The Russian Thistle.

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The Russian Thistle.

By Charles S. Crandall.

The list of Colorado weeds, already a formidable one, has recently received an addition, a new-comer which at once falls into the category of worst weeds and which we deem worthy of special mention. We refer to the Russian thistle, or Russian cactus. These two names for the plant are in common use wherever it is known and are too well established to admit of being changed; they are, however, misapplied, because the plant is neither a thistle nor a cactus. The species of which the plant to be considered is a variety is the saltwort, common along the Atlantic coast and reported from a number of stations inland as far west as Nebraska. It is an introduced plant of weedy character, but during its century or more of existence on American soil has never developed as a serious farm or garden pest.

Saltwort, or Russian saltwort, would be correct as common names for our plant, but following custom we will call it Russian thistle.

Botanically the plant is known as Salsola kali tragus (L.) Moq. It belongs to the goosefoot family—Chenopodiaceae—and is closely related to several of our most common weeds, among them being the common pigweed, Chenopodium album L.; the winged pigweed, Cycloloma platyphyllum Moq.; the sea-blite, Suaeda depressa Watson, which in company with its variety, erecta, is so common on lands moist from seepage; the greasewood, Sarcobatus maximilianii Nees., and several species of the genus Atriplex. There should also be mentioned as relatives of the Russian thistle three members of the amaranth family, Amaranthus retroflexus L.; Amaranthus blitoides Watson; Amaranthus albus L.; the latter is our common tumbleweed, and has often been mistaken for the Russian thistle.

ORIGIN AND HISTORY.

The following concerning the origin and history of the Russian thistle, as given by Mr. L. H. Dewey, in bulletin No. 15, from the Division of Botany of the U. S. Department of Agriculture, will be of interest:

"Nearly a century and a half ago this plant was mentioned by Linnaeus as growing in eastern Europe, and many botanical writers have since described it among the plants of that region. The species Salsola kali, or some of its varieties, is found in most of the provinces of eastern Russia and western Siberia. The variety
tragus seems to have developed on the plains of southeastern Russia, where the conditions are very similar to those of the great Plains region of the United States. For many years it has been a destructive weed in the barley, wheat, and flax regions of southeastern Russia, and the cultivation of crops has been abandoned over large areas in some of the provinces near the Caspian Sea. No effectual methods of exterminating the weed are known in Russia. Sheep, pasturing on the young plants, aid materially in keeping the thistle in check, but it is continually growing more troublesome and extending to new territory.

“The plant was first introduced into the United States in 1873 or 1874, in flaxseed brought from Russia and sown near Scotland, Bonhomme County, S. Dak. The land there is somewhat hilly, and corn is the chief crop raised, so that, owing to the wooded ravines and the standing cornstalks, the Russian thistle was at first slow in spreading. In 1877 it first appeared in Yankton County, east of Bonhomme, and five years later it had spread to the counties to the north and west of Bonhommne. It continued gradually to cover new territory until 1888, when it had infested most of the counties between the Missouri and James rivers south of the Huron, Pierre and Deadwood Division of the Chicago & Northwestern Railway. The strong winds during the winter of 1887-88, followed by the dry summer of 1888, and possibly a fresh importation of seed into the flax fields of Faulk or McPherson Counties, caused the weed to spread, within two years, to nearly all the remaining counties between the Missouri and James rivers in South Dakota, and to infest the southern tier of counties in North Dakota. At about the same time it invaded northern Iowa and northeastern Nebraska.”

No definite date can be assigned for the introduction of the Russian thistle into Colorado. We have authentic information of its existence here in 1892, but it was undoubtedly introduced earlier, and possibly several years earlier. It has attracted no notice and received no attention until within the present year. During the last three months a large number of inquiries have been received by this department, most of them accompanied by specimens of the plant.

From the remoteness of the localities reporting the plant, it is apparent that it has not spread from one point of infection, and the manner of its introduction is a matter of speculation. It is said to have been introduced into Morgan County by a colony of Russians, who brought it as an impurity in seed. At Denver, LaSalle, and Longmont, plants were first discovered upon railroad property, and the development and distribution point to the railroad lines as points of infection, and to passing trains as the means of introduction.
Railroads, as is well known, are very efficient agents in aiding the distribution of plants; trains, and especially freight trains, passing through a district where any particular plant abounds afford convenient lodging places, on the trucks, or among the cargo of open cars, for plants, or parts of plants, or seeds, which are thus transported long distances. The bedding used in stock-cars may abound in weed seeds; it may be carried back and forth, to be finally thrown out at some point far removed from the point of shipment. New plants, strangers in the locality, make their appearance, they multiply and spread, or die out, according as the conditions are favorable or unfavorable to their growth. It is probable that several localities reporting the presence of the Russian thistle owe its introduction to the agency above mentioned.

The Russian thistle is in itself a good traveler, being one of the most perfect tumble-weeds known, but it is not probable that it came to us unassisted, because of the distance from previously infected sections, and the fact that there are intermediate areas from which the plant has not been reported. From the information now at hand, it appears that seventeen counties in Colorado are infested with the plant in greater or less degree; these are Weld, Logan, Phillips, Yuma, Washington, Morgan, Boulder, Jefferson, Arapahoe, Elbert, Lincoln, Kit Carson, Fremont, Pueblo, Otero, Bent, and Prowers. It is very probable that it exists in four other counties, namely: Larimer, Sedgwick, Cheyenne, and Kiowa, but we have as yet no information to confirm this suspicion.

The counties known to be infested are all agricultural counties, and a glance at the list will at once show what a wide distribution the plant already has; it is so widely distributed and has obtained so strong a foothold that it is a serious menace to our agricultural interests. The presence of the plant in Weld County was brought to our notice in a letter from Hon. J. S. Newell, of the Board of County Commissioners. We visited LaSalle, the locality indicated, and traveled over the infested area; from inquiries made it appears that the plant was first noticed in the fall of 1892, near the Union Pacific tracks; no one who saw it knew what it was and no attention was given to it. In 1893 it appeared in quantity along the bank of the canal, and many plants were seen in adjoining fields. This present season it spread still further; the canal bank was occupied for a half mile east from the point of infection; the lateral ditches were lined with it, affording a striking illustration of the efficacy of the irrigating ditch as an agency in the dissemination of weed seeds; an area of waste land adjoining the main canal was covered with the plant, and numerous specimens were seen in neighboring fields of potatoes and corn.

Mr. Newell had previously visited this locality, and I found the farmers advised as to the nature of the plant. A knowledge
of the damage inflicted in other states, and a present forcible illustration of the ability of the plant to spread, quickly awakened them to the impending danger, and all were resolving to at once engage in a war of extermination. But here arose a question: the right-of-way along the railroad and along the canal was infested; would the railroad and canal corporations take care of the weeds on their property? The opinion seemed to prevail that they would not, and the farmers were awake to the fact that it would give them no permanent relief to exterminate the weed from their farms if the plants on neighboring territory were allowed to ripen and produce their seed. They could care for their own farms, but were neither able nor willing to do more. Immediate action was necessary, because seed would soon be forming. Mr. Newell and his colleagues in this case solved the problem; the County Commissioners of Weld County employed a dozen men and set them at work, under instructions to continue as long as a plant could be found. That the work was thoroughly done I can testify from personal inspection, and I desire to hold up this prompt action of the Commissioners as a shining example that may well be followed by other counties. This energetic action at LaSalle does not, however, free Weld County from the weed; knowledge of its presence came late, and mischief had already been done. Later reports show the plant present on farms several miles south and east of LaSalle, and also northeast on Crow Creek; the presence of the plant on Crow Creek traces directly, as I am credibly informed, to alfalfa hay hauled from near LaSalle in the fall of 1893.

At Longmont the Russian thistle was first noticed this summer in three small areas near the Union Pacific depot; these plants, I am informed, have been pulled and burned under the direction of the Street Commissioner. Later the plant is reported as present on several farms near Longmont; but the warning has come in time, and as there appear to be no extended areas covered, we may reasonably look for its complete extermination from this locality.

In Arapahoe County the Russian thistle appears to be quite well distributed over the eastern portion, and it is very abundant in the suburbs on all sides of Denver. We have seen the plant in quantity along the tracks of the Kansas Pacific Railroad from York street east; on the numerous vacant lots, the roadsides, and ditch banks in the district lying east of Gaylord street, between 28th and 40th avenues; in City Park; on Capitol Hill, and in several places south of the city. On Gaylord street, along the tracks and about the terminus of the cable line, it is especially abundant.

For our information regarding the Russian thistle in the Arkansas Valley we are indebted to Mr. F. A. Huntley, Superintendent of the Experiment Station at Rocky Ford, in Otero County. Mr. Huntley writes, under date of September 25th:
"So far as known the first specimens seen in the Arkansas Valley were discovered last year in the vicinity of Fowler, in the western part of this county. That they were there last year has been conclusively proven. It is numerous in the vicinity of Pueblo, then beginning near Nepesta, about 26 miles west of Rocky Ford, and extending east as far as 10 miles east of La Junta, making a continuous infested area of about four miles wide by 45 miles long, not counting Pueblo. A county organization has been formed and its members, over 100, are pledged to put forth every effort possible towards the destruction of this pest. Frank Bingham is the President of this society and F. A. Huntley Secretary. The people here are fully awake to the importance of destroying the Russian thistle. The railroads have been doing good work."

Accompanying Mr. Huntley's letter, were letters from officials of the Atchison, Topeka & Santa Fe, and the Missouri Pacific Railroad Companies, advising him that instructions had been issued to section men to cut and burn all Russian thistles found on the right-of-way. These letters manifest a cordial desire to cooperate with the farmers, and it would seem that everything possible is being done to eradicate the plant from the Arkansas Valley, or at least from Otero County.

Two practical questions appear in most of the letters of inquiry received by this department: First, How can the Russian thistle be distinguished from other plants? Second, How can it be exterminated? In those localities where the plant is abundant, farmers have learned, or will learn this fall by personal contact, the answer to the first question. But there are yet many who have not seen the plant to know it, and it will not be out of place to dwell briefly upon its characteristics. As is the case with most of our weeds, the Russian thistle varies greatly, according to the conditions which surround it. Isolation, rich soil, and plenty of water induce large plants; crowding by other plants, poor soil, and extreme drought produce small plants. With variations in size are also variations in habit of growth; two plants may have the same dimensions as to height and spread, and yet be very different in general aspect; the one grown under favorable conditions will be oval, or possibly almost globular

Fig. 1.—Twig from plant of compact growth, enlarged 1¼ times.
in form, with a thick and matted appearance due to the development of a great number of branches; the other, grown under adverse circumstances, will present an open, straggling appearance, because the branches are fewer in number, farther apart, and usually very short. The matter of color seems largely dependant upon water; plants upon ditch banks, or in other moist situations, have a dark green color, which they retain until quite late in the season; those deprived of water are early tinged with red, and this color deepens as the season advances.

The Russian thistle is an annual. It comes from seed each year, produces seed in its turn, and then dies. The young plants are smooth and succulent, showing none of the characters which mark the mature plant. The early leaves are slender and thread-like, from one to two inches long, each tipped with a spine; on either side, at the base of each leaf, is a short spine, and above the leaves appear branches, which at first seem to be clusters of spines and short leaves. These branches are near or remote, long or short, according to circumstances; on vigorous plants the branching continues until growth ceases, and even the late branches may be from three to six inches in length. On dwarfed specimens the late branches remain quite short, an inch or less long. On all plants the leaves produced late in the season are very short, commonly but little longer than the spines, so that the branches appear to bear spines only, and these in clusters of three. [See Fig. 1.] As the plant approaches maturity, these spines become more rigid, imparting that character which evidently suggested the application of the name thistle. The long leaves produced early in the season wither and usually fall away as the plant nears maturity, so that many plants appear to be almost leafless. Immediately above, and close down in the angle, between the clusters of spines and the stem, is borne a single flower. [See Fig. 2.] The number of flowers on a plant is, however, large, because the clusters of spines are near together. We have counted thirty-five on a branch three inches in length, and the average of several branches counted was nine to the inch. The flowers are inconspicuous and vary in appearance on different plants; sometimes they are pale red, but oftener green or greenish. As the fruit begins to mature, the floral envelope surrounding each flower enlarges somewhat and spreads out until it often measures a quarter of an inch across. The fruit which is held within this floral envelope is small, with rough exterior, and of a light-
grey color when ripe; the outer covering removed shows the seed in spiral form. The root system of the plant is small, giving it but a slight hold on the ground; it can be easily pulled at any time. When the plant dies in the fall the wind may turn it out entire, or break it off at the surface. It is then ready to travel where the winds may take it, distributing its seed as it goes. For further and more minute details of structure, the following technical description given by Mr. L. H. Dewey, in bulletin No. 15, from the Division of Botany of the U. S. Department of Agriculture, may be consulted:

"Technical Description.—Salsola kali tragus (L.) Moq. in DC. Prod., XIII., 2, 187 (1849). A herbaceous annual, diffusely branching from the base, 0.5 to 1 m. (1 1/2 to 3 feet) high and twice as broad, smooth or slightly puberulent; tap root dull white, slightly twisted near the crown; leaves alternate, sessile; those of the young plant deciduous, succulent, linear or subterete, 3 to 6 cm. (1 to 2 inches) long, spine-pointed and with narrow, denticulate, membranaceous margins near the base; leaves of the mature plant persistent, each subtending two leaf-like bracts and a flower at intervals of 2 to 10 mm. (about one-twelfth to five-twelfths of an inch), rigid, narrowly ovate, often denticulate near the base, spine-pointed, usually striped with red like the branches, 6 to 10 mm. (three-twelfths to five-twelfths of an inch) long; bracts divergent, like the leaves of the mature plant in size and form; flowers solitary and sessile, perfect, apetalous, about 10 mm. (five-twelfths of an inch) in diameter; calyx membranaceous, persistent, inclosing the depressed fruit, usually rose-colored, gamosepalous, cleft nearly to the base into five unequal divisions about 4 mm. (one-sixth of an inch) long, the upper one broadest, bearing on each margin near the base a minute tuft of very slender coiled hairs, the two nearest the subtending leaf next in size, and the lateral ones narrow, each with a beak-like connivent apex, and bearing midway on the back a membranaceous, striate, erose-margined horizontal wing about 2 mm. (one-twelfth of an inch) long, the upper and two lower wings much broader than the lateral ones; stamens 5, about equaling the calyx lobes; pistil simple; styles 2, slender, about 1 mm. (one twenty-fifth of an inch) in diameter, dull gray or green, exalbuminous, the thin seed coat closely covering the spirally-coiled embryo; embryo, green, slender, about 12 mm. (one half inch) long when uncoiled, with two linear subterete cotyledons. The plant flowers in July or August and the seeds mature in September and October. At maturity the action of the wind causes the root to break with a somewhat spiral fracture at the surface of the frozen ground, and the plant is blown about as a tumble-weed. The mature flower with the inclosed seed is held in place in the axis of the bracts by the two minute tufts of coiled hairs, preventing the seeds from falling all at once when the plant begins to roll.

The variety tragus differs from the typical form of Salsola kali, which is common along the Atlantic coast, in the following characters: The leaves of the mature plant are very little longer than the leaf-like bracts which they subtend, while in the typical form of the species they are generally two to four times as long. The calyx is membranaceous and nearly always bright rose-colored, and the wings on the backs of the calyx lobes are much larger than the ascending lobes, while in the typical form the calyx is coriaceous and usually dull white or only slightly rose-colored, and the wings are thick, comparatively narrow, and less prominent than the ascending lobes. The species itself is less bushy in habit and less rigid at maturity. It has been known along the Atlantic coast from Massachusetts to Georgia for nearly a century, and has never developed into a troublesome weed."

Three of our native weeds have been mistaken for Russian thistle. These plants do, in some degree, resemble the thistle, but the leaf and spine characters of the latter can hardly fail to readily separate it from the others. The plant bearing the strongest resemblance is the common tumble-weed, Amaranthus albus L. [Plate V.]; its habit of growth is much the same, but its flat leaves, which may
always be found, at least towards the base of the plant, together with the lighter color and early maturity, will serve to distinguish it. The winged pigweed, *Cycloloma platyphyllum* Moq. [Plate VI.], bears resemblance to the Russian thistle only in its compact, globular form of growth; its leaves are flat, its branches slender; it has no spines, and the whole plant is light green in color; these characters should separate it without difficulty. The third plant is the sea-blite, *Suaeda depressa* Watson; the large forms of this species, seen at a little distance, show rather a striking resemblance to the Russian thistle, but, as in the other cases, the leaves and spines serve as a ready means of recognition. The sea-blite is not at all spiny, and its leaves, while of the same general shape, are larger and thicker than in the Russian thistle.

How can the Russian thistle be held in check or eradicated? The plant, being an annual, is perpetuated from season to season only through the seed. The crop of any year depends entirely upon the seed produced the previous year. It will, therefore, be apparent that effort must be directed towards preventing the formation and dissemination of seed. It is only a question of how this can best be accomplished. There is no probability that the plant will die out of itself; the growth and multiplication within the short time the plant has been with us shows that our climatic conditions are favorable to its development, and makes it plain that nothing but active and persistent warfare will rid us of it. Work should be commenced at once and continued as long as plants can be found. Later than September 1st, all plants pulled should be burned, in order to insure the complete destruction of such mature seeds as they may bear. Every plant destroyed in the fall will lessen by so much the work that must be done another season. For spring-sown grain the ground should be prepared and the seed sown as early as possible; having the ground occupied by a crop will, in a measure, check the growth of the weed. Infested grain fields should be harvested early, because the earlier the weed is cut the more succulent it is and the less trouble it will give in handling the grain. Plowing immediately after harvest is recommended as a further means of destruction. Where hoed crops are to occupy the ground there need be no trouble, if reasonable attention is given to cultivation. Clean culture should be given until the first of August, or later, if possible. Weeds springing up after that date will not usually mature seed, and hence are only bad in their effect on the present crop.

Any thrifty farmer can, by a little extra effort, free his cultivated land from the Russian thistle, but, if he stops at this, he must repeat the same effort every year. The borders of fields, fence corners, ditch banks, and waste places which are sure to be found on every farm must, so far as weeds are concerned, receive the same attention he would bestow upon his cultivated land; if they are neglected
they will harbor a sufficient crop of weeds to again seed his fields, and he makes no progress toward their extermination. Attention to the outside localities enumerated is one of the greatest factors in the problem of weed extermination; very many farmers do not seem to appreciate its importance, as is apparent from the too common sight of well-tilled fields bordered by rank growth of a variety of weeds. In some cases there is a possible reason for the neglect in the want of co-operation on the part of the owners of adjoining property. If a farmer is so unfortunate as to be surrounded by unoccupied lands owned by non-residents, or if his neighbors are of the careless, shiftless class, he is quite likely to confine his own labor to the land he occupies with crops, and considers himself fortunate if he can keep these clean. Co-operation is in many things an advantage; in the matter of weeds it is an absolute necessity. Individual effort amounts to nothing. The residents of a neighborhood must be of one mind, and must act in concert, in order that lasting good may be accomplished. A very few years of concerted, well-directed action will solve the weed problem for any district; but can this voluntary united action be brought about? It may be possible in some districts, but observation and experience indicate that there are many difficulties in the way; difficulties that in some cases would be insurmountable. There are in every irrigated valley tracts of non-resident land; there are areas on occupied farms lying above the ditches, areas useless for cropping but abundantly able to produce weeds; there are railway and canal lines, each with its more or less broad right-of-way. In the aggregate, a considerable area where weeds are, as a rule, totally neglected. It is difficult, if not impossible, to secure the voluntary co-operation of all corporation or non-resident land owners in the destruction of weeds—a matter involving labor or the expenditure of money; but perfectly effective warfare against weeds cannot be carried on until all lands involved are looked after with equal care. There would be manifest injustice in asking or expecting farmers to keep the unoccupied lands of their neighbors free from weeds, and it seems equally unjust to require them to combat on their own lands the weeds which periodically come to them from the neglected lands around them.

Some, at least, of the railway companies operating in Colorado are ready and willing to co-operate in a war against weeds. We have already referred to the action of the Atchison, Topeka & Santa Fe and the Missouri Pacific Companies in the Arkansas Valley, and we are informed that the Burlington & Missouri River Company has been taking active measures against the Russian thistle on its line. A railway company, viewing a right-of-way from a business standpoint, would desire it kept clean and made as attractive as possible, but there is no encouragement to pay particular attention to weeds if the line must pass through fields that are entirely neglected. To demand of a corporation the extermination of weeds on a right-of-way
without extending the demand to all bordering lands, would be as
unjust as to require a single farmer to keep his land free from weeds
while his neighbors were allowed to neglect theirs.

We have but one thing to suggest as a remedy that may give
equal justice to all, and that is the enactment of a weed law which
shall make the destruction of at least the most obnoxious weeds com-
pulsory upon all land-owners. We are well aware that the mere en-
actment of such a law would accomplish nothing; its existence on
the statute books would be of no use, unless it were backed up and
supported by a public sentiment strong enough to demand its rigid
enforcement. At the last session of our Legislature a bill providing
for the destruction of weeds was introduced and its passage ably ad-
vocated by some of the members; it, however, failed to become a law,
and the sentiment which prompted the bill has until recently re-
mained dormant.

The interest lately awakened in the Russian thistle, and the
activity which the people of infested districts have shown in efforts
towards its extermination, has so developed the sentiment in favor of
a weed law, that we believe there would now be no difficulty in pass-
ing such a law, and in securing its proper enforcement. Many States
have weed laws which are more or less effective, according as public
sentiment demands their enforcement. Only two States, the Dakotas,
legislate distinctively against the Russian thistle. The South
Dakota law provides for the destruction of all noxious weeds, with
specific mention of Russian thistle, Canada thistle, and cockle burr.
The North Dakota law applies to six species only, namely: "Can-
da thistle, cockle burr, mustard, wild-oats, French weeds (avena
fatua), and Russian thistle (Salsola kali tragus)." The Wisconsin law
covers eleven species; the Nebraska law only one, the Canada
thistle.

A law for Colorado should be comprehensive; it should include
those weeds which are at present giving serious trouble, and be so
worded that amendments to cover new introductions are not neces-
sary. The weed question is of vital importance to the farmers of
Colorado, and any measure that affords promise of relief should be
earnestly supported.
PLATE I.—Russian Thistle—Salsola kali tragus (L.) Moq. Twig from plant of open, straggling growth; enlarged $1\frac{1}{3}$ times.
PLATE III. **Russian Thistle** - *Salsola kali tragus* (L.) Moq. Plant of compact form from City Park, Denver. Diameter at the ground, 6 feet and 6 inches; height, 2 feet and 4 inches.
PLATE IV.—RUSSIAN THISTLE—Salsola kali tragus (L.) Moq. Plant of open, straggling habit. The most common form on dry soils. Spread, 2 feet and 6 inches; height, 1 foot and 5 inches.
PLATE V. - *Amaranthus albus* L. Common tumble-weed. Spread, 3 feet; height, 1 foot and 8 inches.
PLATE VI.—Cycloloma platyphyllum Moq. Winged pigweed. Spread, 2 feet and 4 inches; height, 1 foot and 6 inches.