

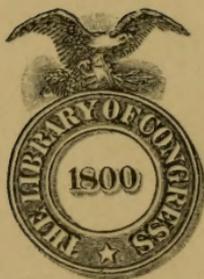
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A Talk on Weeds





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A Talk on Weeds

An address delivered before the County
Road School, Clinton County, Iowa, 1910,
with an appendix describing a few weeds



BY

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AMES, IOWA

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A STUDY OF WEEDS IMPORTANT

I am invited to address you this afternoon on the subject of weeds. I am sure you will agree with me that this is a most important subject for the farmers of Iowa and those who are interested in making our state beautiful. The weeds in villages, cities, along the highways and on our farms are a continual menace to the agriculture of this state. It is important that we begin to realize the menace that weeds are to our agriculture. Iowa should realize the importance of this problem and we should begin at once to clean up, because it is far more economical to do so now than in a decade.

WHAT IS A WEED.

A weed has been defined as a plant out of place. This definition is concise, but is as good as any. Oats growing in a wheat field, if not wanted there, must be looked upon as a weed. A weed may also be defined as a plant detrimental to the growth of a garden or farm crop, in short detrimental to horticulture and agriculture. A great many people regard plants which have inconspicuous flowers as weeds; they exclude, of course, such plants as are cultivated for some purpose. Such people regard the inconspicuous plants of the forest as weeds, forgetting that plants like the Dutchman's Breeches, Bloodroot and Hepatica are most useful plants in the forest and are just as much a part of it as the oak or maple. They do not, however, regard blue grass as a weed. In the forest, however, bluegrass must be regarded as a weed. In a bluegrass pasture such plants as foxtail, golden rod, vervain and crabgrass are weeds. They check the growth of this useful forage plant.

KIND OF WEEDS.

Weeds may be classified according to their duration of life into the following classes; annual, winter annual, biennial and perennial.

Annual.—The annual weeds are the most numerous and are easily recognized. The seed germinates in the spring, it sends up a stem which produces flowers and seeds the same season and then dies. Foxtail, ragweed or kinghead, smartweed, crabgrass, horseweed belong to this class. A large number of our weeds belong to this class.

Winter Annual.—These weeds do not differ essentially from

the annual. The seed germinates in the fall, a mat of leaves is produced and the next spring a stalk is sent up which produces flowers and seed, then dies. Shepherd's purse, wild barley or squirrel tail, pepper grass in our climate, but in the south many more weeds belong to this class. Winter wheat and winter rye are winter annuals.

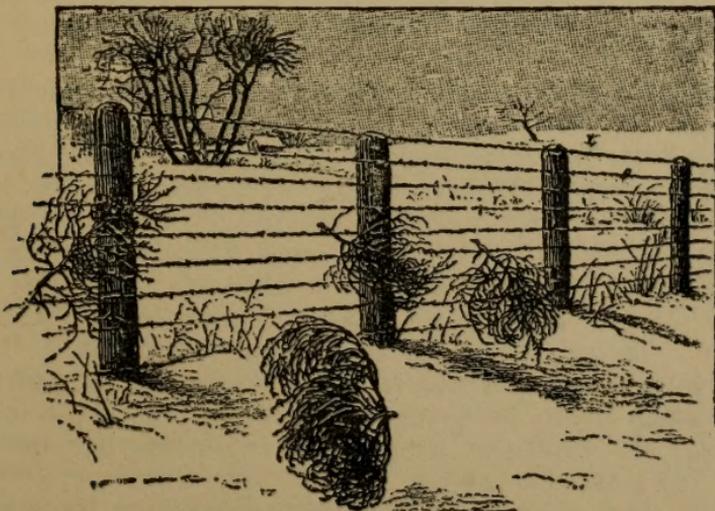
Biennial.—The seeds of biennial weeds germinate in the spring, the plant produces a mat of leaves with a short stem, it passes through the winter in this way, the next season it sends up a stem on which flowers and seed are produced. This ends its existence. Burdock, Parsnip, Carrot, Mullein, and Bull Thistle are representatives of this type. These weeds are common everywhere in the state.

Perennial.—The perennial weeds are often long lived. The seed germinates, sometimes a stalk with flowers is produced the same season. The plant continues to live year after year. Perennial weeds are the most difficult to exterminate. Weeds of this type are numerous and in Iowa are represented by Canada thistle, Morning glory, Milkweed, Quack grass, Nimble will.

HOW WEEDS SPREAD.

Weeds spread in two ways by (1) vegetative propagation and (2) seed production. Some weeds have both methods, some only one.

Vegetative Propagation.—In this method of reproduction the stem or root serves to propagate the plant. This is brought about in three ways, (a) by stem above ground or under-



Tumbleweed (*Amaranthus graecizans*). Scattered by the wind against a fence. (Bergen.)

ground. The stem may be recognized through the presence of leaves or scales. Quack grass, Germander, Northern nut grass, and Morning glory spread by stems. The Quack grass stems, called roots commonly are near the surface of the soil, sometimes over three feet long, and every severed part gives rise to a new plant. (b) These plants spread by roots, sometimes they are fleshy and in other cases they are thin and slender. Dock, Horseradish, Horse nettle, Sheep sorrel and Dandelion. The Milkweed spreads horizontally in the soil and may attain a length of 14 feet. The roots of the Horse nettle on the other hand spread deeply in the soil, sometimes to a depth of three and one-half feet. These roots, when severed give rise to new plants, buds forming on these roots. (c) The third type propagates partly by root and partly by stem. The upper part of the Canada thistle is stem, bearing minute scales (leaves), the lower root which develops buds.

Seed Propagation.—The vast majority of weeds produce seeds. The only weed in the state which has never been known to produce seed is the Horse Radish. It flowers frequently but seeds are never produced. The Canada thistle blossoms freely but it does not seed abundantly. At least this is true for Iowa. It relies chiefly, therefore, on vegetative reproduction. The quack grass spreads as freely by seeds as by its underground stems. Some weeds produce an enormous number of seeds, from a few thousand to over a hundred thousand on a single plant. A single seed of Squirrel tail grass germinates, from this seed a large number of stems arise, each with a spike that contains 50 or 60 seeds, so that the progeny soon becomes greatly multiplied.

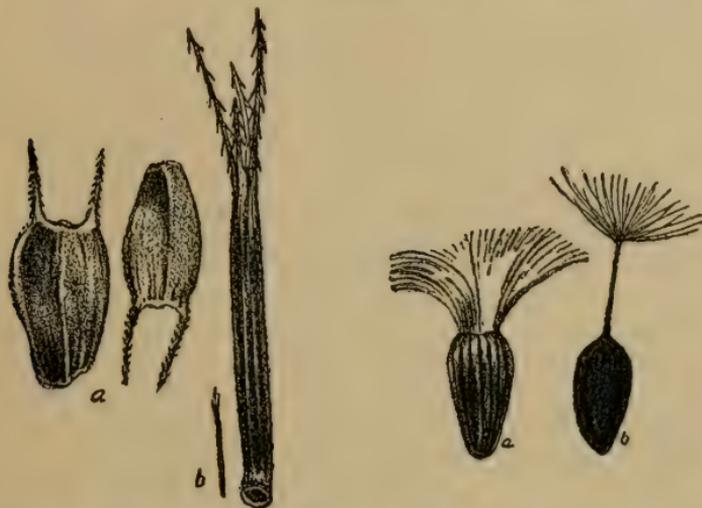
Dr. Beal estimates that a large purslane plant produces 1,250,000 seeds, a patch of daisy fleabane 3,000 to the square inch. We found the following number of seeds per plant, horseweed 324,000; pigweed, 115,600; Jimson weed, 89,100. Dr. Halsted found seeds in some weeds as follows: Speedwell, 186,292; Shepherd's purse, 17,600; Pepper grass, 12,225; Charlock, 9,900. Hitchcock and Clothier record the weeds seeds as follows: Yellow foxtail, 113,600; stink grass, 180,000; cocklebur, 9,700.

DISSEMINATION OR SCATTERING OF PLANTS.

The scattering of plants is called dissemination and this is accomplished in the following ways: (a) wind; (b) water; (c) animals; (d) explosive properties; (e) seeds burying themselves; (f) man as an agent.

Wind.—The wind is an important agent in a large number of weeds. The dandelion may serve as an illustration. The "seed" is cylindrical with a long beak, coming from the beak

are a large number of fine threads, collectively called the pappus. These give it a *parachute-like* arrangement and permit the seed to sail through the air. This weed owes its wide distribution to the facilities for dissemination. Canada thistle; Bull thistle, Horseweed and many plants of the Sunflower family have similar contrivances. The *Tumbleweed* is another type of weed



a—Seed of beggar-tick's, *b*—Spanish needle carried by animals. (C. M. King.)

Seeds carried by the wind: *a*—golden rod, *b*—blue lettuce. (C. M. King.)

disseminated by the wind. The plant grows in circular form and when mature is severed from the root close to the ground. In this form it rolls over and over scattering the seed. The Russian thistle is like it, but each seed is attached by a slender thread like body which becomes severed from the plant, drops the seed as it rolls over the ground.

Water.—Weeds are scattered by the water in two ways (a) in a mechanical way, the seeds, plants or roots are carried by the water. I have seen fields covered with wild oats that had come from higher ground along the streams or ridges, stems of Quack grass have been scattered by the water in this way. (b) Many seeds have bladders filled with air, as in Dock. The three cornered seed is surrounded by the calyx; one or more of the lobes contain a cylindrical body called the tubercle, this is filled with air and makes the seed boyant which enables it to float down the stream and scatter the seed wherever it is lodged. The seeds of Peppergrass when moistened become mucilaginous and cling to the hoofs of animals or shoes and in this way steal a ride.

Animals.—Various animals like cattle, sheep, horses, squirrels,

birds, etc., scatter seeds and fruits. This is done in two ways: (a) Where the fruit or seed is edible as in the black night shade, cherry, poison ivy, seed of dandelion, thistle, etc., crows scatter large numbers of seeds of the poison ivy. Millions of these poison ivy seeds are annually consumed by birds. Large numbers of seeds of the dandelion, thistle, foxtail are consumed by birds some of these are accidentally scattered in this way. Birds are undoubtedly useful, however, in destroying large numbers of weed seed. The colored fruits usually have hard seeds so that they can pass the digestive tract of birds uninjured. (b) In the second type the seeds cling to animals. Many of our weeds have excellent contrivances for such dissemination. We will mention in this connection the cocklebur. Each cocklebur has two so-called seeds. The bur is provided with hooks traveling to any passing animal and I have seen them scattered for miles. The Burdock, another plant of the same family, has numerous seeds in a head; the hooked appendages get in the hair, tails of horses, cattle, etc., where they form balls and thus the seed is scattered. The Spanish needle or boot jack of the same family has a flattened seed with two slender pointed bodies that are barbed downwardly like grappling irons; these cling to passing animals and carry the seed. Another weed, the Tick Trefoil, belonging to the Pea family has a pod containing several seeds, this pod breaks up into separate pieces when ripe, each containing a single seed. The pod is provided with hairs that are hooked and so clings to animals. When removed the seed has often traveled a long distance with the animal. Many other seeds of this family like Licorice may be mentioned. Weeds with similar contrivances are found in members of the Borage family, like Hound's tongue, stickseed, etc.

Explosive Properties.—The seeds of a few weeds have explosive properties. The seeds of the common yellow field sorrel has a straight pod which, when mature and touched, shoots out the seed like shot from a gun. The pods of certain vetches contract and twist when mature, forcing the seed out. Contraction of capsule of the three-seeded mercury scatters the seed, throwing it some distance. This method of scattering can be observed better on such a plant as the common Castor oil bean.

Seeds Burying Themselves.—A few of our weeds bury their seed, but the needle grass growing on our dry sterile hills has a sharp point to its "fruit," with small hairs which point obliquely upward. There is also a long awn to the fruit, this is sensitive to moisture, it contracts when dry and straightens out when moist and in this way buries the seed.

MAN AS AN AGENT.

Man is an agent in many different ways of which the following may serve as illustrations: (a) impure seeds; (b) railways; (c) vehicles; (d) threshing machines; (e) cultivation; (f) packing materials; (g) wool; (h) plants cultivated for ornamental purposes; (i) cultivated for food.

Impure Seeds.—Many weed seeds are scattered with various agricultural and garden seeds. Buckhorn, dodder, wild carrot, ragweed, nimble will, bracted plantain, dock, quack grass, chicory, Canada thistle and many other weeds have been scattered



Some of the impurities found in alfalfa: 1a—alfalfa seed, 1b—toothed bur-clover, 1c—spotted bur-clover, 2c—yellow trefoil, 2b—seed natural size, 2d—pod, 3a—sweet clover, 3b—seed natural size, 3c—bracted plantain (*Plantago aristata*), 5—buckhorn (*Plantago lanceolata*), 6—sour dock, 7—Canada thistle, 8—dodder, 9—quack grass, 10—sheep sorrel, 11—wire grass or Canada bluegrass (*Poa compressa*), 12—bluegrass. (Lettered figures after Hillman.)

with Agricultural seeds. One farmer in Iowa sent to me twenty different kinds of weeds found in his clover meadow which were

introduced with clover seed. In some cases it is difficult to separate the weed seeds from clover seed as dock, buckhorn and bracted plantain. In other cases there is no excuse for the presence of these weed seeds. One can nearly always tell where the seed comes from because of the presence of certain weed seeds.

It may be of interest to give a few statistics on the weed seeds commonly found in some of our agricultural seeds.

Kind of Seed	Purity	Vitality	Iowa Standard	
			Purity	Vitality
Alfalfa	91.1	87.6	96.	80.
Red Clover	96.6	87.8	92.	80.
Alsike Clover	98.6	87.		
White Clover	98.9	76.6	90.	75.
Timothy	98.9	84.1	96.	85.
Millet	96.	60.	90.	85.

The more important impurities found in red clover vary with the season. The imported seed may contain Canada thistle, dodder, buckhorn, evening catchfly, wild carrot. Iowa grown clover seed usually contains none of the above, but ragweed, dock, smartweed, plantain, dropseed grass, foxtail and sheep sorrel are common. Western grown alfalfa may contain black mediek, burr clover, chicory. The seed of sheep sorrel, yellow foxtail and curled dock may also occur. Bachellor's button seed as well as that of evening catchfly indicates European grown seed. Timothy seed generally contains peppergrass, curled dock, common plantain. The seed of oats may contain quackgrass and mustard. Wheat seed contains the seed of vetch, corncockle, chess, cowherb and mustard.

IOWA PURE SEED LAW.

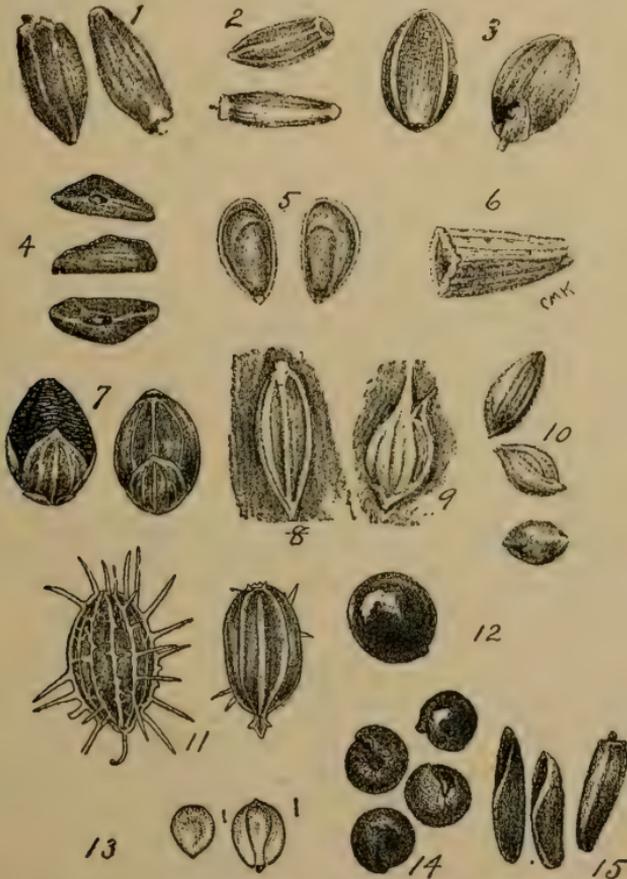
Seed Legislation.—The Iowa law has the following provisions in regard to the sale of seed:

Sec. 9. The term, agricultural seeds, as used in this act, shall include the seeds of the red clover, white clover, alsike clover, alfalfa, Kentucky blue grass, timothy, brome grass, orchard grass, red top, meadow fescue, oat grass, rye grass and other grasses and forage plants, flax, rape and cereals.

Section. 10. No person shall sell, offer, or expose for sale or distribution, in this state, for the purpose of seeding, any of the agricultural seeds as defined in Section Nine (9 of this act, unless the said seeds are free from the seeds of the following weeds: Wild mustard or charlock (*Brassica sinapistrum*), quack grass (*Agropyron repens*), Canada thistle (*Cnicus arvensis*), wild oats (*Avena fatua*), clover and alfalfa dodder (*Cuscuta*

epithimum), field dodder (*Cuscuta arvensis*), and corn cockle (*Lychnis githago*). *

Sec. 11. The seeds of the following weeds shall be considered as impurities in the agricultural seeds, as defined in Section Nine (9) of this act, sold, offered, or exposed for sale, within the state for the purpose of seeding: White cockle (*Lychnis vespertina*), night flowering catchfly (*Silene noctiflora*), curled dock (*Rumex crispus*), smooth dock (*Rumex altissimus*), sheep sor-



Impurities found in red clover: 1—bull thistle, 2—Canada thistle, 3—green foxtail (*Setaria viridis*), 4—common plantain (*Plantago Rugelii*), 5—pepper grass (also found in timothy), 6—chicory, 7—pigeon grass (*Setaria glauca*), 8—crabgrass (*Panicum sanguinale*), 9—old witch grass, 10—timothy, 11—wild carrot, 12—pigweed (*Amaranthus retroflexus*), 13—smartweed (*Polygonum Persicaria*), 14—lamb's quarter, 15—dropseed grass (*Muhlenbergia*). (Charlotte M. King.)

*The scientific names have been changed since this law was enacted. The botanical names now recognized are as follows:—Common Mustard or Charlock (*BRASSICA ARVENSIS*) Canada Thistle (*CIRSIIUM ARVENSE*) Corn Cockle (*AGROSTEMMA GITHAGO*) The weed law has the names now generally recognized.

rel (*Rumex acetosella*), yellow trefoil (*Medicago lupulina*), burr clover (*Medicago denticulata*), sweet clover (*Melilotus alba* and *officinalis*) black mustard (*Brassica nigra*), plantain, buckhorn (*Plantago lanceolata*), bracted plantain (*Plantago aristata*), bindweed (*Convolvulus sepium*), smooth crab grass (*Panicum glabrum*), common chickweed (*Stellaria media*). When such impurities or any of them are present in quantity exceeding a total of two per cent of the weight of said agricultural seeds, the approximate percentage of each shall be plainly indicated in statement specified in Section One (1) of this act.

It will be seen from the above extracts that seed cannot be sold that contains more than two per cent (2%) of the weeds specified in Section Eleven. An amendment was made to Section Ten stating that the weeds specified therein must not be present in quantities of more than one in ten thousand, and that due diligence has been used to find and remove said seeds.

The Iowa law has greatly improved the quality of seed sold in the state. The farmers are demanding a better quality of seed. The seed merchants will supply the demand but the seeds cannot to be sold for the same price. In cleaning there is considerable loss and the farmer should be willing to pay for this. It will cost more to remove the bad weeds than the additional price paid for the better seed.

SOME WEED SEEDS

Characters of a Few Weed Seeds.—The seeds of *Canada thistle* are about 1-8 of an inch long, lance shaped in outline, tapering towards the base, the upper part is cup shaped, with a yellowish rim, a conspicuous point appearing in the center. The *Bull thistle* is much like it, but larger. The seeds of dodder vary from 1-16 to 1-24 of an inch in diameter, somewhat flattened and egg-shaped; the color varies from yellowish to light or dark green, rough and dull, not smooth as in clover and alfalfa. There are two forms of dodder, the field dodder with large seeds and the clover dodder. The seeds of quack grass are sometimes difficult to distinguish from some related species and should be submitted to a botanist. Bull. 115 of the Iowa Agricultural Experiment Station describes them.

The seeds of *Ribgrass* or *Buckhorn* are about 1-10 of an inch long, shiny, smooth, dark brown, the back is convex, the rounded edges folded inwardly forming a rim. The long longitudinal groove of the inner face with a dark colored spot in middle. The *Bracted plantain* is a smaller seed broader and light brown in color, a long groove in the center, on the back is a circle. Two light colored circular areas in groove are characteristic. The seed of the *Common plantain* is black, roughened, flattened with

acute edges; they are rhomboidal in outline, from 1-12 to 1-16 of an inch in length. The seeds of the *Common pigweed* are egg-shaped or lens shaped when viewed from the rim or border; they are about 1-24 of an inch in length, smooth and shiny. The seed of *Goosefoot* or *Lamb's quarter* occur in several forms, usually nearly spherical with attached parts of the flower, the calyx showing ribs. They are dull brown in color. Others with a thin membranaceous covering. The "seed" is about 1-20 of an inch in diameter, nearly spherical, edges somewhat rounded, surface somewhat uneven, jet black in color, sometimes brightly polished. The "seeds" of *Chicory* are characteristic about 1-10 of an inch in length, marked by longitudinal lines and cross lines. The apex with a double row of whitish scales, color dull,

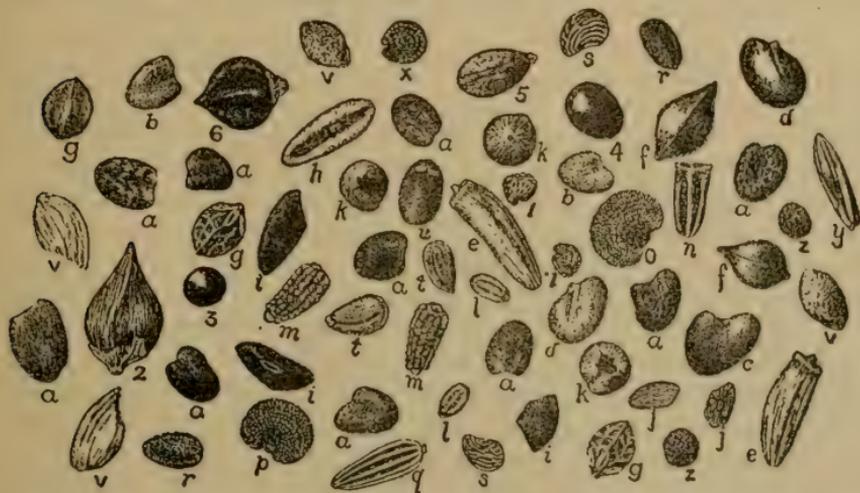


Fig. 5.—Mixture of weed seeds commonly found in low-grade alsike clover seed: a, alsike clover; b, white clover; c, red clover; d, yellow trefoil; e, Canada thistle; f, dock; g, sorrel; h, buckhorn; i, rat tail plantain; k, lamb's-quarters; l, shepherd's-purse; m, mayweed; n, scentless camomile; o, white campion; p, night-flowering catch-fly; q, oxeye daisy; r, small-fruited false flax; s, cinquefoil; t, two kinds of peppergrass; u, catnip; v, timothy; x, chickweed; y, Canada bluegrass; z, clover-dodder; 1, mouse ear; 2, knot-grass; 3, tumbling amaranth; 4, rough amaranth; 5, heal-all; 6, lady's thumb. (Enlarged.) (Hillman, U. S. Dept. Agr.)

very dark, brown to straw color. The seeds of *Bachelor's button* are oblong or obovoid, compressed or 4-angled, smooth and shining attached obliquely with a disk on top and an elevated margin. These seeds occur in alfalfa.

The seed of *May weed* sometimes found in clover is about 1-16 of an inch in length, bristly club-shaped, the base wider than apex, prominently ribbed and tubercled. The "seed" of *Small Ragweed* is 1-16—1-12 of an inch in length, top shaped with prominent projecting teeth, sometimes absent, and a beak. Color dull. Often the outer part missing and then the dark smooth

seed only shows. The *greater ragweed* is like it but much larger. The seeds of *Evening catchfly* are kidney shaped about 1-18 of an inch in length, thickish and roughened, dull grayish brown. This seed is very common in European and Eastern grown clover seed. Several related forms have seed like it. The *Cow herb* seed, however, is larger and more nearly spherical about 1-12 of an inch in diameter. Mature seeds jet black, imature reddish, the surface is slightly roughened with minute projecting points. Another related seed is *Corn cockle*; these are about 1-10 of an inch in diameter, somewhat triangular in outline, very rough; color, dull jet black. These seeds commonly occur in wheat screenings. It is more or less poisonous. A number of seeds in the mustard family are common among them; *Field mustard*, *Black mustard*, the seeds of these are spherical about 1-18 of an inch in diameter, blackish, surface covered with a net work of delicate ridges. The seeds have a sharp taste. The seeds of *Pennygrass* are somewhat egg shaped, broad in the middle, brown, the surface has characteristic, 12-14 curved ridges, color of seed reddish brown. The seeds of pepper grass of the same family are small, about 1-16 of an inch in length, light reddish yellow to brown, elongated, egg shaped, much flattened, the surface is finely grooved, becomes mucilaginous when moistened. The seeds are found in clover and in Iowa especially in timothy. The "seeds" of *Carrot* are flattened, thin, about 1-8 of an inch in length, bearing numerous spines, these are generally broken off. Color of "seed" is whitish or yellowish. The seeds of *Black medick* are similar to alfalfa, but more egg shaped than kidney shaped, they are reddish or greenish with a smooth dull surface. The pods are characteristic oval or kidney shaped, spirally coiled and blackish.

The *White sweet clover* seed is about 1-12 of an inch long, somewhat flattened, resembling red clover in outline, elliptical-oblong in outline, surface smooth and dull yellowish or greenish. The pods often occur in commercial seed, oval in outline 1-8 of an inch long, marked with prominent veins, and beaked. The seeds of *Common vetch* are spherical blackish and large. The seeds of *Cinquefoil* are about 1-24 of an inch in length, straw colored with characteristic longitudinal ridges.

Railways.—The railways scatter many different kinds of weeds. The right of way of the railway is usually one of the best collecting grounds for the botanist. Such weeds as sunflower, Buffalo bur, Russian thistle, gum weed, spurge, western wheat grass are common along the trunk lines. The seeds drop from passing trains.

Vehicles.—It has often been observed that vehicles of various

kinds may be a means of scattering weed seeds. Small weed seeds may cling to mud of wheels and be carried to some distance away from where the seed was produced.

Threshing Machines.—Many farmers in northern Iowa where quack grass is becoming abundant claim that the seed of this weed, mustard, vetch, etc., is scattered by means of the threshing machine. I have in some instances verified this claim.

Cultivation.—The “roots” of various weeds are easily scattered by the cultivator. A small patch of quack grass in the corn field may be the means of widely scattering the plant over the field.

Packing material.—Various kinds of packing material such as is used for packing crockery has been the source of the introduction of Canada thistle, Awned Brome grass, etc. I have traced the origin of these weeds in this way.

Wool.—The seeds of many weeds cling to the fleece of sheep and where the wool is cleaned, and the debris thrown away these weeds spring up. Common teasel which is used to card wool is usually found around the woolen mill. Burdock, cocklebur, sand bur, and hound’s tongue are commonly scattered in this way.

PLANTS CULTIVATED FOR ORNAMENTAL PURPOSES.

In this state we have two conspicuous examples of weeds which at one time were commonly cultivated for ornamental purposes which have become troublesome weeds, namely, the toad flax and bouncing betty. Here and there the European bindweed has been scattered in this way. These have become troublesome weeds, difficult to exterminate because of their perennial character. Live forever, cypress spurge, purple pigweed and Mexican firweed are other illustrations of weeds introduced in this way.

Plants Cultivated for Food.—We have only a few weeds that belong to this class in Iowa, but in some parts of the United States they are more numerous. The conspicuous examples are chicory, wild carrot, vegetable oyster plant, hemp and parsnip.

THE WEEDS OF THE IOWA WEED LAW.

The Thirty-third General Assembly passed a law making it the duty to remove certain weeds from the public highway, lands adjacent thereto, streets of cities and villages, right of way of railroads and public lands.

Destruction of Weeds.

Thirty-third General Assembly of the State of Iowa.

Section 1. Land Owners or Tenants to Destroy Weeds—When. It shall be the duty of every person, firm or corporation owning, occupying or controlling lands, town and city lots, land used as right of way, depot grounds or for other purposes to cut, burn or otherwise entirely destroy all weeds of the kinds

mentioned in section two (2) hereof at such times in each year and in such manner as shall prevent the said weeds from blooming or coming to maturity.

Section 2. Noxious Weeds. The following weeds are hereby declared to be noxious weeds, namely, quack grass (*Agropyron repens*), Canada thistle (*Cirsium arvense*), cocklebur (*Xanthium Canadense*), wild mustard (*Brassica arvensis*), sour or curled dock (*Rumex crispus*), smooth dock (*Rumex altissimus*), buckhorn or ribbed plantain (*Plantago lanceolata*), wild parsnip (*Pastinaca sativa*), horse nettle (*Solanum Carolinense*), and velvet weed or button weed (*Abutilon theophrasti*) and burdock (*Aretium lappa*).

Section 3. Destruction on Highways—neglect or Refusal to Destroy. It shall be the duty of the township trustees or other officers responsible for the care of public highways in each township or county in this state to destroy or cause to be destroyed all noxious weeds mentioned in section two (2) hereof or unnecessary brush on the highways in such a manner as to effectually prevent the production of their seeds or their propagation in any other manner, to warn out labor or to employ labor for this purpose in the same manner as for repairs to the highways, and for neglect or failure to perform this work they shall be subjected to the penalties in this act. If any occupant of lands adjacent to the public highways neglect or refuse to destroy the noxious weeds upon his land, or shall fail to prevent the said noxious weeds from blooming or coming to maturity, when such weeds are likely to be the means of infesting the public highway, or upon complaint of any land owner to the township trustees that his lands have been or are likely to be infested by weeds from the lands of another including railway right of way, the trustees shall make investigation of such condition or complaint and if the same appears to be well founded they shall make an order fixing the time within which the weeds shall be prevented from maturing seed, and an order that within one year such noxious weeds shall be permanently destroyed, and prescribing the manner of their destruction and shall forthwith give notice to the occupant of the lands where the noxious weeds exist, and if he shall neglect to obey such order within the time so ordered the trustees may cause such noxious weeds to be prevented from maturing seeds or may cause such noxious weeds to be permanently destroyed and the cost of the work shall be recovered from the owner by a special tax to be certified by the township clerk in the same manner as other road tax not paid.

Section 4. Road Funds May Be Expended. The destruction of noxious weeds in the public highway and other public places

is hereby made a part of the road work of the township trustees and the county supervisors and they shall have authority to expend road funds for the destruction of weeds.

Section 5. Property Tax. The law as it appears in section fifteen hundred and twenty-eight (1528) of the supplement to the code, 1907, is hereby amended as follows, namely: By inserting after the comma in the eighth line thereof the following words: "and for the destruction of noxious weeds in public



Russian Thistle. a—mature plant; b—seedling, about two weeks after germination, natural size; c—flower hanging from the axil and remaining suspended by minute hairs in the ordinary inverted position of a rolling plant enlarged 3 diameters; d—flower viewed from above and in front, showing the calyx lobes forming a cone-shaped body, and the large membranaceous spreading wings, enlarged 3 diameters; e—seed, with flower part removed; enlarged 5 diameters; f—embryo removed from seed, enlarged 7 diameters. (U. S. Dept. of Agr., Bull No. 15.)

highways and other public places," and by striking out the word "four" in the tenth line of said section and inserting the word "six" in lieu thereof.

Section 6. School of Instruction. Between November and the succeeding April of each year the county supervisors shall call a meeting of the township trustees and the road supervisors of the county to consider the best methods of weed extermination and road building, secure services of experts to give instruction in road building and weed destruction. For such attendance the same compensation shall be allowed to the trustees and road supervisors and the county supervisors as is allowed by law for other services, to be paid as other expenses. The expenses of experts herein provided for may be paid from the county road fund.

Section 7. Cutting of Weeds on Highways. It shall be the duty of the township trustees and other officers directly responsible for the care of public highways to cause to be cut near the



Lamb's Quarter. Goosefoot (*Chenopodium album*). A branch with dentate leaves and inflorescence. 1—flower with calyx, 2—seed. (U. S. Dept. Agr.)

surface all weeds on the public highways in their respective districts at such times and in such manner as to prevent seeds from

maturing.

Section 8. Penalty. Any person, firm or corporation violating any of the provisions of this act, or any township trustees, inspector or other officer who neglects or fails to perform the duties incumbent on him under the provisions of this act, shall be guilty of a misdemeanor and shall be punished by a fine not exceeding one hundred dollars (\$100.00).

Section 9. Repeal. The law as it appears in sections fifteen hundred and sixty-two (1562), fifteen hundred and sixty-two-a (1562-a) and fifteen hundred and sixty-three (1563) of the supplement to the code, 1907, and sections fifteen hundred and sixty-four (1564) and fifteen hundred and sixty-five (1565) of the code are hereby repealed.

Approved April 21, A. D., 1909.

OTHER WEEDS.

This list does not include by any means all of the injurious weeds, but some of the worst. In some parts of the state some weeds are more injurious than others. Quack grass is more important in northern Iowa than in southern. The horse nettle is most troublesome in southern Iowa; cocklebur is troublesome in all parts of the state. The velvet weed, the smooth dock, curly dock, and burdock are widely distributed.

TREATMENT OF WEEDS.

Weeds in order to be eradicated need various treatment. The annual and biennial are not so difficult to exterminate as the perennial. The first and most important consideration is clean cultivation. In nearly every case this will destroy the annual weeds. The land for corn should be plowed in the fall. The good farmer will practice rotation of crops. If he uses the following rotation: oats, clover and corn, the clover field can be plowed under after the removal of the crop. The land will be reasonably clean, because the clover is an excellent plant to keep many weeds down, especially if the growth is rank. In the spring the field should be disced, and the seedlings of many young plants will be destroyed. The corn field should then be given clean cultivation.

It is common practice in Iowa to sow oats directly on the corn stubble, simply discing. This is bad practice. It would be far better if the corn could be cut and the stalks used for fodder, the field plowed in the fall and the oats sown in a clean field. Usually the corn fields are so weedy in Iowa that it is difficult to get a clean field of oats. The time is coming when the Iowa farmer will cultivate his fields more thoroughly.

Clover can be sown with oats, if the stand is even the ground will be pretty well covered the next season. In Iowa clover is usually treated as a biennial. This allows two years for a clover

crop. The above treatment can only be recommended for annuals. Many of the seeds of weeds will germinate but some will keep their vitality for some years as sweet clover and Indian mallow or butter print. The seeds of both weeds are known to keep their vitality for more than half a century.

Perennial Weeds.—The above methods will only partially destroy the perennial weeds. Quack grass, Canada thistle, and weeds of this character need special treatment. If the leaves of these perennial weeds are prevented from growing the weed will be killed in the course of time, they will starve usually, however, in ordinary methods of cultivation, but some plants are not noticed and these give rise to new plants. Let me give a few weeds with specific treatment.



Quack Grass (*Agropyron repens*). Creeping rootstocks and a number of stems (culms), a spikelet at *a*, each containing a number of flowers, *b*—a spikelet with sterile glumes at 2 and flowers above.

TREATMENT FOR A FEW SPECIAL WEEDS.

Quack Grass.—This is the most difficult weed to exterminate in Iowa. There is no easy method. It can be removed by giving the field a shallow plowing, in the summer follow with a harrow, bringing the roots to the surface and continue discing and harrowing until most of the "roots" are destroyed. Late summer and fall is the time to do this. The next season this may be followed with a crop of *sorghum* sown very thickly. This will probably remove most of the quack grass, but not all. *Hemp* may be sown in place of *sorghum*. Dewey claims that several fields where quack grass was abundant, the hemp plant has materially held the quack grass in check. The *pasture* method has been recommended by Prof. Spillman and what I have seen in Iowa would lead me to believe that it is an excellent method. The field containing quack grass is put in meadow and pastured for two or three years in this way. This method causes the roots to come to the surface. They spread less freely in the meadow than in cultivated ground. The soil is plowed two to three inches deep in the summer, then harrowed two or three times to bring the "roots" to the surface; these may then be removed from the soil and burned. If the season is favorable, that is dry, two or three harrowings will accomplish the killing, but if wet some "roots" will keep alive and it may be necessary to plow, say not less than six inches. After this has been done two or three times the land will be nearly free from quack grass. The field should be watched and when quack grass appears, it may be removed by digging up and hoeing. Deep plowing will also destroy the roots, but this can seldom be done well and some "roots" are to be seen near the surface which will develop new plants. The roots of quack grass are shallow rooted.

The Cover Method.—The cover method can be applied when the patch is a small one. For this use tarred paper overlapping the edges. Leave the paper on the quack grass for six months. A heavy coating of straw, six inches to one foot, will also be serviceable, this brings the roots to the surface where they can be raked off and burned; then plow, harrow and cultivate.

Canada Thistle and Horse Nettle.—These weeds are deep rooted and in order to destroy them it will be necessary to plow the field, follow with a harrow two or three times and keep the field clean for the rest of the season. The work should be done in midsummer; if all of the plants cannot be reached by the harrow it may be necessary to cut the plant off with a hoe. Sodium arsenite and iron sulphate may also be used. It is sometimes advisable if the patch of thistle occurs in a field to get it in pasture and place a lot of salt around the Canada thistle. Stock will

then destroy the weed.

Morning Glory and Milk Weed.—Morning glory and milk weed can best be kept down by thorough and continued cultivation. If a field is badly infested with morning glory it is best to get it into pasture, allowing hogs and sheep to pasture closely. The cultivation method according Cox used in some places is as follows:

“Several methods for accomplishing this eradication have been successful. Clean cultivation is one of the best in many cases. It is essential to employ such implements as will keep down the



Wild Morning Glory (*Convolvulus sepium*). Two large bracts at the base of each flower. A common troublesome weed in fields, meadows and waste places. (U. S. Dept. Agr.)

top growth successfully. Where the weed occurs in patches these should be marked off and given special attention.

“The bindweed may be greatly reduced or entirely destroyed

by seeding the land to alfalfa. The frequent cutting and the shading effect of this crop are the determining factors. Alfalfa should be followed by a cultivated crop to complete the work of destruction.

“Pasturing with hogs has been successful in killing bindweed, since hogs are quite fond of the underground parts. This method can be used with both ordinary pasture and fallow land. Results can probably be obtained in less time in the latter case.”

Indian Mallow.—This weed is an annual. It is not difficult to exterminate, cultivation will destroy it. The great difficulty with this weed and the Shoo fly is that the seeds retain their vitality for many years. There are cases on record where a percentage of the seeds of Indian mallow germinated after the lapse



Greater Ragweed or King Head (*Ambrosia trifida*). Sometimes called Horseweed. Upper part of a branch, staminate flowers above, pistillate flowers just above the leaves. *a*—a so-called seed more properly an involucre with a bract on the right hand side, *b*—with bracts removed. U. S. Dept. Agr.)

of half a century. No matter how much cultivation you give the soil a new crop of weeds will appear.

Sweet Clover.—This biennial weed is common in many parts of the state. It produces a tap root which is not difficult to exterminate by cultivation. As in the preceding case the seeds retain their vitality a long time.

Greater Ragweed or Kinghead.—This weed is a troublesome pest in many Iowa fields along fences and railroads. The plants are easily destroyed in fields by cultivation. The seed probably retains its vitality for some time. Iron sulphate, 100 pounds to a barrel of water will destroy it. Plant clean seed.

Nimble Will or Drop-Seed Grass.—This station has received many letters complaining about this weed. The character of the "roots" is so different from that of the roots of quack grass and the other perennial weeds that we have mentioned before that it is not difficult to exterminate. The roots of this weed and the allied species are more or less clustered. In an experiment conducted to exterminate this weed we found that by giving a shallow plowing of four or five inches and harrowing to expose the roots to the sun, they were killed, no growth making its appearance during the rest of the season. Of course this is not effective during rainy weather.

Cocklebur.—The cocklebur is a serious menace to cultivated crops in many parts of the state, more especially in southern Iowa. The best method of combating the cocklebur is the rotation of crops and clean culture. When a field is in corn, the field should be thoroughly cultivated and none of the plants allowed to mature seed. If they cannot be caught by the cultivator, it may pay to kill the remaining plants with a hoe, or to pull them by hand. The corn should be followed with winter rye and then oats, using the oats as a nurse crop for clover and timothy. Leave the field in meadow for at least two years and then if possible turn it into pasture. This certainly eradicated the cocklebur, ragweed and many other annual weeds.

Summer Fallow.—Undoubtedly this is a splendid method for the eradication of weeds. I am not using the term, however, as it is ordinarily used. To plow and then leave fallow for the summer, but constant cultivation and harrowing must be resorted to in order to remove the weed. The field must be kept free from weeds during the summer and fall.

The Use of Chemicals.—In recent years many experiments have been made with various chemicals to destroy weeds. Among them *iron sulphate*, *sodium arsenite*, *corrosive sublimate*, *copper sulphate* and common salt.

Some of these substances like *sodium arsenite* and *corrosive*

sublimata are strong poisons. The *copper sulphate* is also poisonous but less so than the other solutions. *Sodium arsenite* will destroy Canada thistle and many other weeds. It may be used at the rate of 1½ pounds to 52 gallons of water. Stock must be kept away when the thistles are treated. The treatment must be repeated as often as thistles appear. *Corrosive sublimate* was found to be efficient in killing many weeds, but is not to be recommended on account of its very poisonous nature. *Salt*, when applied in sufficient amount is efficacious, but it is expensive when used in this way and can only be used as I have indicated for Canada thistle and Horse nettle. *Iron sulphate*, which is a by-product in the manufacture of wire is cheap, costing in 100 pound bags, 92 cents per hundred pounds F. O. B. from several Iowa points. If bought in 200 pound bags it costs 5 cents less per hundred pounds. It comes in granulated form, is readily soluble in water and may be made in various strengths of solution. For most plants it is used at the rate of 100 pounds to a barrel of water. The solution cannot stand over night. It may be applied with a hand or traction sprayer. I have found it efficacious for the following plants: Mustard, ragweed or kinghead, smartweed, dandelion, artichoke, velvet weed, small ragweed, lamb's quarter, may weed, hedge mustard, pigweed, boot jack, etc. In fact the majority of weeds found in grain fields readily yield to the application of this spray.

WEEDS OF SPECIAL CROPS.

Small Grain.—It is well known that certain weeds occur with certain crops since the very earliest times; such weeds as common mustard, darnel, cockle, vetch and bindweed or wild buckwheat have been found with small grain. These weeds are as common in Europe as in the United States. They are found wherever small grain is cultivated. Formerly it was difficult to remove these weed seeds from the grain, but with modern methods of screening has made it possible to remove most of the weed seeds.

Corn.—Locality sometimes determines the kind of weeds found in the field; in southern Iowa cocklebur, horse nettle, are common. In northern Iowa quack grass and artichoke occurs. The smartweeds, fox tail pigeon grass, crab grass, shoestring, milkweed, pigweed and morning glory are common in all parts of the state. In early spring northern nut grass may appear; easily recognized by the yellowish appearance of the field. The plant has grass-like leaves and spreads by its "roots." Ragweeds are also common in all parts of the state; velvet weed is common and in western Iowa marsh elder and sunflower are abundant.

Garden Weeds.—The most common garden weeds are purslane, pigweed, lamb's quarter, crab grass, nimble will, fox tail, spurge, boot jack, smartweed, speedwell, horse weed, etc., are quite universal in the state.

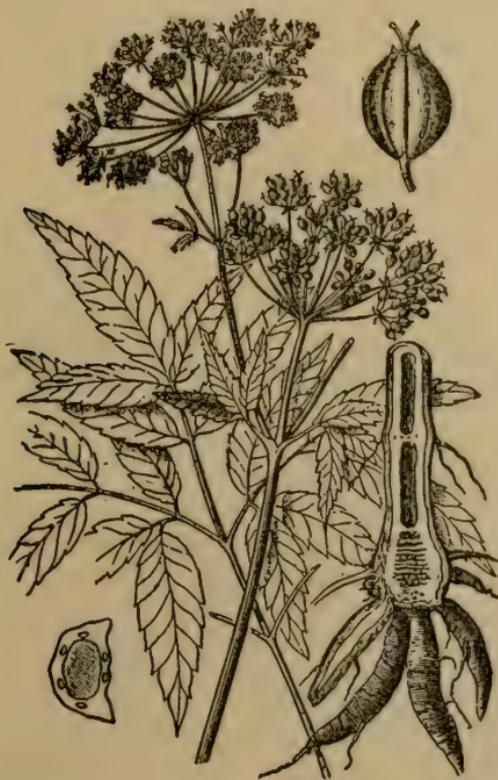
Meadows.—The more important weeds in clover meadows are curled and smooth dock, fox tail, nimble will, horse weed, pepper grass and smartweed, yarrow, pigeon grass and small ragweed. The buckhorn, bracted plantain, chicory, carrot, white catchfly, evening catchfly, black medick and yellow clover are occasional and of recent introduction.

Pastures.—In Iowa pastures the hoary vervain with blue flowers in long spikes. Small ragweed, pigeon grass, fox tail and golden rod are the most conspicuous weed in all parts of the state.

Roadsides.—The weeds of the roadside are generally much the same as those occurring in adjacent fields. In eastern Iowa dog fennel or may weed, yellow clover and jimson weed. The following are general in the state: Small ragweed, greater ragweed, horse weed, pitch forks, golden rod, morning glory, parsnip, milk weed. In western Iowa marshelder, sun flower, stink weed, fetid marigold are among the most important weeds.

Poisonous Weeds.—The laity should become more familiar with the poisonous plants of the state. There are a great many plants which are more or less poisonous to man and lower animals, a few are, however, deadly poisonous. Some of these deadly poisonous plants are found in all parts of the state. The most poisonous of these is the cowbane which occurs in low grounds, has white flowers occurring in umbels, leaves divided, fleshy roots, clustered, of a pungent odor and taste. The roots are deadly poisonous, a small amount not larger than a hazel nut taken in the fall, winter or spring has caused death to a boy. In the year 1909 near Boone two boys were poisoned. One lad a high school boy picked up some of the roots which were turned over by a farmer while breaking a meadow. The boy was carried to a farm house in the neighborhood and a call sent for a doctor. The doctor made a rapid trip to the house in his automobile, taking the boy, but when the hospital was reached he died. The second boy died under somewhat different circumstances. This boy later evidently picked up some of the plant to show the doctors what his companion had eaten and later he developed symptoms resembling those found in poison ivy poisoning. Similar cases have been reported elsewhere. Some persons who pull up the plant get eruptions on the skin. I am told that the same thing occurs when persons pull or come in contact with the leaves of the cultivated parsnip

runing wild. This plant has yellow flowers and a straight tap root. The root so far as I know is not poisonous at least I am a witness to the fact that the root of the wild plant is not poisonous since I have eaten it. Jimson weed is another poisonous plant. The plant is narcotic and has a pungent odor. It has large white flowers leaves and a spiny "pod" (capsule) with numerous blackish seeds. These seeds are very poisonous. Poison ivy is another poisonous plant of the state which is not generally recognized by the laity. It is often mistaken for Virginia creeper, but is readily distinguished by the three leaves—the Virginia creeper having five—the leaves of the poison ivy are also wider. The poison ivy plant may grow erect or creeping over bushes and up trees. The berries are white, while those of the Virginia creeper are blue. Poison hemlock is another poison-



Cowbane (*Cicuta maculata*). Common in low ground; flowers white, stem hollow, fascicled, fleshy roots, "seed" fruit to the right; cross section lower left hand corner. (U. S. Dept. Agr.)

ous plant in the state, as yet not common it belongs to the same family as the cowbane and parsnip. The plant has a rank smell something like mice. The flowers are white, small in um-

bels. This is the plant that Socrates used to kill himself. Of the other poisonous plants I may mention the seed of castor oil; the bark of black locust, the flowering spurge with milky juice, the cultivated poppy, mandrake or may apple sneezeweed with yellow flowers found in marshes. Wilting sorghum is poisonous to stock. The leaves of black cherry and the seeds of plum and cherry are poisonous. The so-called mushroom should be avoided at all times, especially such as are brilliantly colored. We have several deadly poisonous species in Iowa. While there are many edible ones, unless you are familiar with them, they had better be left alone.

WHAT TO DO IN CASE OF POISONING.

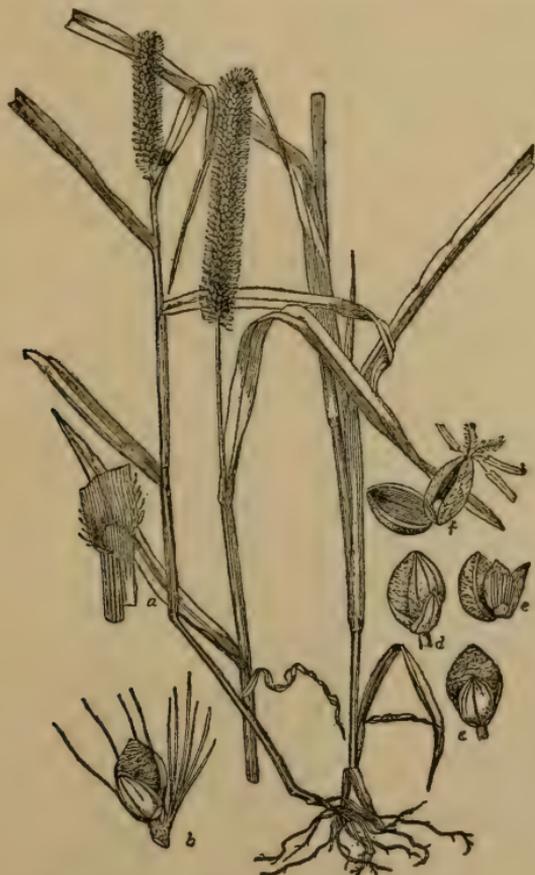
As soon as possible use an emetic to produce vomiting, use tartar emetic; salt and gruel may be given, follow by infusions of hot coffee and epon salts. In case of poison ivy poisoning wash with soap immediately and follow with acetate of lead.

APPENDIX.

Descriptions of a Few Weeds Especially of the Iowa Weed Law.

GRASS FAMILY—(*Gramineae.*)

We have a large number of weedy plants in this family. In addition to those mentioned above, attention may be called to the sandbur, sprouting crab grass, crowfoot grass, Johnson grass, chess or cheat, etc. Mention may also be made of the fact that wheat, rye, barley, oats and corn belong to the same family.



Foxtail or Pigeon Grass (*Setaria glauca*). Annual root, *a*—sheath and part of leaf, *b*—a spikelet with bristles and glumes and cross striated "seed", *c-d-e-f*—other views of the flower, *f* showing stamens and stigmas exserted; pistil and stamens enclosed by the palea. (Charlotte M. King.)

YELLOW FOXTAIL—(*Setaria glauca* (L.) Beauv.)

An erect annual one to two and one-half feet high, flat leaves bristly cylindrical spike, from one to three inches long. The heads are slender and the bristles tawny yellow. The small seeds

of this species are conspicuously cross striated and are easily distinguished from the next species because of its larger size and by its cross striation. This species also comes up in grain fields after harvest, hence seeding the soil abundantly.

GREEN FONTAIL—(*Setaria viridis* (L) Beauv.)

An erect annual from one to three feet high, leaves four to twelve inches long with rough margins, greenish, more or less compound cylindrical spikes from one to five inches long or even in some cases six. Bristles few, much longer than the spikelets. Spikelets one-twelfth of an inch long, the chaff (second and third glumes) as long as the minute chaff (fourth glume), the latter being dotted and striate. A single head produces an enormous number of seeds. When fields are sown to oats this plant comes up in the fall and late summer, seeding the soil.



Quack grass with a head somewhat more enlarged. (U. S. Dept. Agr.)

QUACK GRASS—(*Agropyron repens* (L.) Beauv.)

A perennial with widely spreading but shallow rootstocks which

form dense mats. Flowering stems numerous, smooth, flowers in spikes; leaves from 4 to 12 inches long, smooth or sometimes pubescent; spike 3 to 10 inches long; the separate parts of the spikes are spoken of as spikelets, these contain from 4 to 8 flowers. The chaffy scales of the spikelets are spoken of as the empty glumes. Each flower has a flowering glume and a palet; each flower contains stamens and pistils.

This plant, quack grass, is closely related to western wheat grass which may be readily distinguished by the glaucous green



Squirrel Tail Grass, Wild Barley (*Hordeum jubatum*). Winter annual or annual, *a*—part of stem, *b*—portion of spike showing the sterile and fertile flowers and the long awned glumes, *c*—single flower with long awned glume. A troublesome weed everywhere in the state. (Charlotte M. King.)

Drop Seed Grass or Wild Timothy (*Muhlenbergia racemosa*). I single spikelet to the right. Stalk with roots (rootstock) clustered.

color which forms a decided contrast to the ordinary green of blue grass or other grasses in this state. The spikelets, too, are denser and thicker. This grass is commonly found along rail-

ways. Slender wheat grass (*Agropyron tenerum*) has slender spikes from 4 to 8 inches long; the numerous rootstocks are absent. Quack grass is frequently mistaken for drop seed grass (*Muhlenbergia mexicana*) but this may be readily distinguished from quack grass by its clustered thick and short rootstocks and for this reason sometimes it is called the turkey foot grass. The spikes containing the seed are slender. The empty glumes are nearly equal.



Crab grasses. Left hand figure common Crab grass (*Panicum sanguinale*); right hand figure Smooth Crab grass (*Panicum glabrum*).

SQUIRRELTAIL GRASS—(*Hordeum jubatum* L.)

An annual or winter annual from six inches to two feet high producing fibrous roots. It forms solid and compact bunches. Leaves not unlike those of blue grass, but paler in color, from two to four inches in length, margins scabrous. Flowers in a dense spike from two to four inches long, pale green or purplish in color. The spike consists of a number of one-flowered spike-

lets, three occurring at each joint, only one is perfect (bearing stamens and pistil). The two other spikelets are awl-shaped and rudimentary; these are borne on short stalks. One of these sterile spikelets occurs on each side of the perfect flower which bears a long awn. At each joint will be found six empty long-awned glumes spreading at maturity. These give to the plant the bristly appearance at maturity. When mature the spike breaks up into joints consisting of the rudimentary spikelets and a perfect flower, so that each joint has one "seed." The number of "seeds" in a spike varies from thirty-five to sixty. A single cluster of plants may therefore produce from three hundred to two thousand mature "seeds." The plant has a wonderful capacity for "stooling." From a single plant as many as forty spikes may be produced, and the number no doubt often exceeds this.

CRAB GRASS—(*Panicum sanguinale* L.)

A much branched, leafy annual one to three feet high, spreading on the ground, with erect, smooth, spreading culms, frequently rooting at the lower joints. Joints smooth, though more frequently bearded with deflexed hairs. Sheaths loose, generally pilose; hairy, ciliate on the margins, with a membranaceous ligule. Leaves two to four inches long with rough margins, occasionally pilose at the base. Flowers produced in digitate spikes hence the common name finger grass is sometimes given it. Spikelets less than one-eighth of an inch long in pairs, one nearly sessile the other with a stalk. Each flower consisting of two sterile glumes (chaff) and the flower proper. The first bract very small, the second about one-half to two-thirds as long as the spikelets, usually hairy on the margin. The third glume somewhat longer than the fourth which is five nerved and usually silky-villous along the marginal nerves. Fourth glume smooth and acute. The fruit is minute, pitted and cross striated, light straw color except where the sterile glumes remain attached. These are gray in color and minutely hairy.

SEDGE FAMILY—(*Cyperaceae*.)

Of the Sedge Family the most important weed in the state is the northern nut grass (*Cyperus esculentus*); this plant is readily recognized by the yellowish cast of the corn field in the spring and the little plant has corms or bulbs, and with roots which enables it to spread.

DOCK AND SMARTWEED FAMILY—(*Polygonaceae*.)

This family also contains a large number of important weeds many of them are very troublesome to our crops. Mention may be made of smartweed, tanweed or devil's shoestring, sheep sorrel or horse sorrel, all common weeds in this state.

CURLED DOCK—(*Rumex crispus* L.)

This weed is a smooth perennial from three to four feet high, leaves with strongly wavy and curled margins, lanceolate and acute. In the lower leaves the bases somewhat truncate or inclined to be heart shaped. The flowers are collected in dense



Curled Dock (*Rumex crispus*) in clover meadows and along roadsides. A common European weed. (U. S. Dept. of Agr.)

whorls, extended or prolonged into racemes, entirely leafless above, but below with small leaves. The flower consists of six sepals, the outer herbaceous, leaflike, the three inner larger and somewhat curled, and after flowering forming the valves of the fruit. These surround the three angled fruit (achene) all the valves bearing a grain.

PEACH-LEAVED DOCK OR PALE DOCK—(*Rumex altissimus* Wood).

A tall perennial with multiple roots; leaves oval, oblong, lanceolate extending into a point, pale and thickish; the flowers in spike-like racemes or panicles, flowers with nodding pedicels, the valves of the flower are obscurely heart-shaped; commonly with a conspicuous inflated grain. Common in alluvial soil everywhere in the state.

SHEEP SORREL—(*Rumex acetosella* L.)

A low smooth annual or perennial, usually the latter, growing from six to twelve inches high; producing an erect stem, with horizontal, creeping, woody rootstock or rhizome; petioled, nar-



Sheep sorrel (RUMEX ACETOSELLA). 1 staminate flower; b. pistillate flower. (U. S. Dept. Agr.)

rowly hastate, narrow, lanceolate leaves, the upper linear; flowers on jointed pedicels; dioecious small in a terminal naked panicle; small green calyx; exserted stamens; the valves (inner calyx

lobe) not enlarging in fruit.

GOOSEFOOT FAMILY—(*Chenopodiaceae*.)

This family contains a number of common and troublesome weeds, among them the common lamb's quarter or goosefoot (*Chenopodium album*), a weed commonly found in gardens and along roadsides. Spinage also belongs to this family.

PIGWEED FAMILY—(*Amaranthaceae*.)

This family contains a number of troublesome weeds, in this state one of the most common being the common pigweed (*Amaranthus retroflexus*), and the common Iowa tumble weed (*A. graccizans*.)

PINK FAMILY—(*Caryophyllaceae*.)

Of the weeds of this family mention may be made of the cow herb, common in grain fields, the evening catchfly, wakerobin,



Corn Cockle (*Agrostemma Githago*). A hairy plant with purple flowers. The long outer segments are lobes of the calyx, 2—capsule with calyx and seeds, 3—kidney-shaped seed. (U. S. Dept. Agr.)

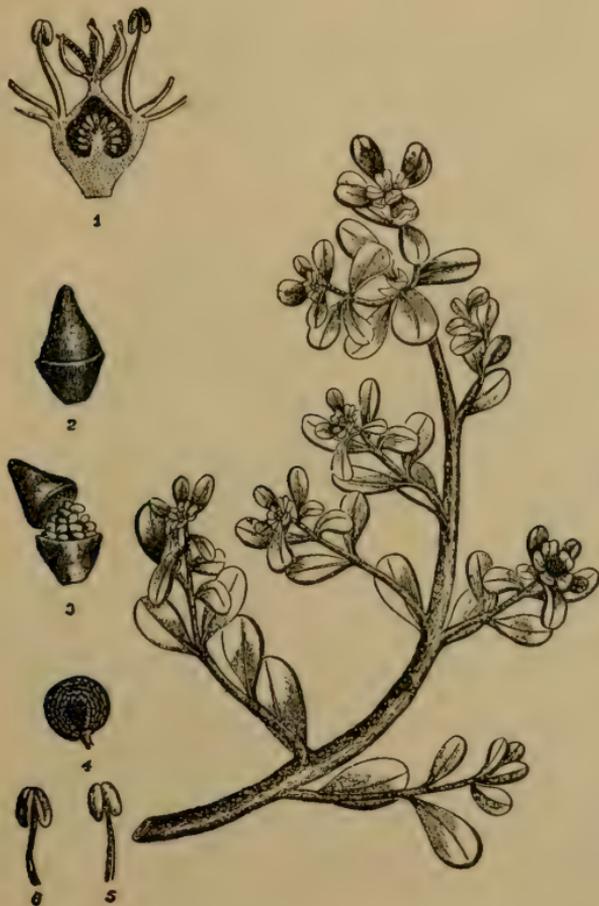
etc. The carnation belongs to the same family.

CORN COCKLE—(*Agrostemma Githago L.*)

A hairy annual weed, clothed with long, soft hairs. Leaves linear-lanceolate, acute or long acuminate; flowers purple and long peduncled; calyx lobes long, linear, surpassing the purple red petals; seeds large, roughened and black.

PURLANE FAMILY—(*Portulacaceae.*)

This family contains but one common weed, the common pusley or purslane (*Portulaca oleracea*) which is common in gardens



Purslane (*Portulaca oleracea*). General view of plant to the right. 1—flower in cross section, pistil in center with ovules attached, stigmas above, stamens to the right and left, 2—A capsule with a line in the middle where the capsule splits. 3—The same with top of capsule removed showing the seeds. 4—Seed. 5-6—Stamens. (U. S. Dept. Agr.)

everywhere in the state, and the common moss rose of Peru is cultivated.



Charlock or Mustard (*Brassica arvensis*). A common weed in grainfields and waste places. (U. S. Dept. Agr.)

CROWFOOT FAMILY—(*Ranunculaceae.*)

A number of weeds are members of this family, among them the common crowfoot with a sharp acrid taste (*Ranunculus abortivus*); also such cultivated ornamental plants as the peony, larkspur, aconite, columbine and clematis. Many of these plants are poisonous.

MUSTARD FAMILY—(*Cruciferae.*)

Among the common weeds not described below mention may



Butter Print or Indian Mallow (*Abutilon theophrasti*). A velvety pubescent annual, flowers and capsule, each division with several seeds. (U. S. Dept. Agr.)

be made of the tumbling mustard, pepper grass (*Lepidium apetalum*), common everywhere in the state. Cabbage, turnip and rutabaga, and mustard belong to the same family.

MUSTARD OF ENGLISH CHARLOCK—(*Brassica arvensis* (L.) Ktze.)

Lower leaves nearly divided to the middle, with the divisions unequal, the terminal lobe larger. Upper leaves sessile much

smaller than the lower. Flowers yellow, large and very fragrant. Pods one to two inches long, irregular in outline, appearing somewhat nodose, three to seven seeded or more occasionally. The upper part of pod forms the beak. Seeds round, brownish black, darker than in *B. nigra* and minutely pitted. The pods of black mustard shorter and angled. Seeds of all of the mustards mucilaginous. There are many other mustards in the state like hedge mustard, pepper grass, etc.



Wild Carrot (*Daucus Carota*). Common in the East in clover meadows and introduced into this state with clover seed. A bristly hairy biennial. 1—general view, 2—flower with stamens, pistil, corolla, 3—fruit. (U. S. Dept. Agr.)

MALLOW FAMILY—(*Malvaceae*.)

A number of very common weeds in this state belong to this family, among them the common cheeses, and crisp mallow, also such ornamental plants as the hollyhoek.

BUTTER PRINT OR VELVET WEED—(*Abutilon Theophrasti Medic.*)

A tall annual from two or four feet high; leaves roundish heart-shaped and velvety, pubescent, taper pointed, pedicels shorter than the leafstalk; flowers small with yellow corolla; pod consisting of 12 to 15 beaked carpels which are pubescent. Common in waste places and vacant lots. Seeds preserve their vitality for a long time.



Field Dodder (*Cuscuta arvensis*). Found on clover. a—flower; b—flower spread apart; c—capsule with stamens and styles therein; d—seed. (Dewey Division of Botany, U. S. Dept. Agr.)

Alfalfa Dodder (*Cuscuta epithymum*). a—flower; b—flower spread apart to show stamens and corolla; c—capsule showing styles; d—seed. (U. S. Dept. Agr.)

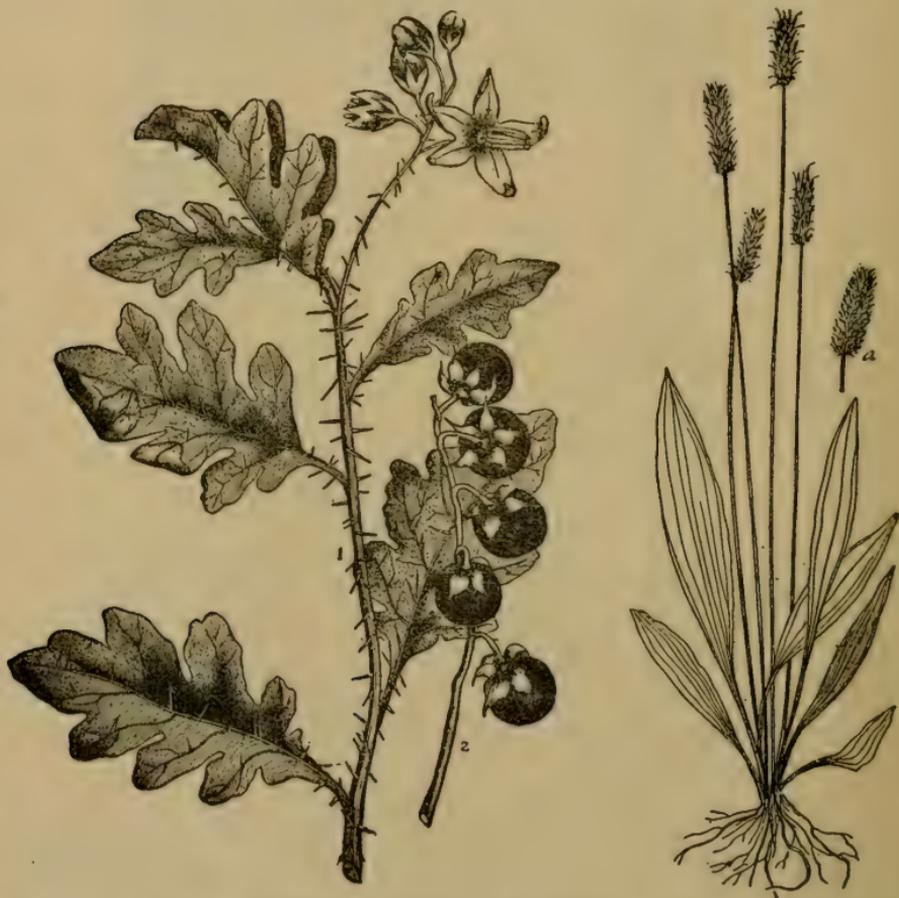
PARSELY FAMILY—(*Umbelliferae.*)

This family contains a number of weeds some of them most troublesome. In addition to those described below mention may be made of the poison hemlock (*Conium maculatum*), some of the cultivated plants are the carrot, parsley, lovage and dill.

This family contains some of the most poisonous plants in the vegetable kingdom, like the cowbane or water hemlock and poison hemlock.

PARSNIP—(*Pastinaca sativa* L.)

A biennial with grooved stems; pinnately compound leaves, with ovate to oblong cut toothed leaflets. Fruit oval to flattened with broad wings. This tall stout glabrous or somewhat pubescent biennial is an escape from cultivation. It has a straight tap root in place of multiple thick fleshy roots as the poisonous hemlock or cowbane frequently called parsnip in this state.



Horse Nettle (*Solanum carolinense*), a perennial weed troublesome in southern Iowa. Potato-like flowers and prickly stem. (Division of Bot., U. Dept. Agr.)

Buckhorn (*Plantago lanceolata*). With a timothy-like head and elongated leaves. Common in clover meadows. (Charlotte M. King.)

CARRROT—(*Daucus Carota* L.)

A biennial or annual with bristly stems and pinnately decom-

pound leaves; bracts surrounding the flowers leaf-like; white flowers in umbels becoming concave. This plant with a straight tap root has been widely distributed with clover and alfalfa. It is one of the most pernicious weeds of the eastern meadows.



Bull thistle (*Cirsium lanceolatum*). A troublesome biennial weed common in woods, pastures and along roadsides. (U. S. Dept. Agr.)

COWBANE. WATER HEMLOCK—(*Cicuta maculata* L.)

It is a smooth marsh perennial two to five feet high with pinnately compound leaves two or three times pinnate; the leaves have long petioles, the coarsely serrate leaflets are lanceolate to oblong lanceolate one-fifth inch long. Stalks of the umbellets numerous and unequal. Flowers white, fruit broadly ovate to oval, small one and one-half inches long. Grows in marshes and in low grounds. The stems spring from thick fleshy underground roots that taper at the lower end. These usually number from three to five, but single specimens are also met with. On

cutting the roots a sharp pungent odor is given off.

MORNING GLORY FAMILY—(*Convolvulaceae.*)

In addition to the weeds described below, we have the European bindweed or morning glory, the southern morning glory (*Ipomoea purpurea*) and related species. The sweet potato belongs to this family.



Canada thistle (*Cirsium arvense*). A common troublesome weed in gardens, roadsides and sometimes in clover fields. Notice the perennial roots at 2, and the flowers at 3. (U. S. Dept Agr.)

DODDER—(*Cuscuta spp.*)

The dodders are leafless excepting the small scales on the stems, herbs of reddish or yellowish color, with thread-like stems twining around the plants upon which they live. They pierce the plant with small and short rootlets which are called suckers or haustoria. The seeds are small, yet there is stored sufficient nourishment in them to give the embryo a start. The seed ger-

minates in the soil and grows sufficient in length to allow it to come in contact with the plant upon which it lives, when it immediately sends in its suckers, and thus becomes established upon the plant as though it were a part of the host.

The dodders contain no chlorophyll, the green coloring matter found in leaves, and hence cannot make food, that is, make starch out of raw material such as ordinary green leaves do, but must derive nourishment entirely from the host upon which they live. Such plants are called parasitic.



Cockle Bur (*Xanthium canadense*.) Weed of cornfields and roadsides. (U. S. Dept. Agr.)

We have two troublesome dodders in this state, the clover dodder (*Cuscuta epithymum* Murr.) on alfalfa and clover, with slender stem with elongated stigmas and field dodder (*C. arvensis*) with capitate stigmas.

HEDGE BINDWEED OR MORNING GLORY—(*Convolvulus sepium* L.)

NIGHTSHADE FAMILY—(*Solanaceae*.)

This family contains a number of very troublesome and pernicious weeds, among them the common black nightshade (*Solanum nigrum*) with small white flowers, the Buffalo bur (*S. rostratum*) with prickly stems and fruit and yellow flowers, leaves resembling those of the water melon; the ground cherry (*Physalis*), the Jimson weed, two types, both species poisonous. Of the cultivated plants it contains the potato, tomato and tobacco.



Burdock (*Arctium Lappa*). A common biennial weed of waste places, gardens and pastures. (Division of Bot., U. S. Dept. Agr.)

HORSE NETTLE—(*Solanum carolinense* L.)

Horse nettle is a deep-rooting perennial, propagating freely by its underground roots, these running roots are often three feet long; stem from one to two feet high, somewhat straggling, half shrubby at the base; stem hairy or merely roughish with minute hairs which are star-shaped, also armed with stout sub-

Smooth, occasionally, however, pubescent, twining around supports or trailing. Leaves triangular, halberd or arrow-shaped, the tip acute, or pointed, the basal lobes obliquely truncate or sinuate lobed. The flowering peduncles four angled with two leaf-like bracts which are commonly acute. Corolla is white or tinged with rose purple.



Small Ragweed (*Ambrosia artemisiifolia*). With deeply divided leaves and branches with flowers. 1—head with staminate flowers, 2—pistillate flower containing the "seed." (U. S. Dept. Agr.)

MINT FAMILY—(*Labiatae*.)

A number of troublesome weeds like the catnip, common germander or wood sage, and peppermint, with creeping "roots"; of the cultivated species the scarlet sage, peppermint, hyssop, etc. Many of the plants have a pungent flavor, and square stem, and thus are easily recognized.

late yellowish prickles which are usually numerous; leaves oblong or sometimes ovate, obtusely sinuate, toothed or lobed or deeply cut, two or four inches long. The flowers are borne in what are called racemes, which later become one-sided; the outer part of the flowers, the calyx, consist of slender lobes, the corolla is light blue or white, an inch or less in diameter. The flowers are followed by the yellow globose berries, half to three quarters of an inch in diameter. The seeds are yellowish, a little less than one-twelfth of an inch long, minutely roughened. The flowers resemble those of the common potato, and are blue or white, an inch or less in diameter. The yellow berries also resemble those of the potato. The spiny character of the leaves and the further resemblance of the flower to the potato should render it easy of detection.

PLANTAIN FAMILY—(*Plantaginaceae*.)

Of the plantains the most common weed not described is the common dooryard plantain of which there are two kinds, *Plantago major* and *P. Rugelii*; the bracted plantain is becoming a troublesome weed in the southern part of the state, especially in clover fields. This plant is something like the common plantain but the leaves are narrower and the heads with large bracts.

BUCKHORN—(*Plantago lanceolata* L.)

A perennial or biennial, pubescent, with short erect root-stocks; leaves narrowly oblong lanceolata, somewhat shorter than the scape, three to five ribbed; scapes slender with spikes dense, at first capitate, later becoming cylindrical; bracts and sepals scarious, brownish; calyx of four persistent sepals and glabrous corolla. Two small smooth brownish seeds found in each vessel.

COMPOSITE FAMILY—(*Compositae*.)

The Composite or Sunflower Family is a large family of plants containing some of the most troublesome of our weeds. The family gets its name from the common sunflower which is weedy in the western part of the state, but in addition there are a large number of other weeds of this family like the dandelion, May weed, sneeze weed, marsh elder, troublesome in western Iowa, the leaf looks something like the sunflower, but the flowers are like the common ragweed, tansy, and so on. Of the cultivated plants attention may be called to the lettuce and chicory. Sneeze weed with yellow flowers growing in low ground is poisonous. Aster, golden rod, horse weed and dandelion belong to this family.

BULL THISTLE—(*Cirsium lanceolatum* Willd.)

A branching biennial, three to four feet high, tomentose, becoming dark green and villous or hirsute with age, branchlets bearing large heads; leaves lanceolate, decurrent on the stem with

prickly wings deeply pinnatifid, the lobes with rigid prickly points, upper face roughened with short hairs, lower face with a cottony tomentum; heads one and three quarters to two inches high, bracts of the involucre lanceolate, rigid when young, more flexible with age, long attenuated prickly pointed spreading tips, arachnoid woolly; flower hermaphrodite, tube of the corolla ten lies long, anther tips acute, filaments pubescent, achenes smooth, one and a half inches long, pappus of numerous plumose bristles.

CANADA THISTLE—(*Cirsium arvense* (L.) Scop.)

A smooth perennial, spreading by creeping roots and root-stocks, one to three feet high, corymbosely branched at the top; stem smooth; leaves lanceolate, sessile, and deeply pinnatifid, lobes and margins of leaf with spiny teeth; heads small, three-fourths to an inch high, bracts appressed, the outer with a broad base, inner narrow, all with an acute, never spiny tip; flowers purple, dioecious, one plant with stamens and the other with pistils. Common in many parts of the state.

COCKLE BUR—(*Xanthium canadense* Mill.)

A coarse, rough annual from one to three feet high, stem marked with brown punctate spots; leaves alternate, cordate or ovate, three nerved, long petioled. Flowers monoecious, staminate and pistillate flowers in different heads, the pistillate clustered below. The involucre of the staminate flowers somewhat flattish of separate scales, receptacles cylindrical. Scales of the fertile involucre closed in fruit two beaked, containing two achenes (seeds). The bur is densely prickly and hispid, the achenes are oblong without pappus. At the upper end of the involucre are two large prickles.

Each bur, as stated above, contains two flowers which develop into the "seeds." The statement is frequently made "that one of these may germinate the first year, and the other lie dormant until a later time. It has been found that if a bur lies in such a position that one seed is up and other down, the one next the soil may germinate while the other remains dormant. This is one reason why the plant is difficult to exterminate.

GIANT RAGWEED. KINGHEAD—(*Ambrosia trifida* L.)

This weed is a stout scabrous, hispid or nearly glabrous annual, three to twelve feet high. Leaves all opposite and petioled three nerved, deeply three to five lobed, the lobes are ovate and lanceolate and serrate, the upper leaf sometimes ovate and undivided; flowers monoecious, staminate borne in spikes surrounded by the larger bract-like leaves. The involucre is turbinate to obovoid, five to seven ribbed, beaked, each rib bearing a tubercle near the summit; the involucre enclosing a single oily seed.

SMALL RAGWEED—(*Ambrosia artemisiacifolia* L.)

This weed is a puberulent or hirsute annual, branched, one to three feet high; leaves thin, once to twice pinnatifid; the upper leaves are alternate, the lower, usually opposite, pale or canescent beneath. Flowers monoecious, the staminate above and the pistillate in the lower axils of the leaves. The fertile heads are obovoid or globose. Short beaked. Four to six spined.

BURDOCK—(*Arctium Lappa* L.)

A coarse, branched biennial from a foot to three feet high; hairy; leaves large, roundish or heart-shaped, thin, obtuse, entire or dentate, floccose tomentose beneath. Petioles deeply furrowed, heads of purplish or whitish flowers, clustered or somewhat corymbose. The involucre surrounding the flowers (heads) are lengthened into hooked tips, glabrous or slightly cottony.

Where burdocks are allowed to grow freely the fruit clings to the fleece of animals, often forming large balls which may be found on the tails of cattle and horses. When they are common where sheep pasture the burdocks work into the wool which soon becomes of little value. The plant is enormously productive.

Suggestions for the Teacher

The most important point in connection with the study of plants is to train the powers of observation. The child should learn to discriminate between plants. While important to know the name of a plant, it is far better to be able to tell what the differences are. For instance, we have about 1100 different kinds of flowering plants in the state of Iowa. They differ from each other by one or more characters. The student should learn the most important differences. To illustrate, we have in Iowa, two kinds of morning glory, one the common bindweed or wild morning glory, native to Iowa, with flowers from one to two inches long, leaves large halberd, or arrow shaped, and running rootstocks often called "roots" but these so-called roots have small scales. The European bindweed has much smaller flowers, less than one inch long, leaves small ovate and arrow shaped, and running roots, no scales on these.

Many people do not know that we have two kinds of dandelion in the state. The common one (*Taxaxacum officinale*,) olive green seeds and coarsely divided leaves, and the red-seeded one (*Taraxacum erythrospermum*) with red or dark brown seed and deeply divided leaves.

There are eight thistles in the state, all of these are easily distinguished by a very simple key which I will insert here for convenience. The characters are all very obvious.

A. Perennial. Plants living year after year.

1. Heads large, numerous.

a. Leaves woolly both sides—Woolly Thistle (*C. canescens*, N. W. Ia.)

a. Leaves hairy on lower surface—Field Thistle (*C. discolor*, Ia. general.)

2. Heads small. Leaves slightly woolly underneath—Canada Thistle (*C. arvensis*, Ia. general.)

3. Heads large, usually 1, blooms early—Prairie Thistle—(*C. Hillii*, Ia. general.)

B. Biennial. Plants form flowers the second season and then die.

1. Heads with numerous sharp spines. Leaves very spiny

—Bull Thistle (*C. lanceolatum*, Ia. general.)

2. Head not spiny but sticky.

a. Leaves not hairy or sparingly; in swamps—Marsh Thistle (*C. muticum*, N. Ia. rare.)

a. Leaves hairy at least below.

Heads very large; in swamps—Iowa Thistle— (*C. iowense*, meadows, Ia. general.)

Heads smaller; in woods—Wood Thistle (*C. altissimum*, E. Ia.)

The *C.* of the Sunflower family (Compositae), stands for the genus *Cirsium*, which includes all of the true thistles. There are other so-called thistles but the botanical name should only be applied to the plants of this genus. The Russian thistle is not a true thistle but belongs to the Goosefoot Family (*Chenopodiaceae*.) The student should early recognize that certain plants belong to some particular family and with a little practice such plants as the sunflower, aster, goldenrod, purple cone flower, may weed, and dandelion, will readily be recognized as belonging to the composite family.

To facilitate the work of the teacher I have added a few questions which the student should answer. If the teacher is not familiar with the terms that are here used, any of the larger dictionaries will assist in getting the definitions, sepals, petals, stamens, pistils, bracts, ray flowers, achene, etc. Simple leaves may be linear, hastate, halberd, cordate, acute, acuminate, cleft, lobed, dissected, and sagittate. Compound leaves may be pinnate (rose), and palmately (horse chestnut) compound. Fruits may be berry (black nightshade, horse nettle), capsule (Jimson weed), pod (clover and sweet clover), achene (sunflower, thistle), caryopsis or grain fruit (corn, wheat, crab grass). Flowers, regular (morning glory, strawberry), irregular (sweet clover, sweet pea), polypetalous (crowfoot, clover), gameopetalous (morning glory, horse nettle), apetalous (smartweed), calyx colored like petals (smartweed.)

QUESTIONS AND TOPICS.

1. Describe accurately in your own language the chief points of the following weeds: Greater or giant ragweed, dandelion, quack grass, burdock, velvet weed, dock, parsnip, cocklebur and other weeds mentioned in the Iowa weed law.

2. Note the methods of reproduction in the following weeds: Canada thistle, dock, quack grass, foxtail, burdock, bull thistle, cocklebur, horse nettle, velvet weed.

3. Note the difference in the underground parts of the following weeds: Morning glory, quack grass, milkweed, sheep

sorrel. Determine whether roots or underground stems. Are there any small scales present on the underground portions?

4. How do you know that quack grass is a stem? How do you know that milkweed is a root?

5. Determine the duration of life of as many weeds as possible. For example, foxtail (annual), wild barley or squirrel tail grass (winter annual), bull thistle, wild carrot and burdock (biennial), quack grass, Canada thistle, tanweed, morning glory (perennial.)

6. Determine the root and stem character of as many weeds as possible. Determine also the space they occupy in the soil, whether deep or shallow rooted and how these roots injure the crops.

7. Determine the number of seeds produced by some individual weeds and make a record of the result.

8. Now determine the weed seeds produced per acre of some weed.

9. Make a study of the following weed seeds: Foxtail, cocklebur, burdock, plantain, catnip, ragweed, dock, smartweed, butter print or velvet leaf, may weed or dog fennel, mustard, sweet clover, dodder, lambs quarter, buckhorn, wild carrot and pigweed.

10. Why are weeds detrimental to agriculture?

11. Determine the number of different kinds of weeds on a given area. If you cannot name them dry the specimens and send to me for identification.

12. In what ways do weeds spread? Give a concise account of the methods and give illustrations of each.

13. What weeds are scattered by the wind, water, snow, animals and explosive properties.

14. Germinate some of the weed seeds. Determine the percentage of germination and study the characters of the weed seedlings. How many seeds in the cocklebur and how many seeds germinate the first season.

15. Try to germinate the seeds of some weeds immediately; take another lot of the same kind, stratify in sand or earth and allow them to freeze. Plant the seed in April. If you find any difference determine the percentage in each case.

16. Determine the percentage of impurities in clover seed. Obtain bulletin 115 of the Iowa Agricultural Experiment Station which gives methods in detail. This bulletin will be sent upon application.

17. Make a collection of weeds and weed seeds. Specimens can be preserved and dried for reference.

18. Determine the kinds of weeds found in the following places: The corn fields, garden, roadsides, pasture and in vacant lots, door yards and barn yards.

19. After these points have been carefully studied and the habits of the plants determined, suggest a method of extermination of weeds studied.

20. Determine the yield of corn or other crops per acre in some clean fields and compare them with some weedy fields. Which fields give the largest yield.

21. Become familiar with a few poisonous plants such as poison ivy, which is frequently a climbing plant, jimson weed, a rank smelling herb with large white flowers, the cowbane with clustered roots and clustered white flowers in umbels like parsnip.

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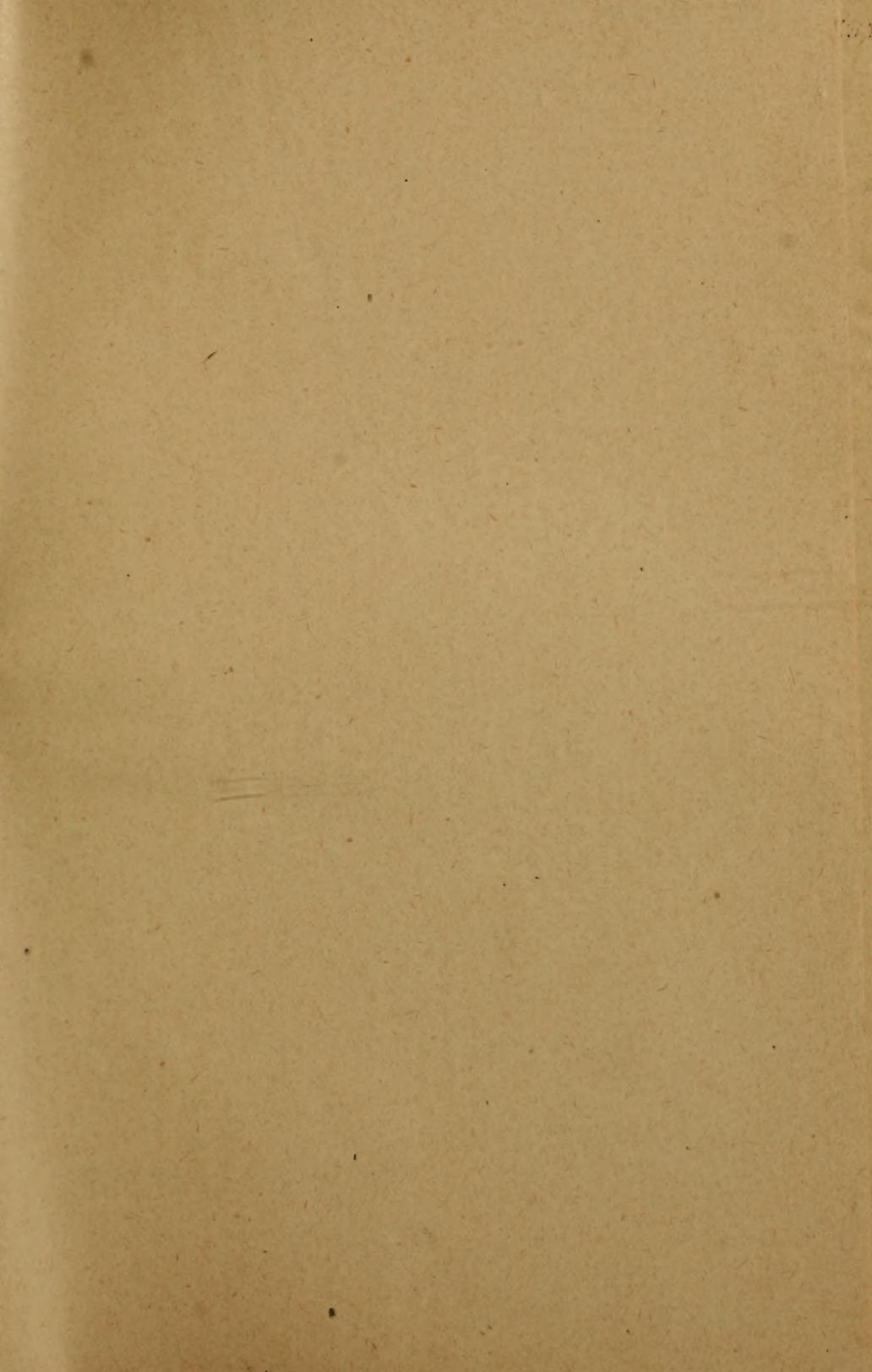
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Key for Families

1. Plants grass-like.
 - Stems solid, 3 angled, *Cyperaceae* 34
 - Stems hollow, round in cross section, *Gramineae* 30
2. Plants not grass-like.
 - Flowers inconspicuous.
 - Flowers with thin, not greenish bracts, *Amaranthaceae* 37
 - Flowers greenish, succulent herbs. *Chenopodiaceae* 37
 - Flowers greenish, 3 sepals enclosing the seed, acrid herbs, *Polygonaceae* 34
 - Flowers conspicuous.
 - Succulent plants, *Portulacaceae* 40
 - Plants not succulent, acrid, sepals petal-like, *Polygonaceae* 34
 - Plants not succulent, acrid, sepals and petals present, *Ranunculaceae* 40
 - Plants not acrid.
 - Stems with swollen joints, *Caryophyllaceae* 37
 - Stems with joints not swollen.
 - Flowers regular of separate parts.
 - Flowers in umbels, *Umbelliferae* 42
 - Flowers not in umbels.
 - Pungent herbs, 6 separate stamens, *Cruciferae* 40
 - Bland herbs, stamens in one set, *Malvaceae* 41
 - Flowers in one piece, Gamopetalous
 - Flowers irregular, stem 4 angled, *Labiatae* 47
 - Flowers regular, stem not 4 angled.
 - Twining plants, *Convolvulaceae* 45
 - Not twining plants.
 - Conspicuous flowers not in heads.
 - Fruit a berry, *Solanaceae* 48
 - Flowers in heads, *Compositae* 49
 - Flowers inconspicuous. *Plantaginaceae* 49

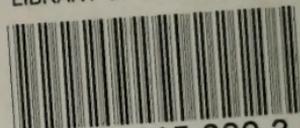


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