany
North Dakota State University

Investigators who have worked with members of the family of plants known as the spurges and particularly those treated in this report are aware of the variation in form which is exhibited by specimen collections from different localities and are immediately confronted with the confusion as to its proper nomenclature. Historically, this group of plants has been combined to make up a single group and then subdivided into several groups a number of times resulting in the appearance of several synonyms appearing in the literature. Although it is not a weed of significant economic consequence in its Eurasian origin, leafy spurge has lived up to all expectations of becoming a severe weed problem in numerous areas of the U. S. and Canada during the 150 years of its reported existence in North America.

Leafy spurge has been a persistent weed, defying the various control programs available to date and consequently has been documented as increasing the range of its distribution and degree of infestation. Therefore, there has been considerable revival of interest to support research on the spurges and in particular the plant we call leafy spurge. It becomes appropriate then, in considering this plant and the problems it causes, to review its natural history and its pedigree. This report deals specifically with the latter of these two. Since more than one scientific name is being used in this region to designate leafy spurge, such a review may help in the adoption of a uniform use of nomenclature or at least assist investigators to be cognizant of the basis for the different names that have been used over time.

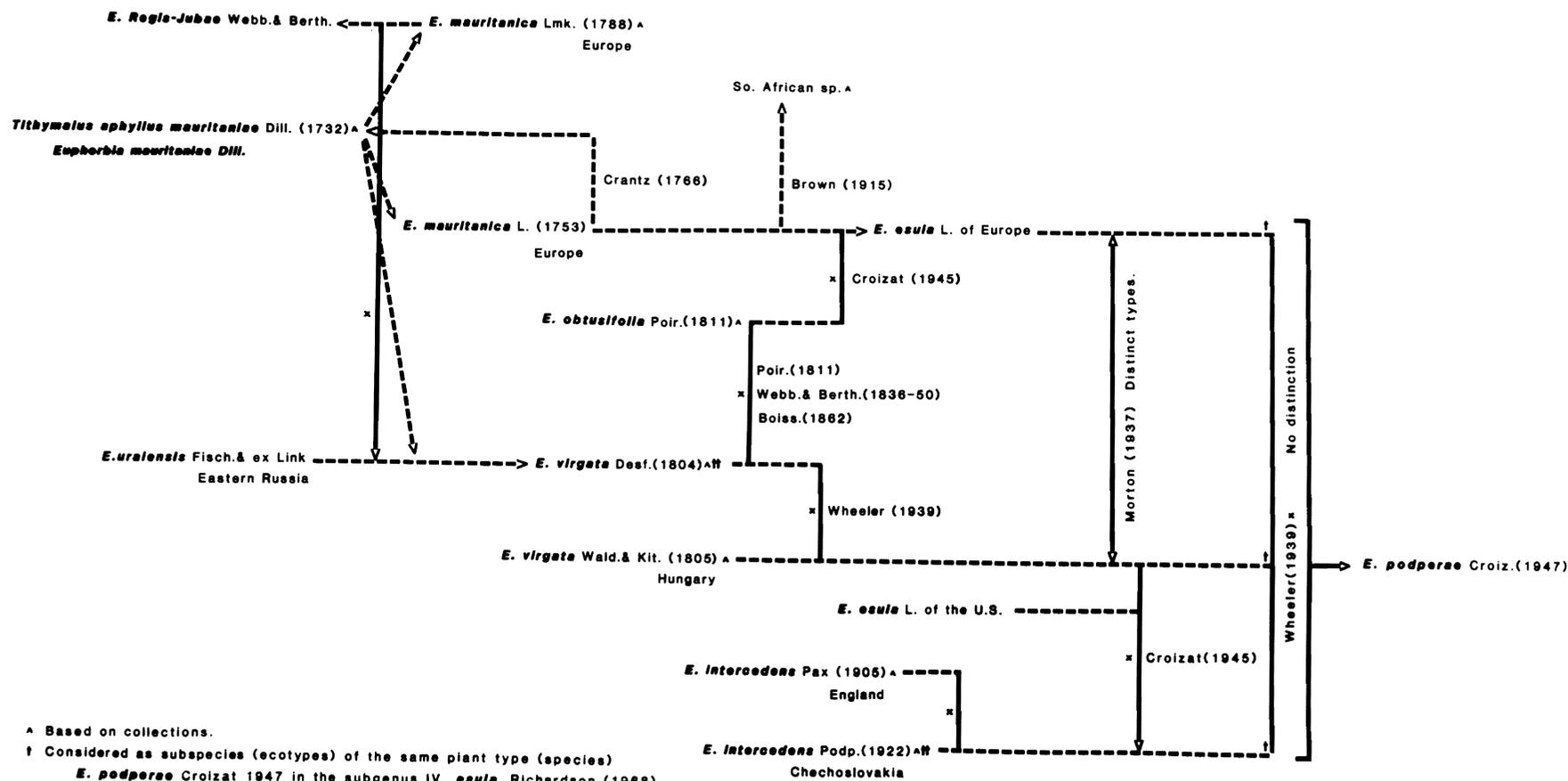
RANGE

The first reported collection of leafy spurge in the United States is that of William Oakes in Massachusetts in the year 1827. Twenty years later in the first addition of Asa Gray's manual, leafy spurge was described as a weed likely to become troublesome. Just over 100 years later, in 1933, Hanson and Rudd reported the range of leafy spurge to include 20 states in the United States, and parts of southern Canada. At that time it already reached from upper New England including Maine, across the northern half of the United States to Idaho and Washington, with the greatest concentration of infestation being

in southwestern Minnesota. It is suggested by several authors that the original source of seed for the plants occurring in North America was contaminants in ballast seed brought from Eurasia. Batho (1931) suggested that leafy spurge was a contaminant in oat seeds brought to southwestern Minnesota from southern Russia around 1890. The first reports of leafy spurge in North Dakota are dated 1909. At a recent symposium on leafy spurge held in Bismarck, ND (1979), D. L. Noble reviewed the distribution of spurge in North America, citing Moore (1958) and Harris and Alex (1971) as reporting spurge to occur in every Canadian province, except Newfoundland, and Reed and Hughes (1970) as reporting a distribution similar to that of Hanson and Rudd (1933) with a shift in the center of infestation to the west at a point near Wolfpoint, Montana, then including 25 states and 451 counties. Dunn (1979) has since reported a study of the distribution of several species of *Euphorbia* indicating a still further migration of the infestation westward. Because of its persistence as an aggressive perennial throughout the upper half of the United States and most of Canada, the taxonomy of this plant of Eurasian origin has been the center of several treatments.

In spite of the considerable amount of literature available, as in the works of Stevens (1922), Hanson and Rudd (1933), Barnett and Hanson (1934) and Batho (1938), which deal with local forms of leafy spurge, there seems to be little agreement as to whether to call this weed *Euphorbia esula* L., *E. virgata* Wald. & Kit., or as more recently introduced by Croizat (1947), *E. podperae* Croiz. Part of the confusion lies in the fact that some investigators have not been able to recognize a difference between what has been described as *E. esula* and *E. virgata* whereas others have claimed to be able to distinguish between these plant types. Considering the fact that the basis for the confusion in nomenclature is due to the conflicting literature which exists in reviews of *E. esula*, it is relevant to review on a chronological basis the development of the different names which have been proposed with the hope of coming to a conclusion as to what might be the most acceptable name to use at the present time.

SUMMARY OF SYNONYMY OF LEAFY SPURGE



^A Based on collections.

^f Considered as subspecies (ecotypes) of the same plant type (species)

E. podperae Croizat 1947 in the subgenus IV *esula*, Richardson (1968).

x No distinction between specimens or descriptions.

^f Numerous synonyms in literature.

FIGURE 1

SYNONYMY

With the establishment of the genus *Euphorbia* in 1753, Linnaeus rejected the distinction that earlier herbalists had made between the plant groups *Chamaesyce*, *Tithymalus*, *Euphorbium* and *Peplis*. Since that time this genus has been subjected to considerable controversy with some investigators on one hand using *Euphorbia* in a broad sense and others dividing it into various sections or groupings of genera or subgenera.

The relationships of the various recorded treatments of plant types is summarized in Figure 1.

In 1872, Boissier did a revision of the entire genus *Euphorbia*, incorporating the writings of Englemann. Again in 1931 Pax and Hoffman attempted a major survey of the genus in which they established a single genus which was subsequently divided into nine sections with an estimated 1600 species. Croizat in his review in 1945 cited several other workers who have dealt with parts or all of the genus *Euphorbia*, taking particular note of the major works of Norton (1900) and Wheeler (1941). The most recent treatment to include all of the members of the genus *Euphorbia* prior to that of Croizat's in 1945 was Rydberg (1932), who divided the genus into six genera with 24 species. Later treatments of this genus in the United States are for the most part incomplete works which dealt primarily only with those species which occurred and were reported within a state or region. Croizat's detailed review of *Euphorbia* was written using the fairly classical approach which recognizes distinct groupings as subgenera of a very diverse genus *Euphorbia*. This

tion of *E. mauritanica* is based on diagnostic notes. In 1766 Crantz indicated that the Linnean *E. mauritanica* is probably based on Dillenius' descriptions of *Tithymalus aphyllus mauritaniae.*, *Tithymalus* Dill. and *Euphorbia mauritaniae* Dill. dated 1732. According to Croizat, Dillenius' illustrations of *E. mauritaniae* are so explicit that modern taxonomists

After Richardson (1968):

Family: Euphorbiaceae	283 genera	1600 species
Genus:	Subgenera:	# Species
Euphorbia	Chamaesyce	12
	Agalomia	3
	Poinsettia	2
	Esula	4
		spathulata
		podperae (includes types)
		esula L.
		virgata Wald. and Kit.
		intercedens Pax.
		cyparissias
		robusta
		+ 2 varieties

FIGURE 2

cannot distinguish it from *E. obtusifolia* Poir. and therefore Crantz's conclusion that *Tithymalus* Dill. is the appropriate reference for Linnaeus' publication of *E. mauritanica* is correct. It should be mentioned that Lamarck did not publish an *E. mauritanica* of his own but rather was referring to

is
lants ←

Correction Page 4, col. 2, after line 14;

Euphorbia mauritaniae Dill. Since this is based on Dillenius' Tithymalus, it is concluded.

nica
rica,
804
orb
was
died
let,
by

Linnaeus' publication of *E. mauritanica* in the year 1753. According to Croizat (1945) this presentation of *E. mauritanica* is hazy and over-inclusive, with references to a number of poorly noted entities which has been cultivated for years in European gardens. He goes so far as to suggest that *E. mauritanica* so conceived probably includes a number of non-*Euphorbia* plants. Since there is no specimen existing in the Linnean herbarian, the validity of the descrip-

Boissier in 1862, all of whom concluded that *E. virgata* was not distinguishable from the *E. obtusifolia* of Poiret. Since the date for *E. virgata* precedes that of *E. obtusifolia* the former should be the proper name. Since *E. mauritanica* L. which is based on *Tithymalus* Dill. is also *E. obtusifolia*, that makes *E. virgata* Desf. synonymous with *E. mauritanica* L. and *E. mauritanica* Lmk. In 1939 Croizat observed the specimen described as *E. mauritanica* Lmk. and

SYNONYMY

With the establishment of the genus *Euphorbia* in 1753, Linnaeus rejected the distinction that earlier herbalists had made between the plant groups *Chamaesyce*, *Tithymalus*, *Euphorbium* and *Peplis*. Since that time this genus has been subjected to considerable controversy with some investigators on one hand using *Euphorbia* in a broad sense and others dividing it into various sections or groupings of genera or subgenera.

The relationships of the various recorded treatments of plant types is summarized in Figure 1.

In 1872, Boissier did a revision of the entire genus *Euphorbia*, incorporating the writings of Englemann. Again in 1931 Pax and Hoffman attempted a major survey of the genus in which they established a single genus which was subsequently divided into nine sections with an estimated 1600 species. Croizat in his review in 1945 cited several other workers who have dealt with parts or all of the genus *Euphorbia*, taking particular note of the major works of Norton (1900) and Wheeler (1941). The most recent treatment to include all of the members of the genus *Euphorbia* prior to that of Croizat's in 1945 was Rydberg (1932), who divided the genus into six genera with 24 species. Later treatments of this genus in the United States are for the most part incomplete works which dealt primarily only with those species which occurred and were reported within a state or region. Croizat's detailed review of *Euphorbia* was written using the fairly classical approach which recognizes distinct groupings as subgenera of a very diverse genus *Euphorbia*. This approach seems to have stayed with workers in the area and is the same one used by Richardson in 1968 in which the genus *Euphorbia* is broken down into four subgenera; *Chamaesyce*, containing 12 species, *Agalomia*, consisting of three species, *Poinsettia*, consisting of two species, and *Esula*, consisting of four species. The four species of *Esula* are *spathulata*, *podperae*, *cyparissias* and *robusta*. This is a total of 21 species in the genus *Euphorbia* with 2 additional varieties which are usually attached to the genus (Fig. 2).

The origin of *Euphorbia esula* L. of Europe is in Linnaeus' publication of *E. mauritanica* in the year 1753. According to Croizat (1945) this presentation of *E. mauritanica* is hazy and over-inclusive, with references to a number of poorly noted entities which has been cultivated for years in European gardens. He goes so far as to suggest that *E. mauritanica* so conceived probably includes a number of non-*Euphorbia* plants. Since there is no specimen existing in the Linnaean herbarian, the validity of the descrip-

tion of *E. mauritanica* is based on diagnostic notes. In 1766 Crantz indicated that the Linnaean *E. mauritanica* is probably based on Dillenius' descriptions of *Tithymalus aphyllus mauritaniae*, *Tithymalus* Dill. and *Euphorbia mauritaniae* Dill. dated 1732. According to Croizat, Dillenius' illustrations of *E. mauritaniae* are so explicit that modern taxonomists

After Richardson (1968):

Family:	Euphorbiaceae	283 genera	1600 species
Genus:	Subgenera:	# Species	
Euphorbia	Chamaesyce	12	
	Agalomia	3	
	Poinsettia	2	
	Esula	4	spathulata
			podperae (includes types)
			esula L.
			virgata Wald. and Kit.
			intercedens Pax.
			cyparissias
			robusta
			+ 2 varieties

FIGURE 2

cannot distinguish it from *E. obtusifolia* Poir. and therefore Crantz's conclusion that *Tithymalus* Dill. is the appropriate reference for Linnaeus' publication of *E. mauritanica* is correct. It should be mentioned that Lamarck did not publish an *E. mauritanica* of his own, but rather was referring to *Euphorbia mauritanica*, which in actuality is *Euphorbia Tithymalus*, it is concluded that the plants of Linnaeus and Lamarck are the same.

Today the Linnaean nomenclature *E. mauritanica* L. is associated with a plant type from South Africa, as was pointed out by Brown (1915). In 1804 Desfontaines recorded the description of an euphorb which he called *Euphorbia virgata* and which was based on a collection. This specimen was studied once again by Poiret in 1811, Webb and Bertholet, somewhere between 1836 and 1850, and also by Boissier in 1862, all of whom concluded that *E. virgata* was not distinguishable from the *E. obtusifolia* of Poiret. Since the date for *E. virgata* precedes that of *E. obtusifolia* the former should be the proper name. Since *E. mauritanica* L. which is based on *Tithymalus* Dill. is also *E. obtusifolia*, that makes *E. virgata* Desf. synonymous with *E. mauritanica* L. and *E. mauritanica* Lmk. In 1939 Croizat observed the specimen described as *E. mauritanica* Lmk. and

concluded that it was indistinguishable from *E. Regis-Jube* of Webb and Berth. If this is the case, then *E. virgata* Desf. is the same as *E. mauritanica* of Linnaeus, but perhaps distinguishable from *E. mauritanica* of Lamarck which is *E. Regis-Jube*.

In 1805 Waldstein and Kitaibel of Hungary described a collection as *E. virgata*. According to Wheeler, 1939, this is indistinguishable from the *E. virgata* of Desfontaines but since *E. virgata* Desf. preceded by a year *E. virgata* Wald. and Kit., the legitimate name should be *E. virgata* Desf. Croizat points out that *E. virgata* Desf. is probably synonymous with *E. uralensis* of Fisch. ex Link which comes from Eastern Russia. If the conclusion about *E. virgata* Desf. and *E. virgata* Wald. and Kit. is accepted (Wheeler, 1939) and *E. virgata* Desf. takes precedence, then there is a shift in the emphasis of the origin of *E. esula* L. from Europe to Asia. Croizat points out that such phytogeographic shift does not assist the stability of the binomial. Therefore, he suggests that it is in the best interest of this plant's complex pedigree to retain *E. virgata* of Wald. and Kit., and not to go along with the conclusion of Wheeler, 1939, although he recognized that *E. virgata* Wald. and Kit. does have its limitations.

In Croizat's 1947 treatment of the taxonomy of *E. esula* he reviews not only *E. esula* but *E. virgata*, *E. intercedens* and several other species. After studying the complete Palmer collection in Massachusetts, he concluded that it was different from those found in Czechoslovakia annotated as *E. intercedens* Podp. (1922). He states that these spurge plants were probably the basis of most of the old records of *E. esula* in North America which had been introduced from Eurasia. He further states that on the basis of his observations, *E. esula* and *E. virgata*, both of which are growing in the United States, are naturalized forms of the *E. intercedens*. He notes that the only difference between these reports of *Euphorbia* species is essentially in their habitats, which do not appear to be completely compatible. He, therefore, concludes that perhaps these are ecotypes of the same plant form. Croizat therefore states in 1945 that *E. virgata* Wald and Kit., *E. esula* L., described for the U. S., and *E. intercedens* Podp. are in fact indistinguishable from one another and therefore the same plant type. It was later pointed out to him by a colleague, E. J. Palmer, that *E. intercedens* Podp. was actually preceded by an *E. intercedens* Pax. in 1905 in England and that the *E. intercedens* Podp. is therefore not a legitimate name.

Wheeler (1939) in making a comparison of the *E. esula* L. of Europe, the *E. virgata* Wald. and Kit. and the *E. intercedens* Podp. by Croizat, published that he could not distinguish between these three plant types and that this conclusion therefore supported the use of the name *E. esula* as applied to the *E. esula* L. of Europe. On the basis of the fact that there were differences between the plants that appeared to be associated with the locality from which they came, Croizat disagreed with Wheeler and as reviewed by Richardson (1968) proposed that the *E. esula* L. of Europe, the *E. virgata* Wald. and Kit., and *E. intercedens* be considered subspecies or perhaps ecotypes of the same plant type or species *E. Podp.* belonging to the subgenus *E. esula*.

In a short note in the American Midland Naturalist in 1947, Croizat acknowledged the precedence of *E. intercedens* Pax. in England, 1905. He realized the invalidity of the nomenclature then and proposed that until such time as a worldwide study and revision be made of the "esula complex," the following name be applied to the plant described as leafy spurge:

Euphorbia podperae Croz. (1947) with the description *E. intercedens* Podp. in Publ. Fac. Sc. Univ. Masaryk 12: 29, 1922; Domin Pl. Cecosl. En. 77, 1935 - non *E. intercedens* Pax. in Engl. Bot. Jahrb. 34: 75, 1905.

CONCLUSION

It appears that at this time a definite answer as to the true relationships and the status of the various taxa which are involved here has not as yet been uncovered. If it is even possible to establish these relationships, and that may be doubtful now, it apparently will require a worldwide treatment and monograph on the subject. Therefore, it would seem only expeditious to follow the suggestions and conclusions of the most recent reviews of the *esula* complex, namely that of Croizat in 1945, 1947, and Richardson in 1968, and follow the classical approach which recognizes under the genus *Euphorbia* four subgenera, one of which is *esula*, and within *esula* four species, one of which is *podperae*. It would seem that the adoption of the nomenclature for leafy spurge as *Euphorbia podperae* Croz. 1947, as supported by Richardson in 1968 in his review of the species, and as adopted and published by the Great Plains Flora Association (1977), would be to the advantage of all plant scientists who are investigating the basic biology of this pernicious weed as well as various chemical, cultural and biological control methods.

BIBLIOGRAPHY

- Barnett, H. C. and H. C. Hanson. 1934. Control of leafy spurge and review of literature on chemical weed control. N. D. Agri. Exp. Stn. Bull. 277:1-31.
- Batho, G. 1931. Leafy spurge. Manitoba Dept. of Agric. & Immigra. Cir. 106.
- Batho, G. 1938. Manitoba Dept. Agri., Circ. 106.
- Croizat, L. 1945. **Euphorbia esula** in North America. Amer. Midl. Nat. 33:231-243.
- Croizat, L. 1947. **Euphorbia intercedens** Podp., a homonym. Amer. Midl. Nat. 37:801-802.
- Dunn, P. H. 1979. The distribution of leafy spurge (**Euphorbia esula**) and other weedy **Euphorbia** spp. in the United States. Weed Sci. 27:509-516.
- Fernald, M. L. 1948. Two forms in **Euphorbia**. Rhodora 50:148.
- Gray's Manual of Botany 8th ed. 1950. Amer. Book Co., New York. 1632 p.
- Great Plains Flora Assn. Atlas of the Flora of the Great Plains. Iowa State Univ. Press, Ames 1977.
- Hanson, H. C. and Velva E. Rudd. 1933. Leafy spurge, life history and habits. N. D. Agri. Exp. Stn. Fargo, Bull. 266, 24 pp.
- Harris, P. and J. Alex. 1971. **Euphorbia esula** L., leafy spurge and **E. Cyparissias**, cypress spurge (**Euphorbaceae**) in biological control programmes against insects and weeds in Canada 1959-1968. Common, Inst. Biol. Control. Trinidad Tech. Common. No. 4:83-88.
- Leafy Spurge Symposium, Proceedings. 1979. NDSU Coop. Ext. Serv. Publication p. 8-15.
- Moore, R. J. 1958. Cytotaxonomy of **Euphorbia esula** in Canada and its hybrid with **Euphorbia cyparissias**. Can. J. Bot. 36:547-559.
- Morton, C. V. 1937. The correct name of the leafy spurge. Rhodora 39:49-50.
- Norton, J. B. S. 1900. A revision of the American species of **Euphorbia** of the section **Tithymalus** occurring north of Mexico. Ann. Rep. Missouri Bot. Gard. 11:85-144.
- Pax, F. and K. Hoffmann. 1931. Euphorbiaceae, in Engler & Prantl, Naturalischen Pflanzenfamilien, Z Aufl., 19c:11-233.
- Podpera. 1922. Descn. **Euphorbia intercedens** Podp. Publ. Fac. Sc. Univ. Masaryk 12:29.
- Reed, C. F. and R. O. Hughes. 1970. Selected weeds of the United States. U. S. Dept. Agric. Handb. 366, Washington, D.C.
- Richardson, J. W. 1968. The genus **Euphorbia** of the high plains and prairie plains of Kansas, Nebraska, South and North Dakota. Univ. of Kansas Sci. Bull. 48:45-112.
- Rydberg, P. A. 1932. Flora of the prairies and plains of central North America. New York Botanical Garden. 970 p.
- Stevens, O. A. 1922. North Dakota Weeds, General habits and methods of control. N. D. Agri. Coll., Agri. Exp. Stn. Bull. 162.
- Stevens, O. A. 1931. North Dakota Weeds, N. D. Agri. Exp. Stn. Bull. 243.
- Stevens, O. A. 1963. Handbook of North Dakota. N. D. Institute for Regional Studies, Fargo, 324 p.
- Weed Society of America. 1962. Report of the terminology Com. WSA Weeds 10:225-271.
- Wheeler, L. C. 1939. A miscellany of New World **Euphorbiaceae** - II. Contr. Grey Herb. 127:48-78.
- Wheeler, L. C. 1943. The genera of the living Euphorbieae. Amer. Midl. Nat. 30:456-503.

