

# Russian-Thistle (*Salsola*) Species in Western United States

JANICE C. BEATLEY

**Highlight:** Russian-thistle populations in western United States consist of either of two species, or both, and are distinguishable at all stages in the field. *Salsola pestifer* is now replaced by an earlier name, *S. iberica*. The second species,

*S. paulsenii*, prevails in many areas, especially in the southwest. Where growing together they appear to hybridize freely, resulting in populations exhibiting varying degrees of genetic introgression.

In the course of insect control investigations in California in the 1950's<sup>1</sup>, and field studies in southern Nevada in the 1960's (Beatley 1965, 1969), it was independently concluded that Russian-thistle populations consist of two distinct taxonomic entities which, although apparently hybridizing in many areas, have maintained their genetic and taxonomic identities. Russian-thistle has been treated in the plant manuals and floras of the country as a single species, usually as *Salsola pestifer* A. Nels. or *S. kali* L.

California material of the two entities was determined in 1967 by V. Botschantzev, Russian monographer of the genus *Salsola*, University of Leningrad, as *Salsola pestifer* A. Nels. and *S. paulsenii* Litv. Southern Nevada specimens were also assigned to two species by Botschantzev in 1970. These were *S. iberica* Sennen & Pau and *S. paulsenii* Litv. *S. iberica* Sennen & Pau, described in 1908, has priority over *S. pestifer* A. Nels.

---

At the time of the research, the author was associate research ecologist, Laboratory of Nuclear Medicine & Radiation Biology, University of California, Los Angeles. She is now at the Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio.

Studies were supported by Contract AT (04-1) Gen-12 between the U. S. Atomic Energy Commission and the University of California. The author gratefully acknowledges her indebtedness to Thomas C. Fuller, California Department of Agriculture, Sacramento, for sharing the history of his efforts to establish the correct names for the two species in California, and field and herbarium information relating to the species in that state; to William A. Weber, University of Colorado, for his interest in the problem and for the final resolution of the determinations of the taxa, especially the handling of all arrangements and sending of the Nevada material to the USSR; and to Peter H. Raven, Missouri Botanical Garden, for his efforts in 1965 to obtain critical judgments of the Nevada plants from P. Aellen in Switzerland.

Manuscript received April 5, 1972.

which was described in 1909. *S. kali* L. subsp. *ruthenica* (Iljin) Soo var. *tenuifolia* (Tausch.) Aellen (Aellen, 1961) also appears to be a synonym, at least in part, of *S. iberica* Sennen & Pau.

It is the purpose of this report to record, for the information of those who deal with these noxious weeds on western rangelands and elsewhere, that there are two Russian-thistle species to be considered in land management and agricultural practices.<sup>2</sup> The species are readily distinguishable, beginning with the seedling stage. The combinations of characters by which they may be distinguished in the field are as follows:

*Salsola iberica* Sennen & Pau. (1) Plants neither rigid nor prickly from seedling to early maturity, i.e., plants are "soft" to the touch until late summer and autumn. (2) Plants blue-green in color. (3) Stems with longitudinal red-purple striations. (4) Stems slender, not rigid until time of maturity. (5) In immature plants, leaves slender, subterete, less than 1 mm wide (commonly 0.5 mm), the principal ones 2 cm long, not rigid, weakly spine-tipped and not pungent, more or less densely short- and soft-pubescent; leaves becoming more rigid at maturity, and replaced in the inflorescence by short, pungent, rigid, and broad bracts. (6) During the period of vegetative development, plants appearing taller than wide and

---

<sup>2</sup> A third introduced species of *Salsola*, *S. collina* Pallas, is not here under consideration. Plants of this species are scarcely prickly at maturity, have elongate branches (virgate), and calyx-segments are unwinged or short-winged. The species has been reported from Iowa, Minnesota, and Colorado (Schapaugh, 1958); it is now reported to be common in the Front Range area of Colorado (Weber, 1967), and its introduction and establishment may be anticipated elsewhere in western United States.

<sup>1</sup> Personal communication, T. C. Fuller, 1969.

narrowed toward the apex, i.e., the central stem longer and more prominent than the lateral branches. (7) Flowering beginning in late summer (August to early September); where the two species grow together, flowering begins usually at least 2 to 3 weeks later than in *S. paulsenii*. (8) Fruiting calyx-wings small (usually less than 2 mm long), deep red. (9) Seedlings and young plants with branches ascending from their bases, not appearing cruciform.

*Salsola paulsenii* Litv. (1) Plants rigid and prickly to the touch, from seedling through maturity. (2) Plants yellow-green in color. (3) Stems without purple striations, or pale striations only. (4) Stems thick and rigid from seedling stage through maturity, scabrid. (5) Leaves from seedling stage through maturity, thick, terete, rigid, appearing turgid, recurved toward the apex, strongly pungent-tipped; principal leaves ca 1 cm (0.5 - 1.5 cm) long 1 - 1.5 mm wide, more or less short-pubescent. (6) Plants appearing as wide as tall, not narrowed toward the apex, but with basal branches strongly developed, i.e., the central stem not exceeding, or shorter than, the main laterals, and plants of all ages more or less convex-topped. (7) Flowering beginning in May in some areas (in southern Nevada), and where the two species grow together, nearly always at least 2 to 3 weeks earlier than in *S. iberica*. (8) Fruiting calyx-wings large (3 - 4 mm long), colorless to pale pink (usually reddish near base of wings), veins very conspicuous. (9) Seedlings and young plants markedly cruciform, the four lateral branches nearly prostrate in seedlings and later ascending toward the tips.

In southern Nevada, where *Salsola* distributions have been closely observed and documented for a decade, *S. iberica* is an abundant weed of disturbed soils at the higher elevations (above 6,000 ft), occurring especially on sandy soils derived from rocks of volcanic origin. *S. paulsenii* is a widely distributed and common weed of disturbed sites at the lower elevations (below 4,000 ft), and is associated especially with soils derived from limestones. From 4,000 to 6,000 ft both *S. iberica* and *S. paulsenii* may occur in pure stands, in mixed stands of both species or, frequently, as a hybrid swarm showing varying degrees of introgression between both species. In these populations no two plants may be phenotypically the same, and the marked variability is an apparent expression of differing genotypes within the populations. Once a Russian-thistle population is established, species composition does not change significantly in subsequent seasons, including the proportions of hybrid derivatives in relation to numbers of individuals of the parental species.<sup>3</sup>

Both species and their genetic intergrades are known to occur in a number of areas in California<sup>4</sup>, in at least the southern part of Nevada, and southern and at least north-western Utah (Anonymous, 1969); both occur also in Arizona, but *S. paulsenii* is not known from Colorado.<sup>5</sup> It is probable that both occur to some extent throughout western United States, especially over the Intermountain Region, and that *S. paulsenii*, common in the Mojave Desert of California, southern Nevada, and southwestern Utah, is more prominent at lower elevations in the southwestern part of the country, and that *S. iberica* is the prevailing species of the higher elevations and latitudes of western United States. Definitive geographic distributions are dependent upon future recognition of the two species and collecting of the genus in all of the

western states.

*Salsola paulsenii*, although present at least since the time of a collection by Alice Eastwood from near Barstow, Calif., in 1913, has gone unrecognized as a distinct species by plant taxonomists of the country through the years, and therefore does not appear in any regional plant manuals of the United States, except for the recent citation in Munz (1968). In most manuals of western United States, *S. paulsenii* and the hybrid derivatives appear to be included under *S. pestifer* through mention of great variability within the species. However, the near-spherical shape of the plants of *S. paulsenii* at immature stages, their rigid stout stems and thick, strongly pungent-tipped leaves at all stages, the yellow-green color and inconspicuous pigmentation otherwise, and the large, veiny, fruiting calyx-bracts are all distinctive characters in combination, once known. The species is described by Aellen (1964) as having "purple or reddish stems" and heights to only 40 cm, both of which features are at variance with our populations characterized by the near absence of red pigment in the stems and heights of mature plants to over 100 cm.

That two morphologically and physiologically different taxa were present among Russian-thistle populations has been known since 1950 by California entomologists, who have long referred to the extremely coarse and prickly *S. paulsenii* as the "Barbwire Russian-thistle".<sup>6</sup> Physiological differences were evident from the marked preference of the beet leafhopper (*Circulifer tenellus*) for *S. iberica* over *S. paulsenii* as an autumn host plant; leafhopper control measures are unnecessary where *S. paulsenii* is the prevailing species.

Neither species was collected by Coville (1893) in southeastern California or southern Nevada on the Death Valley Expedition of 1891, throughout which region *S. paulsenii* is today a thoroughly established weed; it is therefore inferred that the appearance of this species in southern California, and perhaps its introduction into the country, occurred sometime between the years 1891 and 1913. According to Robbins et al. (1951), *S. iberica* was introduced in South Dakota with flax seed in 1873 or 1874, from Russia, where it was then a serious pest over large continental areas. Aellen (1964) reports *S. iberica* to be a ruderal throughout most of Europe and *S. paulsenii* native to southeastern Russia and central Asia.

#### Literature Cited

- Aellen, P. 1961. *Salsola* L. In Hegi, G., *Illustrierte Flora von Mitteleuropa*. Vol. 3. Carl Hanser, Munich. p. 739-746.
- Aellen, P. 1964. *Salsola* L. In *Flora Europaea*. Vol. 1. Cambridge Univ. Press. p. 104-107.
- Anonymous. 1969. New weed menaces desert ranges. *Utah Sci.* 30:31.
- Beatley, J. C. 1965. Ecology of the Nevada Test Site I. Geographic and ecologic distributions of the vascular flora. UCLA 12-553. Lab. Nucl. Med. & Rad. Biol., Univ. of Calif., Los Angeles. 69 p.
- Beatley, J. C. 1969. Vascular plants of the Nevada Test Site, Nellis Air Force Range, and Ash Meadows (northern Mojave and southern Great Basin deserts, south-central Nevada). UCLA 12-705. Lab. Nucl. Med. & Rad. Biol., Univ. of Calif., Los Angeles. 122 p.
- Coville, F. V. 1893. *Botany of the Death Valley Expedition*. Contr. U. S. Nat. Herb. 4. Govt. Printing Office, Washington, D.C. 363 p.
- Munz, P. A. 1968. Supplement to A California Flora. Univ. of Calif. Press, Berkeley. 224 p.
- Robbins, W. W., M. K. Bellue, and W. S. Ball. 1951. Weeds of California. Calif. State Dep. Agr., Sacramento. 547 p.
- Schapaugh, W. 1958. *Salsola collina* Pall. new to Iowa. *Proc. Iowa Acad. Sci.* 65:118-121.
- Weber, W. A. 1967. *Rocky Mountain Flora*. Univ. of Colorado Press, Boulder. 437 p.

<sup>3</sup> Author's unpublished data.

<sup>4</sup> Personal communication, T. C. Fuller, 1909.

<sup>5</sup> Personal communication, W. A. Weber, 1970.

<sup>6</sup> Personal communication, T. C. Fuller, 1969.