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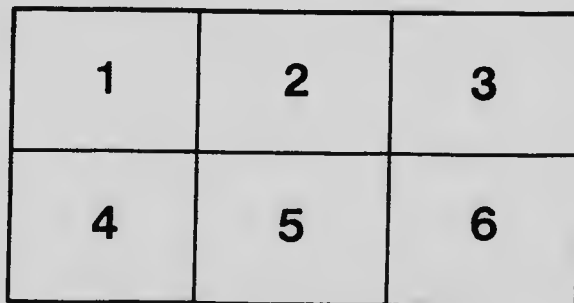
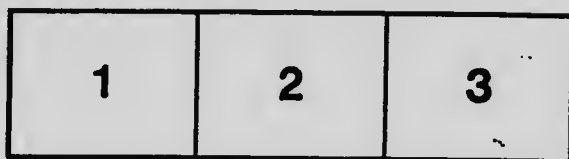
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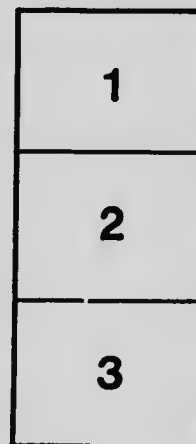
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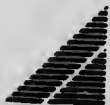
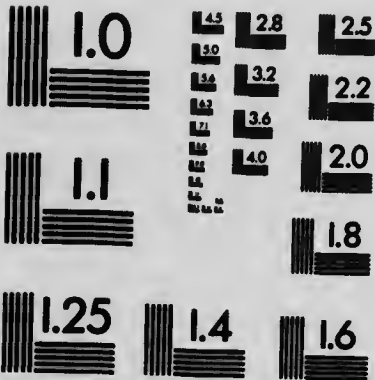
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Ontario Agricultural College and Experimental Farm

SOME COMMON ONTARIO WEEDS.

By F. C. HARRISON, Professor of Bacteriology,

AND

W. LOCHHEAD, Professor of Botany.

It is undoubtedly true that noxious weeds are spreading very rapidly in the Province of Ontario, and farmers need all the information they can get in preventing further loss from this very serious hindrance to successful agriculture. That two large editions of this bulletin have been exhausted within six years is a strong indication that the information given has been appreciated. Besides, it is gratifying to know that the teachers of our high and public schools value this pamphlet as a help in their Nature Study work.

The writers wish to acknowledge the valuable assistance rendered by Norman Ross, B.S.A.; John Buchanan, B.S.A.; and V. W. Jackson, B.A. These gentlemen furnished the pen-drawings of the weeds and weed-seeds described in the bulletin. Besides, Mr. Jackson assisted very materially in the present revision, in which the most important additions are a summary of the Dominion Seed Control Act, and a new page of weed-seed illustrations.

WHY WEEDS ARE INJURIOUS.

A weed has been defined as any plant out of place; and, in that sense, a wheat plant in a field of turnips is a weed.

Most weeds do considerable, and some very much, injury to the crops in which they are found. They produce these effects in several ways:

1. *They absorb soil moisture.* The amount of water which is taken up by weeds and evaporated from the surface of the leaves is very great. For instance, an average Mustard plant pumps from the soil about fourteen ounces, or seven-tenths of a pint, per day; a sun-flower, thirty-three ounces; and so on. The transpiration is generally in proportion to the surface of the leaf; but thin leaves transpire, or throw off water, more freely than fleshy ones. Consequently, weeds having large leaf-surface draw from the soil and give off through the leaves a large amount of water, and thereby rob the surrounding plants. Many botanists consider this waste of moisture the most serious injury done by weeds.

2. *They use plant food.* Weeds naturally make use of the same food as the cultivated plants among which they grow. Consequently they deprive a crop of a large amount of the available nourishment; and they rob the succeeding crop as well. For example, an analysis of the Russian Thistle by Snyder showed that "it contains from 12 to 17 per cent. as much nitrogen as there is in clover; and an ordinary thistle of this kind covering a square yard takes more potash and lime from the soil than two good crops of wheat from the same area."

3. *They shade, crowd, and choke useful plants.* Weeds often grow more vigorously than useful plants; and, as a consequence, they shade or crowd, or partially choke the seedlings of the desired crop. Black Bindweed (Fig. 20), for instance, often covers completely a large part of the plants among which it grows.

4. *They increase the labour and expense of cleaning seed.* At best it is difficult to clean many of the smaller seeds, such as clover, grass, and rape seed; and the difficulty is greatly increased when they are grown on a dirty farm. It is almost impossible to clean clover seed by winnowing. Hence the necessity that the land on which it grows be clean.

5. *They interfere with a regular rotation of crops.* A well-balanced rotation of crops conserves the fertility of the soil; but it is often necessary to depart from such a rotation when noxious weeds get possession of the farm—to give undue attention to the growth of hoed crops, for instance, or omit a certain crop altogether for a time, as in the case of the oat crop on a farm overrun with wild oats.

6. *They harbor the spores of injurious fungi.* Many of the rusts which attack grain crops find a resting place on weeds of the grass and other families, which preserve them through the fall, winter, and spring.

7. *Lastly they offend the eye, or are, as we say, an eyesore to farmers and all people of taste.* They also interfere with the use of mowers, binders, and other implements in taking off crops.

INTRODUCTION AND SPREAD OF WEEDS.

Most of the injurious weeds found in this Province have come directly or indirectly from other countries. They are brought in and conveyed from field to field and farm to farm in various ways:

1. *By the wind.* Seeds which are carried by the wind usually have tufts of fine, silky hair attached to them. Such are the seeds of the Dandelion, Canada Thistle, Sow Thistle (annual and perennial), Wild Cow Herb, and Cotton Grass. These and similar seeds are wafted to and fro, till they become attached to the soil and commence to grow. In some cases, as in the Dock and Wild Parsnip, the seeds are winged; in others the pod containing the seed has flat and extended edges, exposing much surface to the wind. The Penny Cress is an example of the latter.

Some weeds are rolled along the ground by the wind. To this class belong the Russian Thistle and the Tumbling weed of the Northwest. When these weeds ripen, they break off close to the ground; and, being light, they are easily carried by the wind, especially on an open prairie, and the seeds drop out as the weed rolls from place to place.

An examination of snow drifts in Dakota, a few years ago, showed the presence of many weed seeds. Thirty-two seeds of nine species were found in two square feet of a drift. In the same place it was observed that a twenty-five mile wind carried wheat seed a distance of thirty rods in a minute.

Seeds which become sticky when wet often adhere to leaves, and go wherever the leaves are carried by the wind. This is true of the Plantain.

2. *By water.* Some seeds, especially those of aquatic plants, are distributed by water. Darwin maintained that many seeds, dropping into the sea, or being washed in from the shore, might be carried nearly a thousand miles by the movements of the water without injuring their vitality. Seeds which float on the surface of water are carried to and fro by the wind till they find a lodgment and begin to grow; and many, of various kinds, are carried from high to low ground and distributed far and near by the rills and streams which flow from mountain, hill, and upland after heavy rains and spring thaws. The common Speedwell and Ragweed are often distributed in this way.

3. *By birds and other animals* Seeds are distributed by animals in a variety of ways. "It is estimated that about ten per cent. of all flowering plants possess seeds which are dispersed by means of barbed or cleaved processes." By these barb or processes the seeds cling to the feathers of birds and the hairy coats of animals, and in this way are carried from place to place. To this class belong the Bur, Burdock, Hound's Tongue, Bedstraw, Cockle, and such like. And the seeds of some plants, such as Mistletoe and the Meadow Saffron, exude sticky substances which cause them to adhere to birds and other animals.

In the hardened earth taken from the feet of birds Darwin found a large number of seeds, many of which germinated; and it is, undoubtedly, true that seeds are often conveyed from one place to another in the dirt that clings to the feet of animals.

Seeds often pass through the stomachs of animals without being digested; and, during their passage, they are conveyed hither and thither by the animal, and, finally, deposited, to grow and reproduce their kind, whether of weeds or useful plants. Every farmer knows the truth of this statement as regards cattle, horses and swine; and it may be mentioned that Darwin picked from the excrement of small birds twelve kinds of seeds which were perfect in form and germinated in nearly every instance.

Ants, locusts, and other insects, also, do something in the way of distributing the seeds of certain plants, including noxious weeds.

4. *By man.* Man himself, however, has most to do with the spread of troublesome weeds, chiefly through the agency of railroads, implements, farm yard manure, feed-stuffs, and impure seed.

Many weeds are carried from one province or country to another in the fodder and litter used by animals in transit on railways and in grain carried by rail. More or less of the grain, litter and fodder are scattered at places along the track, and at stations where grain and animals are unloaded and cars cleaned out. Weeds thus get a start and spread to neighbouring farms. The Russian Thistle was introduced in this way.

When implements are transferred from one field to another pieces of dry earth or sod are frequently dislodged, and new weed seeds are introduced. This is a common method of spreading weed seeds all over farms and throughout whole neighborhoods. Threshing machines from dirty farms are well known sources of trouble under this head.

Fresh farmyard manure from city stables is very often full of weed seeds, and should be rotted or piled and allowed to heat thoroughly before it is applied to clean land. Wild lettuce, for example, was brought from Toronto to the neighborhood of Burlington in manure; and in this way many other pests have been distributed from towns and cities to the farms of the Province.

A FEW FACTS REGARDING WEED SEEDS IN CLOVER AND GRASS SEEDS.

Of many hundreds of samples of commercial clover and grass seeds which were analyzed at the Agricultural College during the last two or three years, very few were free from noxious weed seeds. Many samples were *foul*, and there is no doubt that the sowing of an immense number of weed seeds accounts largely for the alarming spread of noxious weeds in recent years. The analyses made by the Department of Agriculture at Ottawa confirm those made at the College.

To give an idea of the *foulness* of many of the samples analyzed the following statements of some of the results may be impressive: In 1894, each of 12 samples of clover out of 60 contained 200 weed seeds to the ounce; another and the worst sample contained 9,080 weed seeds per ounce of clover seed. In 1902, fifty samples of clover and timothy were examined, and the percentage *purity* of the red clover seed ranged from 72 to 97 per cent. One sample contained 10,538 weed seeds per pound! In 1907, over 150 samples were examined, and the results were just as startling.

The following weed seeds were found in *common red clover*: rib-grass, curled dock, green foxtail, lamb's quarters, Canada thistle, white cockle, broad-leaved plantain, false flax, shepherd's purse, worm-

seed mustard, ragweed, mayweed, sheep sorrel, black medick, pepper grass, ox-eye daisy, and chicory.

In *white Dutch clover*: Broad-leaved plantain, pepper grass, rib-grass, mayweed, sheep sorrel, yellow foxtail, and lamb's quarters.

In *crimson clover*: white cockle, pigeon weed, wild mustard, sheep sorrel, and poppy.

In *flax seed*: lamb's quarters, yellow foxtail, lady's thumb, white cockle, false flax, wild buckwheat, curled dock, wormseed mustard, burdock, wild mustard, ragweed, hawkweed, and barnyard grass.

In *spring wheat* from the North-west: great ragweed, common ragweed, wild oats, corn cockle, wild buckwheat, and tumbling pigweed.

In *cultivated oats* exposed for sale: wormseed mustard, lamb's quarters, spiny sow thistle, night-flowering catchfly, lady's thumb, shepherd's purse, Canada Thistle, sour dock, broad-leaved plantain, smartweed, pepper grass, wild tare, and black medick.

In *alsike clover*: rib-grass, curled dock, sheep sorrel, broad-leaved plantain, false flax, foxtail, Canada thistle, white cockle, lamb's quarters, wormseed mustard, shepherd's nurse, ox-eye daisy, night-flowering catchfly, mayweed, mouse-ear chickweed, lady's thumb, and sour dock.

In *timothy seed*: false flax, sheep sorrel, wormseed mustard, pepper grass, foxtail, rib-grass, shepherd's purse, curled dock, lamb's quarters, white cockle, Canada thistle, broad-leaved plantain, Norway cinquefoil, catnip, ox-eye daisy, spiny sow-thistle, night-flowering catchfly, mouse-ear chickweed, mayweed, pigweed, stickseed, horseweed, wild mint, corn cockle, chess, old witch grass, yellow avens, Kentucky blue grass, and ergot.

In the foregoing list the weed seeds are given in the order of relative abundance.

COLLECTION AND IDENTIFICATION.

Not only every seedsman, but every farmer, and every teacher in a rural school, should have a collection of weed seeds for reference and comparison in order that he may be able to detect and identify such seeds when they are in grass seed, clover seed, rye seed, or any other kind of seed which is sold or offered for sale. A good collection can be easily made in the summer months. All that is necessary is a number of small bottles and a little attention at the right time. The so-called homeopathic vials of one drachm capacity are suitable for the purpose, but they should be carefully and plainly labelled. If they are not so labelled, the collection will be valueless.

clover:
thistle,
worm-

A small magnifying glass is very useful in identifying seeds. Perhaps the most convenient glass for the purpose is the *tripod magnifier* (Fig. A), costing about fifty cents. The *linen-tester* (Fig. B) is cheaper, but yet quite serviceable.



Fig. A. Tripod magnifier.



Fig. B. Linen tester.

CLASSIFICATION OF WEEDS.

Weeds may be classified according to the length of time they live, as follows:

Annuals or weeds which germinate, bloom, fruit, and die, in one year or season. Corn Cockle is an example.

Winter Annuals, which germinate late in summer or autumn, pass the winter as seedlings or immature plants, and complete the cycle of their existence by blooming, fruiting, and dying during the following summer. Such are Chess and Shepherd's Parse.

Biennials, which produce leaves and roots the first year, and flowers and seeds the second year, after which they die. The Wild Carrot and Evening Primrose are familiar examples.

Perennials which last from year to year, blooming and seeding annually. These are divided into two classes:

(1) Those with underground creeping stems, such as the Canada Thistle.

(2) Those with roots which do not spread underground, such as Chicory, Plantain, and Dock.

It is important to know the class to which a weed belongs, as the method of eradicating an annual is often very different from that required to destroy a perennial.

ERADICATION OF WEEDS.

The most important points under this head are:

First, a determination to get rid of weeds and to keep the land clean.

Second the method or methods of tillage and cropping.

As regards the latter point, the writer feels that he cannot do better than submit the method outlined by our late Farm Superintendent, Wm. Rennie, whose experience of over thirty years warrants him in speaking with some confidence on the subject. Mr. Rennie's method not only cleans the land, but increases its fertility, and those who wish fuller information should consult the college reports for 1895, 1896, and 1897.

For various reasons very few farms in the older sections of the Province of Ontario are free from weeds, and the question how to clean our lands without incurring too much expense is one of the most important which can engage the attention of Canadian farmers.

In the first place, I would say that all obstructions to cultivation, such as piles of stone, must be removed—hailed away to the woods or an out-of-the-way corner in the winter or some other slack time. Secondly, places for harboring weeds, such, for example, as snake fences, should be got rid of as soon as possible. On the Ontario Experimental Farm nearly all field fences have been removed. The outside and lane fences are almost the only ones left. Portable fences are used when required for pasturing live stock.

Annuals and Biennials. Wild oats, wild mustard seed, and some other seeds belonging to these classes, have great vitality. If down pretty well beyond the reach of the air, they will live for twenty years, and will germinate as soon as they are brought near the surface.

The best way to destroy annuals and biennials is by thorough and frequent shallow cultivation, early after harvest in stubble ground and in sod plowed for the following year, and at the proper season (spring and summer) among what are called "hoed crops," that is, potatoes, carrots, turnips, mangels, Indian corn, etc. By shallow cultivation the seeds are kept near the surface, and by frequent stirring of the soil they are made to sprout; and, having sprouted, they can be killed by further cultivation. Those which sprout late in the fall are destroyed by the winter frost. It is impossible to get rid of such weeds by plowing the ordinary depth, say seven or eight inches, once in the fall or at any other time. Plow shallow (not more than four inches in sod and three inches in stubble ground), and harrow and cultivate frequently, as by each stirring of the soil fresh seed is made to sprout, and what has already sprouted is destroyed. When necessary to loosen the soil to a greater depth, use a grubber or a subsoil plow.

Perennials. It is necessary to study the habits of perennial weeds to see how they grow and propagate themselves from year to year, in

order to keep them in check; and a close examination of almost any of them will show that the buds from which the young plants start are near the surface of the soil. Hence shallow cultivation, similar to that mentioned above, is the effective method of destroying them. Disc harrows cut the shallow, creeping roots into fragments, which bud and greatly increase the difficulty of eradication. Deep plowing only transports the buds to a greater depth, and increases the trouble. Plow shallow (see preceding paragraph), and harrow and cultivate frequently, using a grubber or subsoil plow when it is necessary to stir the soil to a greater depth. As above, the cultivation must be early after harvest and throughout the fall in stubble ground and sod, and in spring and summer among corn, potatoes and root crops. Ill-timed, irregular or partial cultivation only makes all weeds grow more vigorously.

Canada thistle, perennial sow thistle, couch-grass, bindweed etc., can be destroyed by the following method: Middle of May gang plow the land about three inches deep and harrow thoroughly. In two weeks, when the weeds are nicely up, cultivate with a common or spring-tooth cultivator provided with wide points that overlap so as to cut off every plant two or three inches below the surface. Then harrow to pull up the plants and leave them to die. In the middle of June there will be another crop, and possibly a greater number of plants, but not so vigorous as the first crop. Repeat the operations with the wide point cultivator and the harrow. In July a few delicate plants will make their appearance and will have to be destroyed in the same way. This will be sufficient for most weeds; but bindweed may need one or two extra cuttings with the wide points, and a corresponding number of harrowings.

The preceding method will clean the land, but it involves the loss of a year's crop; so it is well to add that land may be kept comparatively free from weeds without the loss of a crop, by after-harvest cultivation of all fields not in grass, begun with each field *just as soon as the crop is off* and continued throughout the fall, first by shallow gang-plowing and harrowing, and afterwards at intervals, as above, by the wide-point cultivator and the harrow. This treatment followed by a hoed crop *properly attended to* will destroy most perennial weeds and all annual and biennial seeds that are near the surface.

Note. To Mr. Rennie's method, or methods, as above given, we would venture to add one which we have seen carried out with the most satisfactory results by Mr. Rennie on the College farm, and with marked success by farmers in other parts of the Province. It may be put in the imperative form, as follows: Sow much with red clover, in order to have a rich clover sod to plow down for all or nearly all spring crops, taking as far as possible only one crop of hay or pasture before plowing, occasionally two, but not more than two. Plow the clover sod shallow, not more than four inches, early after harvest, say the 1st to

the 15th of August, and harrow at once. Let it stand a couple of weeks; then cultivate, the same way as it was plowed, two or three inches deep, with a spring-tooth cultivator. After a while, cross cultivate a little deeper. If possible, cultivate a third, or even a fourth time, going a little deeper each time. Then, if you can manage to do so, rib it up with a double mouldboard plow, as you would for a crop of turnips. When this is done the available plant food (clover roots, etc.) is preserved in the center of the drills, the water runs off early in the spring, and the drills can be levelled with the cultivator and harrow, either for spring grain or for hoed crops.

This method will not only clean land, but will greatly enrich it.

INFORMATION FROM FARMERS AS TO NEW WEEDS, ETC., IN DIFFERENT PARTS OF THE PROVINCE.

At the request of the writers, the Ontario Department of Agriculture, in 1898, kindly sent out a few questions about weeds to its regular correspondents, and others, chiefly those who had done satisfactory experimental work in connection with the Experimental Union. A large number of answers were received, and, as part of the information contained therein is not given elsewhere in the bulletin, some of the answers are briefly referred to below. The questions were as follows:

1. *What is the character of the soil in your township?* This was to ascertain what species of weeds grow most abundantly in certain kinds of soil.

2. *Are the weeds in your neighborhood more numerous and more troublesome than they were ten years ago?* The majority of the correspondents say that weeds are far more numerous than they were, and that the injury done by them is far greater. The Canada Thistle, however, is spoken of as much less troublesome than it was,—a fact due, no doubt, to the vigorous methods taken to eradicate it from cultivated land, and in a less degree to the law for its destruction on the highways.

3. *Are the provisions of the weed law enforced in your township?* About 95 per cent. answer *No* most emphatically. They say that a number of townships appoint men to look after the Canada Thistle, but that little or nothing is done with other weeds. "The township council takes no action, because the councillors are afraid of losing votes at the next election." "Pathmasters do not enforce the Act, for fear of incurring the enmity of neighbors;" and "rented farms, especially such as belong to loan companies, are often overrun with weeds, to the great injury of neighboring farmers."

4. *What is the estimated annual loss which you sustain from weeds?* Some of the answers to this question are amusing, but the

great majority of them show a full appreciation of the fact that a serious loss undoubtedly results from the existence of weeds among farm crops.

Some consider the weeds a blessing in disguise, as they compel lazy and careless farmers to keep on cultivating the soil; and very many, in making their estimate, seem wholly to overlook the loss from the use of plant food and the absorption of soil moisture by weeds. A number estimate their loss at twenty-five cents per acre, and quite a few place it as high as \$5 per acre; so, considering the whole list and counting labor, with the loss of soil moisture, fertility, etc., we think that \$1.00 per acre is a conservative estimate of the annual loss throughout the Province.

5. *What means do you use to destroy the weeds on your farm? and with what success?* Many full answers were given to this question; and the most valuable information contained in these answers has been set forth under various heads in the descriptions which follow. One point, however, which is strongly emphasized by many, may be mentioned in passing, viz., that no method, however good it may be, is of any use unless it is faithfully carried out. A lack of thoroughness in the work done for the destruction of weeds always results in failure.

6. *What new weeds have you noticed lately in your locality? Are they spreading rapidly? and how have they been introduced?*

As to the ways in which the above weeds have been introduced, the answers are various, but the great majority of the correspondents mention two agencies as chiefly responsible: (1) Impure seed, especially grass and clover seed; (2) Threshing machines.

Several grades of clover seed are sold by seedsmen:—No. 1, or the best quality, is usually clean, but most of it is exported, as Canadian farmers will not pay the price asked for this grade; No. 2, or second quality, is the kind generally sold in country stores throughout the Province. Of the samples referred to on a previous page as having been examined by us, by far the worst were from country stores, for which fact we cannot say that the storekeepers are to blame any more than the farmers who refuse to pay the price necessary to secure the best seed.

We would again urge that every farmer, no matter what the assertions or statements of sellers may be, should examine carefully with a glass all grass and clover seed which he thinks of sowing on his land; and in case he discovers foreign seeds which he does not know, let him send samples to the Ontario Agricultural College, Guelph, and all such samples will be promptly examined and reported upon.

SEED CONTROL ACT, 1905.

By the Dominion Seed Control Act, which came in force on the first day of September, 1905, it is declared illegal (1) for any person to sell or offer for sale for the purpose of seeding any seeds of cereals, grasses, clovers or forage plants unless they are free from any seeds of the following noxious weeds:—

- Wild Mustard or Charlock (*Brassica sinapistrum*).
- Tumbling Mustard (*Sisymbrium sinapistrum*).
- Hare's-ear Mustard (*Coringia orientalis*).
- Ball Mustard (*Neslia paniculata*).
- Field Pennycress or Stinkweed (*Thlaspi arvense*).
- Wild Oats (*Avena fatua*).
- Field Bindweed (*Convolvulus arvensis*).
- Perennial Sow-Thistle (*Sonchus arvensis*).
- Common Ragweed (*Ambrosia artemisiaefolia*).
- Great Ragweed (*Ambrosia trifida*).
- Purple or Corn Cockle (*Lychnis Githago*).
- Cow Cockle (*Vaccaria vaccaria*).
- Orange Hawkweed or Paint Brush (*Hieracium aurantiacum*).
- Ergot (*Sclerotia*), (*Claviceps Purpurea*).

Or unless labelled with the full name and address of the seller, and the common name or names of the impurities.

(The provisions contained in this section do not apply to the sale of seed that is grown, sold and delivered by any farmer on his own premises, for seeding by the purchaser himself.)

(2) Or for any person to sell or offer for sale, timothy, red clover, or alsike seed, as "No. 1," unless free from the above fourteen and the following nine weed seeds:—

- White Cockle (*Lychnis vespertina*).
- Night-Flowering Catchfly (*Silene noctiflora*).
- False Flax (*Camelina sativa*).
- Canada Thistle (*Cnicus arvensis*).
- Ox-eye Daisy (*Chrysanthemum Leucanthemum*).
- Curled Dock (*Rumex crispus*).
- Blue weed (*Echium vulgare*).
- Ribgrass (*Plantago lanceolata*).
- Chicory (*Cichorium Intybus*).

Or unless 99 per cent. pure, 90 per cent germinable, and not more than five of the above weed seeds in a thousand.

The provisions contained in this Act do not apply to—

(a) any person growing or selling seeds for the purpose of food in respect of seed sold, or exposed or had in possession for sale, for such purpose;

(b) any person selling seeds direct to merchants to be cleaned or graded before being offered for sale for the purpose of seeding in respect of seeds sold, or exposed or had in possession for sale, for such purpose;

(c) seed that is held in storage for the purpose of being recleaned, and which has not been offered, exposed or held in possession for sale for the purpose of seeding;

(d) seed marked "not absolutely clean" and held or sold for export only.

DESCRIPTIONS OF THE WEED-SEEDS ILLUSTRATED ON OPPOSITE PAGE.

1. *Green Fox-Tail*. About one-twelfth of an inch long; oval with blunt ends; unequally bi-convex; brown and often mottled; surface granular and striate. Yellow Fox-Tail seed is about one-eighth of an inch long, plano-convex, with fine, distinct cross ridges.

2. *Chess*. About one-third of an inch long; back rounded; glume 7-nerved; middle nerve projecting as an awn; the plate bears a row of spine-like hairs along each nerve.

3. *Wild Oat*. About three-fourths of an inch long; spindle-shaped; glume 9-nerved, middle nerve forming a twisted and bent awn; a tuft of brownish hairs arise from scar at base.

4. *Couch Grass*. Seeds about one-half inch in length; rather slender; oval; and tipped with a short awn.

5. *Curl Dock*. One-eighth to one-twelfth of an inch long; pointed elliptical, with three faces; surface smooth; reddish brown.

6. *Sheep Sorrel*. Seeds about one-twentieth of an inch in length; usually greyish or reddish brown, and finely roughened; provided with three equal faces, egg-shaped, each face of the cover of the seed bears central ridges with branches.

7. *Lamb's Quarters*. Circular, lens-shaped, and black; grooved on one face; often partially covered with the seed covering.

8. *Purslane*. One-twenty-fourth to one-twenty-fifth of an inch in diameter; jet black; flattened egg-shaped; notches at smaller end; surface finely roughened.

9. *Corn Cockle*. Seeds from one-twelfth to one-eighth of an inch long; angular in outline; color jet black, occasionally dark brown; each surface is crowded with ridges or spines arranged in circular rows leading from the scar.

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The small drawings beside the enlarged drawings represent the natural size of the seeds.

DESCRIPTIONS OF THE WEED-SEEDS ILLUSTRATED ON OPPOSITE PAGE

10. *Bladder Campion*. About one-sixteenth of an inch in length; kidney-shaped; surface roughened by many little projections arranged more or less in concentrative rows; light brown in color.
11. *White Cockle*. Resembling Bladder Campion, but lighter in color; roundish and not so angular; depression about scar not so well marked.
12. *Night-Flowering Catchfly*. Resembles white cockle, but darker.
13. *Pepper-Grass*. About one-sixteenth of an inch in length; egg-shaped but much flattened; the groove is curved and quite evident; the scar is white; reddish yellow to reddish brown.
14. *Penny Cress*. Seeds one-twelfth of an inch long; somewhat egg-shaped and flattened; surfaces have 12-14 curved ridges, which start and end at the pointed end of the seed; color dark reddish brown.
15. *Wild Mustard*. One-sixteenth of an inch in diameter; dark brown to reddish brown in color; almost spherical in outline.
16. *Worm Seed Mustard*. About one-twenty-fourth of an inch in length; most are pointed at the end opposite the scar; the groove is quite evident; surfaces smooth and dull; reddish yellow in color.
17. *Shepherd's Purse*. About one-twentieth of an inch in length; somewhat flattened; oval; each face has two grooves; color reddish yellow.
18. *False Flax*. Reddish brown; more or less oval and slightly flattened; about one-twentieth of an inch long; the groove more evident on one face than on the other; a whitish scar at one end.
19. *Field Bindweed*. About one-sixth of an inch long; oval; color dark brown; surface is somewhat roughened; outer face convex; inner face divided by a ridge into two plane faces.
20. *Dodder*. Ranging from one-sixteenth to one-twenty-fourth of an inch in length; slightly egg-shaped and flattened; notched near one end; resembles red clover seed, but is smaller, with a dull, roughened surface; color is yellow to brown and reddish, or often yellowish green.
21. *Hound's Tongue*. Seeds are spiny nutlets, one-eighth of an inch long; upper side flat, oblique and roughened with hooked prickles.

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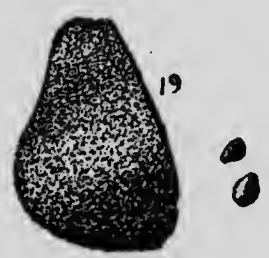
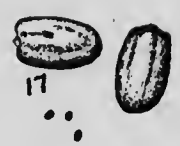
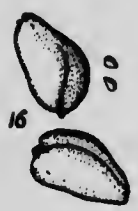
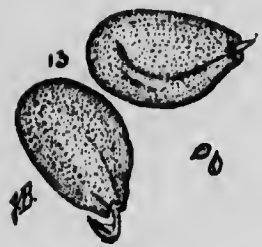
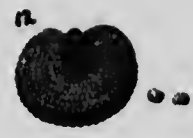
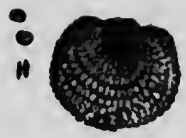
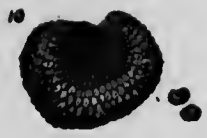
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DESCRIPTIONS OF THE WEED-SEEDS ILLUSTRATED ON OPPOSITE PAGE.

22. *Blue Weed*. Stone-like in hardness; about one-tenth of an inch in length; surface roughened and of a gray color; the scar is large and triangular at flat end; the ridge along the outer face is convex.
23. *Mullein*. About one-twenty-fifth of an inch in length; thimble-shaped; base flat with scar at centre; thimble slightly six-sided, each side deeply pitted; pits of adjacent rows alternate; light to dark brown. The seeds of Moth Mullein and Common Mullein are much alike.
24. *Rib-Grass*. From one-eighth to one-twelfth of an inch in length; oval in shape with one face rounded, the other deeply grooved bearing a central scar; dark brown or amber colored.
25. *Ragweed*. Ranging from one-fifth to one-twelfth of an inch in length; top-shaped; apex-pointed, and bearing a crown of four to eight spines; light to brown in color.
26. *Yarrow*. Seeds about one-twelfth of an inch long; small and thin; slightly egg-shaped; color varying from yellowish-white to gray.
27. *Ox-Eye Daisy*. About one-twelfth of an inch long; ten slender white ribs running from end to end; a knob at the broad end; and slightly club-shaped.
28. *Burdock*. One-fifth to one-fourth of an inch in length; prismatic and mottled; four or five faces; apex broader than base; apex star in centre of a distinct brown ring.
29. *Canada Thistle*. From one-eighth to one-twelfth of an inch in length; brown in color; somewhat spindle-shaped, but often flattened; top end cup-shaped with a rim and a small central knob.
30. *Chicory*. From one-eighth to one-twelfth of an inch in length; usually light brown; usually cylindrical; top flat and crowned with scales.

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DESCRIPTIONS OF THE WEED-SEEDS ILLUSTRATED ON THE OPPOSITE PAGE

31. *Prickly Lettuce*. Seeds one-eighth to one-sixth of an inch length; broadly lance-shaped; each face has 5-7 ribs; color dark brown somewhat mottled with black. Apex is tipped with a beak which is most as long as the seed.
32. *Spiny Sow Thistle*. One-eighth of an inch in length; varying from oval to lance-shaped; flat; each face bearing three narrow ridges which meet at the ends; surfaces smooth; color straw-colored to reddish brown.
33. *Perennial Sow Thistle*. Slightly spindle-shaped with blunt ends and often much flattened; five coarse, finely wrinkled ridges running lengthwise on each face; dark reddish-brown; about one-eighth of an inch long.
34. *Fleabane*. Seeds one-twentieth of an inch long; oval; remnants of pappus bristles remaining often at the apex.
35. *Dandelion*. Seeds one-eighth of an inch long; exclusive of short beak; lance-shaped in outline; ten ridges running lengthwise; provided with barb-like teeth towards the apex; color varies from light to dark brown.
36. *Wild Carrot*. Seeds each one-eighth of an inch in length; and flattened on the back; primary ribs slender, bristly, and five in number; secondary ribs, 4 in number, each bearing a row of barbed prickles.
37. *Pigeon Weed*. Nutlets one-twelfth of an inch long; egg-shaped and curved; scar is conspicuous; surface roughened; gray in color.
38. *Broad-Leafed Plantain*. Seeds about one-twentieth inch long; flattened; outline variable from oval to rhomboidal; wavy lines on surface; color, brown.
39. *Pig-Weed*. About one-twenty-fourth of an inch in length; flattened, egg-shaped, or lens-shaped; polished and jet black; a slight notch on sharp edge is the scar; near the scar-notch is a small projecting point.

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DESCRIPTIONS OF THE WEED-SEEDS ILLUSTRATED ON OPPOSITE P

40. *Barnyard Grass*. One-tenth of an inch long, plano-convex mandolin-shaped. It is a smooth, glossy seed, and the color is greenish or grayish yellow.

41. *Witch Grass*. A small, shiny gray seed, about one-sixth of an inch long, oval and somewhat flattened bi-convex.

42. *Black Medick*. Often found in the black, ribbed pod or legume which is somewhat coiled up. The seed is egg-shaped, but otherwise resembles Alfalfa seed.

43. *Common Chickweed*. Very small seed, one-twenty-fourth of an inch in diameter, somewhat wedge-shaped, with a notch at the top. The surface is finely tubercled, in four or five looped rows on each of the parallel faces, and the color varies from reddish to gray.

44. *Cinque Foil*. Minute, yellowish-gray seeds, somewhat kidney-shaped, and covered with curved ridges.

45. *Orange Hawkweed*. Small torpedo-shaped seeds, about one-twelfth of an inch long, and grooved. Ripe seeds are dull jet black, immature seeds reddish.

46. *Cone Flower, Yellow Daisy, Black-Eyed Susan*. A small black seed, curved and somewhat angular, with fine longitudinal striations on the four faces.

47. *Wild Lettuce*. A thin, flat, oval seed, with a slender beak at the tip. It has a dull black color and faint cross-ridges, and is about one-sixth of an inch in length.

48. *Wild Buckwheat, Black Bindweed*. A jet black, shiny four-sided seed, about one-eighth of an inch long. It is broadest near the abruptly pointed apex, and the sides are slightly concave, but the corners are rounded.

49. *Heal All, Self-Heal*. A brownish seed, about one-twelfth of an inch long, oblong-oval, tapering to a small white triangular scar at the base. Dark lines follow the margins and centres of the four faces. These pretty double lines are characteristic.

50. *Evening Primrose*. An angular, reddish-brown seed, usually with a narrow wing along the edges. The four faces are finely rounded, and faintly ridged. Some seeds are pyramidal, some prismatic, others wedge-shaped, but commonly four-sided with one face rounded.

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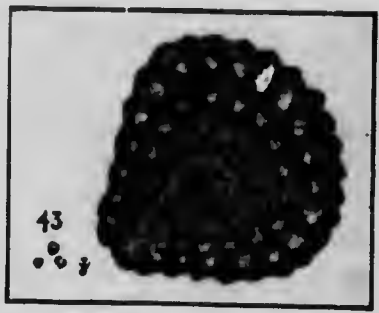
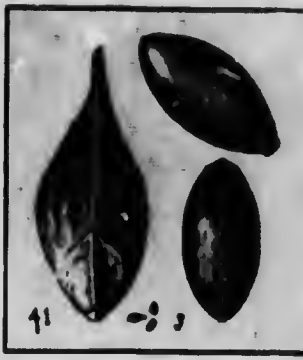
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A NUMBER OF COMMON WEEDS, WITH POPULAR DESCRIPTIONS AND NOTES ON ERADICATION.

FIG. 1.

FOX-TAIL, YELLOW FOX-TAIL OR PIGEON GRASS.

Setaria glauca (L).

A common weed in stubble, fallow or root fields. It has an annual root, with stems about two feet high, of erect habit of growth. At the summit of that part of the leaf which sheaths the stem (the ligule) there is a fringe of hairs. The leaves are flat, rough above, and smooth beneath. The dense, close spike, which resembles millet, is bristly and tawny yellow in color.

The seeds are $\frac{1}{8}$ in. long, of various shades of brown in color, with transverse wrinkles. They frequently retain their green color, and are quite commonly found as an impurity in clover and grass seed. (Fig. 1, a.) An average plant produces about 15,000 seeds.

Time of flowering, July-September.

Time of seeding, August-October.

Eradication. Gangplow stubble ground about three inches deep early in the fall; as soon as the seeds have had time to sprout, cultivate thoroughly; repeat cultivation and rib the land with a double moldboard plow the last thing before the frost. Put in a hoed crop (potatoes, roots or corn) next spring, and cultivate thoroughly throughout the growing season. Follow with a grain crop seeded with clover without plowing after the roots, for if the land is plowed it is liable to bring more seed to the surface. When the sod is broken up, plow shallow in the latter part of harvest, cultivate with harrow and cultivator throughout the fall, and rib up as above.

In the early after-harvest cultivation of stubble ground, some harrow the stubble as the first step; and when the weed seeds have sprouted under their light covering, then gang-plow and harrow, and stir afterwards with the cultivator as time permits throughout the fall.

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FIG. 1.
YELLOW FOX-TAIL.
(*Setaria glauca.*)

FIG 2.

CHESS, CHEAT, OR WHEAT THIEF.

Bromus secalinus (L).

A weed naturalized from Europe. It is a winter annual, with fibrous roots and rough, coarse leaves. It has large spikelets, dark green in color, of characteristic shape, and grows from three to four feet high.

Many look upon Chess as degenerated wheat, because it appears among fall wheat that has been winter-killed. This idea is erroneous and without foundation. The fact is that Chess will mature seed under adverse conditions, even though the plant be only a few inches high. The seed possesses great vitality, and is often found in wheat and rye. Chess is most commonly found among wheat and rye.

The flour made from it is dark-colored, and has narcotic principles. Care in the selection of seed grain and careful cultivation, tending to prevent the maturing of the seeds, are the chief remedies. The planting of a crop that can be harvested before the Chess matures is a good plan in badly infested localities. An average plant produces about 1,000 seeds.

Time of flowering, June. Time of seeding, July.

"Chess is a typical plant belonging to the genus *Bromus*. Wheat belongs to the genus *Triticum*. Chess will produce Chess and only Chess, and a seed of wheat cannot be sown to produce Chess, and Chess cannot produce wheat under the most favorable conditions of growth.

"In instances where parts of a plant, apparently a combination of Chess and wheat were so united as to seem but one plant, close examination proved them to be parts of separate plants, and that the apparent union was not real."

Eradication. Avoid fall sown crops, and follow as far as practicable the same method as is recommended for Mustard. In this case, however, the meadow will require special attention, and any weeds that appear must be removed. If many weeds appear in the meadow, it will be better to break it up and follow the rotation suggested under Fox-tail.

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FIG. 2.
CHESS.
(*Bromus secalinus.*)

FIG. 3.

WILD OAT.

Avena fatua (L.).

An annual weed with erect and smooth stems. The leaves and stems are covered with white bloom, which give a peculiar white-green color to the whole plant. The head forms a loose panicle, with nodding and spreading branchlets. The awn is long and bent, and covered with brown hairs. It is bent most when dry; but if moistened, it uncoils and wriggles around, thus causing the seed to move appreciable distances.

The principal points of difference between the wild and cultivated oats are (1) In the former the chaff is thick and hairy, while in the latter it is thin and hairless; and (2) The wild oat has a long, stiff awn which is bent and twisted when dry, while the cultivated oat either has a much smaller and less stiff awn or none at all. An average plant produces about 800 seeds.

Time of flowering, July. Time of seeding, July-August.

Dispersal—Conveyed from place to place by threshing machine and as an impurity in seed-grain.

Wild oats are at home in any soil that will grow cereals, and they ripen their seeds among almost any cereal crop. The seeds possess wonderful vitality, some of them remaining buried in the soil for years and germinating as soon as they are brought under favorable conditions.

Eradication. On a field infested with wild oats, cereal crops should be dropped out of the rotation as far as possible; and hoed crops, soiling crops, hay, and pasture should take their place. To get the land under grass, it should be fallowed during part of the season, the cultivation being frequent and shallow, to destroy all seeds that may have germinated in the upper layer of the soil. The land can then be sown with winter wheat and seeded, or with an early variety of barley, which should be cut on the green side. The treatment mentioned is suitable for pasture land, or land which has produced a hay or soiling crop during the forepart of the season.

Wild Barley, or Squirrel-Tail Grass (*Hordeum jubatum*). This pest is a native of the western prairies, but is invading the western parts of the Province. It has a dense head, like that of barley, and grows to a height of 12 inches or more. It is quite a serious pest in Manitoulin Island, and the districts farther west. It should be gathered and burned wherever found.

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FIG. 3.
WILD OAT.
(*Avena fatua*.)

FIG. 4.

COUCH-GRASS, TWITCH-GRASS, QUACK-GRASS, QUITCH-GRASS, OR
QUICK-GRASS; ALSO WHEAT-GRASS.

Agropyron repens (L).

Couch-grass is a creeping perennial which grows from 1 to 3 feet high. It has a jointed root-stock which penetrates deeply into the ground and possesses great vitality. The plant produces spikes from 3 to 8 inches long. The small spikelets alternate at each notch of the flower stalk, with the side of the spikelet turned towards the stalk.

The seeds are about $\frac{1}{4}$ in. long, and rather slender (Fig. 4.) An average plant produces 400 seeds.

Time of flowering, June-July.

Time of seeding, July-August.

Dispersal—The root-stocks are carried around by implements, and the seeds are occasionally found in seed-grain.

Whatever value Couch-grass may have for pasture, its habit of taking and keeping possession of the soil renders it extremely objectionable. It flourishes best in loamy or humus soils, from which it is especially difficult to eradicate.

Eradication. As soon as the crop is harvested plow lightly, then harrow with the ordinary harrow, and, if necessary, cultivate with the spring-tooth cultivator. This shakes the roots free from the soil and makes it possible to gather them up with the horse rake. Burn as soon as they have dried sufficiently. Repeat this process two or three times. If the weather at this time should happen to be dry and hot, so much the better. Late in the fall rib up the land into drills, and allow to stand over winter. The frost, in all probability, will render material assistance in the eradication. The following spring plow about the end of May, cultivate well, and put in some hoed crop, or summer fallow, sowing buckwheat, the crop to be plowed in. A carefully cultivated crop of rape is recommended as being particularly effective in destroying this pest.

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FIG. 4.

Couchgrass on right of figure and part of a stalk of perennial ryegrass (*Lolium perenne*) on left. Note the arrangement of spikelets in ryegrass.

FIG 5.

DOCK, CURLED DOCK, SOUR DOCK, OR YELLOW DOCK.

Rumex Crispus (L).

A deep-rooted perennial weed introduced from Europe. It occurs around buildings, in neglected lanes, along waysides and in pastures. The stem is quite slender, and the leaves are from six to twelve inches long, with wavy margins; hence the common name, "curled dock." The flowers are in racemes, green in color.

The seed is winged, and is carried considerable distances by the wind. The manner of attachment of the seed to the wing is shown in illustration (Fig. 5.) The seeds are light brown in color, triangular, with sharp edges and tapering point. They are smooth and shiny.

The wind acts as an agency in scattering the seed, and it is a very common impurity in clover and other seeds used on the farm.

An average plant produces about 17,000 seeds.

Time of flowering and seeding, July-August.

Eradication. In most cases this weed can be kept in check by the frequent introduction of well-cared-for hoed crops into the rotation. The shorter the rotation, the better. The later sown hoed crops, especially rape, are more effective than those sown earlier in the season. Before the hoed crop is sown, this weed may be kept from breathing above ground by going frequently over the field with a broad-shared cultivator, which will cut the plants an inch or two below the surface; but, as the roots are tough and strong, it may sometimes be necessary to use the gang-plow, or even the single plow. About the 1st of July, the land may be sown with rape in drills, say 26 inches apart, and kept clean, or nearly so, by the horse-hoe and more or less hand hoeing. The rape can be pastured off in the usual way during the fall; and, occasionally, it may be necessary to put another hoed crop on the same ground the following spring, say a crop of corn; but much depends upon the timeliness, regularity, and thoroughness with which the hoeing is done.

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FIG. 5.
CURLLED DOCK.
(*Rumex crispus*.)

FIG. 6.

SORREL, OR SHEEP SORREL.

Rumex Acetosella (L.).

A perennial with running root-stocks. The stem is slender erect with branches. The leaves are spear-shaped and quite characteristic. The flowers occur in racemes, and are green in color. The foliage has a pronounced acid taste.

The seed is 1-16 in. long, triangular, smooth, and shining when naked, but dull brown when invested by its covering. An average plant produces about 10,000 seeds.

Time of flowering, June-September.

Time of seeding, July-October. •

Propagation—By its running root-stocks, and as an impurity of clover seed, especially Alsike.

Eradication. Sorrel is usually an indication of a poor, sandy, gravelly soil. It prefers acid soils, hence liming and manuring are effective remedies when the land is well tilled. The remedies given for the Dock (Fig. 5) are applicable to Sorrel, only it requires more frequent use of the broad shared cultivator, which should be used so as to cut the roots just below the surface of the soil, without bringing up any of the creeping root-stocks.

Lady's Thumb, or Smartweed (*Polygonum Persicaria*). This plant grows to a height of 12 to 18 inches. Its leaves are lance-shaped, usually with a blotch near the centre. It is an annual, and is often abundant.

Treatment. Prevent from seeding, and sow clean seeds.

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FIG. 6.
SHEEP SORREL.
(*Rumex acetosella*.)

FIG. 7.

LAMB'S QUARTERS, OR GOOSEFOOT.

Chenopodium album (L).

An annual weed widely distributed in cultivated land. It grows to a height of from 2 to 6 feet. The stem is grooved and much branched. The leaves are whitish green below and dark green above. The flowers are inconspicuous and greenish in color.

The seed (Fig. 7) is black and shining, lens-shaped and round, about 1-16 in. in diameter.

Time of flowering, June-October.

Time of seeding, August-October.

Distribution—By seeds, especially as an impurity in clover and grass seeds.

Eradication. Late cultivation is especially necessary in combating this weed, as it flowers and seeds till very late in the season. The soil should be gang-plowed shallow and harrowed immediately after harvest and cultivated at intervals until late in the fall, when it may be plowed or ribbed up for a hoed crop the following spring. Subsequent treatment the same as for Foxtail (Fig. 1).

Oak-leaved Goosefoot. Usually spreads on the ground. Its leaves are like minute white oak leaves.

Maple-leaved Goosefoot. Grows erect, with large thin, triangular leaves.

Strawberry Blite. Resembles the last, but has red seed clusters.

Spreading Orache. Somewhat resembles Lamb's Quarters, but has larger and thicker leaves, goosefoot shape. It is much branched and spreading and the seed covers are warty.

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FIG. 7.
LAMB'S QUARTERS.
(*Chenopodium album*.)

FIG. 8.

PIGWEEED, OR REDROOT.

Amaranthus retroflexus (L.).

An annual, with pink root, stout, erect stem, and many branches. It grows from 1 to 6 feet high. The leaves are light green in color and ovate in shape. The flowers are in spikes, which terminate in branches, or are from the axils of the leaves, and are green in color.

The seeds (Fig. 8) are round and lens-shaped, smooth, and shiny black in color, resembling the seed of Lamb's Quarters, but slightly smaller and thinner. An average plant produces 15,000 seeds.

Time of flowering, July-September.

Time of seeding, August-October.

Dispersal—The seed is distributed by the wind and as an impurity in grass seed.

Eradication. Special attention must be given to fall cultivation of the soil, so as to prevent plants from ripening, and to sprout and destroy the seeds which have fallen upon the ground. The land should be gang-plowed shallow and harrowed immediately after harvest, and cultivated at intervals until late in the fall, when it may be plowed and ribbed up for a hoed crop the following spring. Subsequent treatment the same as for Foxtail (Fig. 1).

Tumble Weed, or White Pigweed (*Amaranthus albus*). This plant resembles Russian Thistle quite closely, but can be distinguished from it by its round, shiny, jet-black seeds, and by its leaves, which, although small, have a definite blade. It is a low branched annual when growing in sandy, open fields and roadsides.

Treatment. Prevent the maturing of the seeds which ripen in August. The plants, as a rule, are conspicuous, and may be readily collected and burned. The seeds are often found in grass-seed mixtures.

Spreading Amaranth (*Amaranthus blitoides*), forms large mats of waste ground, along roadsides and walks.

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FIG. 8.
PIG-WEED.
(*Amaranthus retroflexus.*)

FIG 9.

PURSLANE, OR PURSLEY.

Portulaca oleracea (L).

Purslane is pre-eminently a garden weed and is readily recognized by its fleshy leaves and stem, which lie prostrate on the ground. It is an annual.

The stems are red, and the leaves wedge-shaped and clustered at the ends of branches. The flowers are bright yellow, about $\frac{1}{4}$ in. across and open only during full sunlight for a few hours in the morning. The seeds (Fig. 9), in small capsules, are black, kidney-shaped, and extremely small. An average plant produces 60,000 seeds.

Time of flowering, July, until frost.

Time of seeding, August, until frost.

Dispersal—By seeds.

Purslane has been used as hog feed in very dry seasons, but the cost of gathering it is too great.

Eradication. Careful hoeing and constant cultivation. The latter should be as early as possible. The same treatment should be followed as that outlined for the tail (Fig. 1).

Corn Spurry (*Spergula arvensis* L). This is an annual with small white flowers, and is related to the chickweeds. It grows from 7 to 12 inches in height. The needle-like leaves are in whorls at the joints of the stem, and the plant is covered with clammy hairs. It grows mainly on sandy soil. Its effect is to smother the crop. It seeds very profusely.

Treatment. Frequent stirring of the soil to make the seeds sprout and frequent harrowing to destroy the seedlings.

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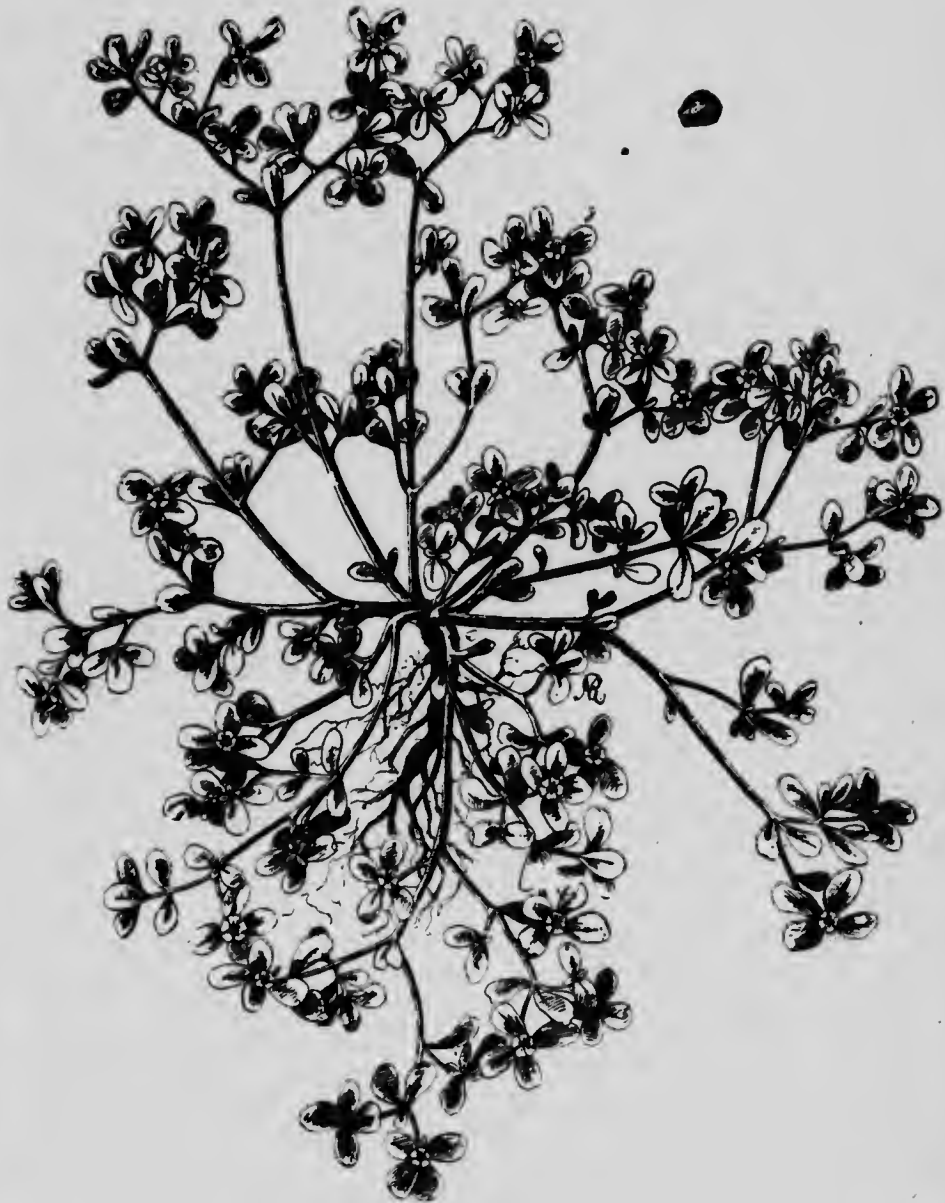


FIG. 9.
PURSLANE.
(*Portulaca oleracea.*)

FIG. 10.

CORN COCKLE, OR CORN CAMPION.

Agrostemma githago (L).

An annual adventive from Europe, about 1 to 3 feet high, with erect habit of growth. It has but few branches, and the stems are all very hairy, with whitish-green hairs. The leaves are rather long and narrow, with pointed ends. The flowers are red to purple, and the flower cup (calyx) has long lobes, three or four times the length of the petals.

The seed capsules are generally well filled with seed which is black in color and kidney-shaped, with tubercles (small conical projections) arranged in rows around the sides of the seed. (See Fig. 10). The seed is about 1/8 in. across. An average plant produces about 500 seeds.

Time of flowering, July.

Time of seeding, August.

Dispersal—By birds, in manure, and as an impurity in seed.

It may be noted, in passing, that the seed is injurious to young chickens, and the husks of the seed often elude the miller and appear as black specks in flour, which is seriously damaged thereby. An old writer, Gerarde, says:

“What hurt it doth among corn (wheat) the spoyle unto bread, is well in colour, taste, and unwholesomeness, is better known than desired.”

Eradication Sow clean seed; and when the weed is not very thick pull it by hand. Otherwise use the same treatment as for mustard. (See Fig. 15).

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FIG. 10
CORN COCKLE,
(*Agrostemma githago*.)

FIG. 11.

BLADDER CAMPION, OR COW BELL.

Silene inflata (L.).

A naturalized perennial which promises to be a bad weed in Ontario; and it is spreading very fast. It grows from 6 inches to 2 feet in height, and branches from the base. The leaves are oblong, and vary greatly in size. The flowers are white, about $\frac{1}{2}$ in. broad, and arranged in a loose panicle. The flower cup (calyx), veined and inflated like a bladder, distinguishes the plant from others that resemble it.

The seeds are brown and kidney-shaped, with minute tubercles disposed regularly over the surface (Fig. 11). An average plant produces about 9,000 seeds.

Time of flowering, June-August.

Time of seeding, July-September.

Dispersal—By root-stocks and as an impurity in seeds.

The Night-flowering Catchfly (*Silene noctiflora*), resembles the Bladder Champion; but it is an annual, tall and very leafy, with a viscid secretion all over its stem, often so profuse that the stems and leaves are covered with small insects entangled in it. It opens at night and possesses a fragrant smell. It is not so bad a weed as its relative, the Bladder Champion. In Fig. 11 are shown the seeds of these two plants, natural size and enlarged. That on the left is Bladder Champion, that on the right is the Night-flowering Catchfly.

Eradication. For these weeds practically the same treatment as outlined for the creeping perennials (Canada Thistle, etc.) will answer, although the plow may have to be resorted to more frequently, instead of the broad-shared cultivator, on account of the size and thickness of the roots.

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FIG. 11.
BLADDER CAMPION.
(*Silene inflata*.)

FIG. 12.

WHITE CAMPION, OR WHITE COCKLE.

Lychnis alba (L).

A biennial weed introduced from Europe, with hairy and branched stems from 1 to 3 feet high. Like the Night-flowering Catchfly, it has a viscid secretion, which attracts many insects. The leaves are long, with acute tips. The flowers are in loose panicles, white or pink in color, and nearly $\frac{3}{4}$ in. broad. As a rule, they open at night, and remain so until the morning of the following day. The pod has sharp teeth around the top, which curl back when dry, and the seeds are distributed by the winds swaying the stem, when the seeds drop out. In wet weather these teeth straighten out and completely close the opening at the top.

The seed (Fig. 12) is brown in color and kidney-shaped, with tubercles regularly disposed over the surface. An average pistillate plant produces 10,000 seeds.

Time of flowering, June-August.

Time of seeding, July-August.

Dispersal—By wind and as an impurity in seeds.

Eradication. Exercise great care in cleaning seed grain, and examine all purchased grain with a sharp lookout for this seed. If this weed be on the farm, follow the method outlined for Foxtail (Fig. 14) or Mustard (Fig. 15).

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FIG. 12.
WHITE COCKLE.
(*Lychnis alba.*)

FIG. 13.

PEPPER GRASS, OR TONGUE GRASS.

Lepidium Virginicum (L).

A native annual which grows from six inches to a foot and a half high. The stem usually has many branches, and the lower leaves are pinnate in a large lobe (with small lateral ones), with edges slightly serrated along the margin. The upper leaves are tapering. The flowers are small and white, with slender spreading flower stalks. The seed pods are round, with a very small wing at the top and a notch at the extremity. The end of a branch with seed pods is shown nearly natural size in Fig. 13, a.

The seeds (Fig. 13) are reddish brown, flat and oval in shape, and 1-16 in. long. The average plant produces about 18,000 seeds.

Time of flowering, June-August.

Time of seeding, July-September.

Dispersal—By birds and as an impurity in clover seed.

Eradication. Be careful to prevent the plants from seeding, and do not plow them under when half ripe, as many of the seeds will germinate even though partially matured. Pull and burn where only a few plants exist, and when they are numerous use the method employed for the eradication of Mustard (Fig. 15).

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FIG. 13,
PEPPER GRASS,
(*Lepidium virginicum*.)

FIG 14.

PENNY-CRESS, BASTARD-CRESS, FRENCH WEED, WILD GARLIC, OR
STINK-WEED.

Thlaspi arvense (L).

A winter annual, introduced from Europe, and a very bad weed. It is very abundant in Manitoba, and is becoming rather common in Ontario. It grows as an erect plant, with a number of branches from the upper part. The leaves are numerous during the first of the season and clasp the stem by ear-line lobes. The flowers are white and small with spreading flower stalks. The pods which succeed the flowers are very characteristic. They are nearly orbicular, about half an inch broad, quite flat, with a broad wing all around, and notched at the tip. Fig. 14 shows this peculiarity. Each pod produces about twelve seeds which are dark brown to black and oval in shape, with curved lines. An average plant produces about 20,000 seeds.

The plant has a peculiar odour, resembling that of garlic, hence some of the common names. The seed also has a very pungent taste. When eaten by milch cows, it imparts a disagreeable flavor to the milk.

Time of flowering, May-September.

Time of seeding, June-September.

Dispersal—Chiefly by the wind.

Eradication. Continuous growing of hoed crops with thorough cultivation thereof, followed by heavy seeding with rye. In places where the weed is very thick, mowing and burning is a good remedy. The method outlined for eradicating Mustard is applicable to this weed (Fig. 15).

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FIG. 14.
PENNY-CRESS.
(*Thlaspi arvense*.)

FIG. 15.

WILD MUSTARD, CHARLOCK, OR HERRICK.

Brassica sinapistrum (L).

Among the worst weeds in Ontario is the Wild Mustard, an annual naturalized from Europe, with fibrous roots and erect habit of growth. The stem is rough, with stiff hairs somewhat scattered over the surface. The branches arise from the upper part of the stem and bear oblong leaves; and the lower leaves have one terminal large lobe and several smaller lateral ones (lyre shaped). The flowers are yellow, showy, and about $\frac{2}{3}$ in. broad, with stout flower stalks, which are more noticeable when the plant is in fruit. The pods, which appear on the lower part of the stem whilst the top is still in flower, are from 1 to 2 inches long and are either spreading or ascending.

The shape of the pod is characteristic; it is constricted between the seeds, thus giving the appearance of a rounded enlargement where each seed is borne. This appearance is termed "knotted." The pod terminates in a two-edged beak, and the two valves of the pod are strongly veined or ribbed.

The seed (see Fig. 15) is black, $\frac{1}{8}$ in. in diameter, perfectly spherical, and very much like rape or turnip seed; and it retains its vitality for a long time when buried in the soil. An average plant produces 15,000 seeds.

Time of flowering, June-September.

Time of seeding, July-September.

Dispersal—By birds and implements, but chiefly as an impurity in seed.

Eradication. Owing to the great vitality of the seed, Mustard is a very hard weed to eradicate. The seeds, once in the ground, live for years, and continue to germinate as they are brought near the surface. Hence it takes patience, a great deal of labor, and a long time to get rid of the weed, when it once gets possession of the land. When present only in small amounts, hand-pulling is the best method, provided the pulling is done before seeds have formed; and as persons pulling in a hurry cannot wait to examine for seed, it is best to put the weed as they are pulled, in bundles where they can be burned when dry.

When fields are overrun with the weed, it is best to proceed as follows: Harrow stubble-ground early after harvest, or gang-plow and harrow. As soon as the seeds have had time to sprout, cultivate thoroughly; repeat cultivation at intervals; and rib up with a double mouldboard plow the last thing in the fall. Put in a hoed crop, either roots or corn, the following spring, and cultivate it thoroughly throughout the growing season. Cultivate and harrow well two or three times after roots or corn, having first run the plow along each row of corn roots to cut the roots and turn them up; and rib up before the frost. (If the

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FIG. 15.
MUSTARD.
(*Brassica sinapistrum.*)

plow is used after roots or corn, it is likely to bring more seed to the surface). Sow a crop of grain the following spring and seed with clover. Pull weeds by hand out of the grain crop; take a crop or two of hay, or pasture; and break up the clover sod, treating it as outlined in the note to Mr. Rennie's method of cleaning land. (See page 7.) When necessary at any stage in this method, use a grubber or subsoil plow to stir the soil to a greater depth than is reached by the surface cultivation.

Blue stone method. When mustard plants are sprayed with a 1 per cent. solution of blue stone (blue vitriol, or copper sulphate), which is made by dissolving one pound in 5 gallons of water, or 9 pounds in 40 gallons of water, they are killed. It is necessary that the plants be sprayed early, just when coming into bloom, and on a fine bright day, if the best results are to be obtained. A barrel (45 gallons) should spray an acre.

FIG. 16.

WORMSEED MUSTARD, OR TREACLE MUSTARD.

Erysimum cheiranthoides (L)

A native weed, which seems to be spreading rapidly through the Province. Many specimens have been sent here for examination during the past year.

An annual or winter annual with erect and branching stems from 8 in. to 2 ft. high. The foliage is bright green and abundant. The leaves are long, tapering at the base into a short petiole, and they are covered with T-shaped hairs. The flowers are yellow and about $\frac{1}{4}$ in. across. The little stalks (pedicels) holding the pods, come out from the stem obliquely, but the pod stands erect on the pedicel, parallel with the stem. The pod is about an inch long and four-angled, with one row of seeds in each cell. The seeds are 1-16 in. long and light brown in color, with a furrow on one side (Fig. 16a). An average plant produces 25,000 seeds.

Seeds give a bitter taste to feed containing them.

Time of flowering, June-July.

Time of seeding, July-August.

Dispersal—Frequently as an impurity in clover seed.

Eradication. Hand-pulling and burning is the best remedy when the weed occurs in small quantities; but where there is much of it, the following procedure is advised: Harrow stubble-ground early after harvest, or gang-plow and harrow. As soon as the seeds have had time to sprout, cultivate; repeat the cultivation, and rib up the land with a double mould-board plow the last thing in the fall. Put in a hoed crop, either roots or corn, the following spring, and cultivate thoroughly throughout the growing season. Cultivate after the roots or corn, sow a crop of grain, and seed with clover. If not too much, pull weeds by hand out of

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FIG. 16.
WORMSEED MUSTARD.
(*Erysimum cheiranthoides*.)

the grain crop; take a crop or two of hay or pasture; and break up the clover sod, treating it as outlined in note to Mr. Rennie's method of cleaning land. (See page 7.)

FIG. 17.

SHEPHERD'S PURSE.

Capsella bursa-pastoris (L).

A winter annual, naturalized from Europe, with a long, deep, tap root. The root leaves are lobed and form a large rosette which lies close to the ground, and in this state it passes the winter. The following spring a more or less branched stem arises, with arrow-shaped leaves thereon. The flowers are very small and white in color, and are much less conspicuous than the seed vessels, which are triangular in shape, and are attached to the stalk or pedicel at the lower apex of the triangle. From the character of these pods, the plant obtains its scientific and common name. The triangular pod is divided down the centre by a partition, forming two cells, each of which contains from 10 to 12 seeds (Fig. 17). In size the plant varies greatly from a few inches to two feet, depending on the soil and locality. But even a very diminutive plant produces many seeds. The seed is very small, light brown in color, and oblong in shape (Fig. 17). An average plant produces over 50,000 seeds. Fig. 17 shows shape of seed, also the arrangement of seeds in the pod.

Time of flowering, early spring till the beginning of winter.

Time of seeding, early spring till the beginning of winter.

Dispersal—As an impurity in grass seed; also by birds, as the pods when ripe open and drop the seeds, which are eaten by birds, and often evacuated without digestion or injury.

Eradication. It easily succumbs to cultivation; and as the plant spreads only by seed, persistent effort should be made to prevent seeding. The method employed against the preceding weed may be used for eradicating the Shepherd's Purse. (Fig. 16.)

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FIG. 17.
SHEPHERD'S PURSE.
(*Capsella bursa-pastoris*.)

FIG. 18.

FALSE FLAX, OR GOLD OF PLEASURE.

Camelina sativa (L).

This weed probably came to this country in imported flax seed. In Europe it is cultivated for the fine oil extracted from the seed, which is used in feeding cattle. Its common name arose from its supposed resemblance to flax.

An annual and winter annual, with simple or branching stems; the lower leaves are long, with a stem, or petiole; and the upper ones clasp the stem with arrow-shaped bases. The flowers are numerous, yellow, and somewhat inconspicuous. The seed vessel, or pod, is pear-shaped or globular, with a small projection from the upper end. The little stalks holding the pods are slender and spreading or ascending. The seed is brown and somewhat larger than that of Shepherd's Purse. (Fig. 18.) An average plant produces about 40,000 seeds.

Time of flowering, June-August.

Time of seeding, July-August.

Dispersal—As an impurity in flax and clover seed, and occasionally in grain.

Eradication. Plow lightly as soon as the crop is harvested. Harrow and then cultivate frequently throughout the autumn, to destroy the young seedlings. It is important that this autumn cultivation should be thorough. Grow a hoed crop the following year. The rotation of crops should be modified in the infested fields by dropping winter wheat out for a time. Grass seed should be sown along with the spring wheat or barley.

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FIG. 18.
FALSE FLAX.
(*Camelina sativa*.)

FIG. 19.

WILD CARROT, BIRD'S NEST, OR DEVIL'S PLAGUE.

Daucus carota (L).

This is a biennial, naturalized from Europe, with a deep, strong root, a bristly stem, and much divided leaves like the cultivated carrot. The clusters of flowers are in compound umbels which resemble bird's nest cavities.

Time of flowering, July-September.

Time of seeding, August-December.

Dispersal—By seeds carried by wind and animals.

Eradication. Spudding is quite effective when the roots are cut before blossoming the first season. When the field becomes badly infested it should be plowed and cultivated and treated to a hoed crop, as described for the treatment of Blue-weed (page 66).

The Cinque-Foils, or Five Fingers. There are two or three species of Cinque-Foils which are becoming quite noxious. The large-flowered Cinque-Foil (*Potentilla recta*) is a perennial, with cream-colored flowers. The Norway Cinque-Foil (*Potentilla Norvegica*) is also a pest in many pastures. Cultivation, spudding, and hoeing will keep these plants under control.

Sweet Clover (*Melilotus alba*). The white sweet clover is a very common plant in vacant grounds and neglected fields about cities and along roadsides. It is a tall, rank-growing plant, and thrives best on heavy clay soils. It may be classed among the weeds, inasmuch as it grows where it is not wanted, but it cannot be considered a noxious weed. As a soil-former sweet clover is a valuable plant. It roots deeply and is a nitrate producer. With the aid of the rains and frosts it gradually mellows the soil of unproductive clay, and makes it fit for cultivation.

It is a biennial. The shoots of the first year's growth are tender and are valued in the South as fodder for stock, but those of the second year are tough, fibrous, and branching, and bear the flowers which are very attractive to honey bees. In some districts sweet clover is grown extensively by apiculturists. The number of seeds produced every year by each plant is very large. Experience shows that sweet clover is not difficult to control. It grows altogether from the seed. If seeding is prevented by cutting down the plants at blossoming time very few plants will make their appearance the following season.

Although a fodder plant in the South, sweet clover is not relished by stock in Ontario. On account of the tough, fibrous structure of the second year's growth there is a possibility that the plant may in a few years be grown for the manufacture of binder-twine, etc.

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FIG. 19.
WILD CARROT.
(Daucus carota L.)

FIG. 20.
 BINDWEED.

Convolvulus arvensis (L).

A very troublesome weed which winds its tough and curling stems around the stalks of various plants, partially chokes them, and thereby hinders their growth. It is a perennial with a very extensive creeping root which penetrates far into the soil, and any piece of the root possessing one or more buds is capable of starting new plants; hence it is necessary to clean implements very thoroughly after they have been used in a field containing this weed. The stems are branched and either trail along the ground or climb by twisting around some other plant. The leaves are rather small, with 2-4 lobes at the base, giving them an arrow-head shape. The flowers are white or rose-colored and 1 inch across. The seeds, three in number, are large, black, and angular, and are held in a spherical capsule (Fig 20). An average plant produces about 160 seeds.

Time of flowering, June-September. Often no seed is produced.

Time of seeding, August-October. Dispersal—Chiefly by means of its creeping roots; sometimes also by impurity in seed grain.

Eradication. This is a very difficult weed to eradicate, and careful cultivation only increases the trouble by carrying the roots from place to place. Salting is recommended by some practical farmers who have succeeded in eradicating this very troublesome pest; but we cannot speak from experience as to the value of this method of treatment.

The weed may be kept in check by the frequent introduction of well-cared-for hoed crops into the rotation, and the shorter the rotation the better. The later sown hoed crops, especially rape, are more effective than those sown earlier in the season. Before the hoed crop is sown, the weed may be kept in check by going frequently over the field with a broad-share cultivator, so as to cut all the plants an inch or two below the surface without bringing up any of the creeping rootstocks. About the 1st July the land may be sown with rape in drills, say 26 inches apart, and during the early growth of the crop the weeds may be kept in check by means of the horse-hoe, with more or less hand-hoeing. If the land has been well manured or is naturally rich in vegetable matter, the rape will make a rank growth and smother some of the weeds. The rape may be pastured in the fall, and in extreme cases may be followed by another hoed crop, such as corn. If the corn is well cultivated and hoed, most, perhaps all, of the plants will be destroyed.

In some cases it may be advisable to summer-fallow, and in such cases it is best not to plow more than is absolutely necessary, but to depend mainly on the broad-share cultivator. Buckwheat sown on summer-fallow and plowed under when coming into blossom, followed by surface cultivation with broad-share cultivator, will assist very much in killing the weed. If necessary, the summer-fallow may be followed by a hoed crop.

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FIG. 20.
BINDWEED.
(*Convolvulus arvensis*.)

FIG. 21.

DODDER, CLOVER DODDER, DEVIL'S GUT, OR STRANGLE WEED.

Cuscuta epithymum (Murr).

Judging from the number of enquiries made about Dodder, we find that it is spreading rapidly in the Province of Ontario.

The seed takes root in the soil and puts forth a shoot which winds around some living plant. Having a good start, the shoot disconnects itself from the earth and derives its nourishment from the juices of the plant to which it clings. Drummond says:—"There are certain plants, the Dodder for instance—which begin life with the best intentions, strike true roots into the soil, and really appear as if they meant to be independent for life. But after supporting themselves for a brief period, they form curious sucking discs into the stem (Fig. 21 [3]) and branches of adjacent plants, and, after a little experimenting, finally cease to do anything for their own support, thenceforth drawing all their supplies ready made from the sap of their host. In this parasitic state the Dodder has no need for organs of nutrition of its own, and Nature therefore takes them away. Henceforth, to the botanist, it presents the degraded spectacle of a plant without a root, without a twig, without a leaf, and having a stem so useless as to be inadequate to bear its own weight."

The stems are very slender and red in color, curling around clover or grass, and completely choking it, as well as appropriating its juices. It puts forth dense clusters of small whitish flowers, which are succeeded by rounded pods full of seeds. The seeds are small, grey or yellowish brown, and round in shape. An average plant produces about 2,500 seeds. There are numerous species of dodder, parasitic on flax, onions, and a variety of other herbs and small shrubs.

Time of flowering, June-July.

Time of seeding, July-September.

Dispersal—Often as an impurity in clover and lucerne seed.

Eradication. Guard carefully against it in clover and other seeds. Cut before ripening, as near the ground as possible, collect, and burn, and modify the rotation so as to leave clover out for a time.

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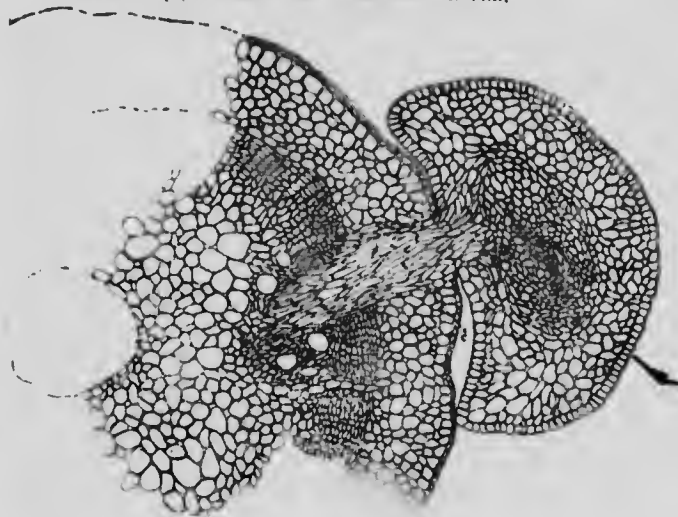
FIG. 21 [1]. DODDER ON GRASS AND CLOVER.



FIG. 21 [1].
DODDER SEED.
Natural size and
enlarged five
times.



FIG. 21 [6]. DODDER,
showing the seeds in situ



(a) Cross-section
(b) Cross-section
(c) Sucker



FIG. 21 [2]. DODDER
growing on stem of clover.
(After Körner.)

FIG. 22.

HOUND'S TONGUE, DOG BUR, OR BURS.

Cynoglossum officinale (L).

A biennial weed, with erect hairy stem, of rank growth, and much branched, one to three feet high. The lower leaves have petioles; the upper ones clasp the stem. They are 6-12 inches long and covered with downy hair, and have a disagreeable odour resembling that of mice. The flowers are small and lurid purple-red in color. The fruit consists of a broad, rounded bur, $\frac{1}{4}$ inch long, with one flat side and covered with short spines which enable it to adhere to clothing or to animals (Fig. 22). An average plant produces about 600 seeds.

Time of flowering, June-August.

Time of seeding, July-September.

Dispersal—Chiefly by animals carrying the burs.

Eradication. Spud or cut deep in fall and early spring; the former to destroy the plant in its first year, and the latter to complete the destruction by removing those that escape the first cutting.

Pigeon Weed, Wheat Thief, Red Root, or Corn Gromwell (*Lithospermum arvense*, L). A winter annual naturalized from Europe, with reddish roots. It is usually branched, and grows to a height of 12 inches. The leaves are sessile, narrow, and harsh to feel. The flowers are small and white; at maturity, four small smooth seeds are produced, which have considerable vitality.

Time of flowering from April to July.

Time of seeding from June to August.

Dispersal—Mainly through seed grain, such as wheat, rye, timothy, and alsike clover,—often spread by birds, and distributed in the manure.

Eradication. Drop fall wheat from the rotation. Cultivate lightly after harvest and cause the seeds to germinate. When three or four inches high, harrow or plow them under. If this treatment is repeated each fall, wheat can again be grown.



FIG. 22.
HOUND'S TONGUE.
(*Cynoglossum officinale*.)

FIG. 23.

BLUE WEED, VIPER'S BUGLOSS, BLUE THISTLE, OR BLUE DEVIL.

Echium vulgare (L).

A biennial weed naturalized from Europe, with deep tap root, which penetrates to a great depth. During the first year, the portion above ground is a rosette of leaves; and from the centre of this, next season, bristly, hairy, and erect stems arise one to two and a half feet high. The leaves are oblong, two to six inches in length, with both upper and lower surface hairy. The flowers are numerous, arranged in a rich spire, and are azure blue in color. The seeds are hard and brown in color, with a broad base and angular body 1-8 in. long (Fig. 23). An average plant produces 3,500 seeds. The seeds are probably dispersed in winter by the wind, as they remain for a long time on the plant.

Its names, both Latin and English, are significant of the notion that it was an effectual remedy against the bite of a viper.

The weed prefers gravelly and lime soils.

Time of flowering, July-October.

Time of seeding, August-October.

Dispersal—By seeds, especially in winter, when they are blown over the snow.

Eradication. This weed gives very little trouble in arable land, if the cultivation is at all thorough. In fence corners, on roadsides, and in waste places, cutting below the crown with a spud, is practically the only effective method of destroying the weed. Sometimes, however, this is impracticable, because of the number; and in such cases, some special treatment, similar to that recommended for the Dock (Fig. 5) may be resorted to.

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FIG. 23.
BLUE WEED.
(*Echium Vulgare.*)
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FIG. 24.

MULLEIN, OR VELVET DOCK.

Verbascum thapsus (L.).

The mullein is a weed introduced from Europe,—very common in waste places, roadsides, and gravelly or sandy pastures. It is a biennial with large, long roots, from which spring a tall and unusually unbranched stem, 2 to 6 feet high. Both stem and leaves are densely woolly all over with branched hairs. The leaves are whitish, thick, and velvety to the touch. The flowers are yellow and arranged on densely crowded elongated spikes. The capsule containing the seeds is about 3-8 in. long and the seeds are small, about 1-20 in. long, six-sided, with irregular ridges running lengthwise between the sides. The color of the seeds is dark brown. An average plant produces 6,000 seeds.

Time of flowering, July-September.

Time of seeding, August-November.

Dispersal—As an impurity in clover and grass seed.

Eradication. Spud or cut below the crown; or dig up the roots when young; or break up the side and grow hoed hops. It easily succumbs to cultivation.

The Moth Mullein (*Verbascum blattaria*), is a worse weed than the common mullein, as it infests meadows and bears far more seed. The seed is often found as an impurity in clover and timothy. The plant itself is smooth and slender, from 2-6 feet high, with dentate leaves. The flower is yellow, with brown marks on the back of the petals; and the stamens have violet filaments. The seed is brown, very small, and six-sided. Treat it the same as common mullein.

In Fig. 24 are shown the seeds of the mulleins—the upper seed is the common mullein, the lower is the moth mullein.

Toad Flax, or Butter and Eggs (*Linaria vulgaris*, L.). This is a perennial which has escaped from cultivation as an ornamental, and has become a decided pest. It grows in tufts, and has bright, yellow, spurred flowers. It flowers from July to October, and seeds from August to November. It propagates itself by root-stocks, and by seeds in grass seed. It is found chiefly in meadows and roadsides.

Treatment. Continuous cultivation will subdue it, but care must be taken not to spread the root-stocks. Coal-oil, salt, etc., are effective after hoeing.

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FIG. 24.
MULLEIN.
(*Verbascum Thapsus*.)

FIG. 25.

PLANTAIN, BLACK PLANTAIN, RIB-GRASS, OR RIB-WORT.

Plantago lanceolata (L).

This plant was once very generally believed to be a favorite food of cattle, yet the opinion of most agriculturists is against it. It is considered a bad weed, especially when it appears in lawns. Numerous inquirers ask what it is, and how to get rid of it. It is a perennial or biennial, with a short thick root-stock, of erect growth, or more generally, lying on the ground as a rosette of leaves. At the base of the leaves there are tufts of brown hair: and the leaves themselves are long, narrow and tapering, with prominent veins, or ribs running lengthwise; hence some of the popular names. The flower-stock is slender and channelled, is without leaves and terminates in a dense spike. The stamens project from the inconspicuous flowers, giving a whitish appearance to the whole head. The seeds are enclosed in small pods, each containing two seeds. The seeds are about 1-12 of an inch long, brown and shiny, with a groove on one side, in the centre of which there is a black spot. The opposite side is rounded, as are also the ends (Fig. 25a). An average plant produces 1,200 seeds.

Time of flowering, June-September.

Time of seeding, July-September.

Closely allied to this plant is the Broad Leafed Plantain (*Plantago major*), which has broad oval leaves and very long tapering spikes.

The seeds of both of these weeds are very common in clover and grass seed; and persons buying these seeds or lawn mixtures, should examine closely and guard carefully against plantain seed.

Eradication. If the plants are not numerous, cut below the crown with a spud. If they are, use treatment outlined for Mustard (Fig. 15).

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FIG. 25.
PLANTAIN.
(*Plantago lanceolata*.)

FIG. 26.

RAGWEED, HOGWEED, BITTERWEED, OR ROMAN WORMWEED.

Ambrosia artemisiæfolia (L).

Ragweed is an annual. The stem is much branched and slightly hairy, from 1 to 3 feet high. The leaves are very finely divided, the lower surface being of a lighter color than the upper. The flower heads are very numerous, from 1 to 6 inches long, green, and inconspicuous. The flowers are yellow, 1-6 inch across, infertile in the terminal spikes and fertile only at the base of the spikes. The seed is dark brown, with a sharp tip, around which are arranged 4 to 6 spines, 3-16 inches long. They have great vitality and remain in the soil a long time without injury. An average plant produces about 5,000 seeds. The seed has a bad taste and gives a peculiar odor to the milk of cows which eat it.

Time of flowering, July-September.

Time of seeding, August-November.

Dispersal—As an impurity in seed grain; and by wind and water, being borne long distances by freshets.

Eradication. For the eradication of this weed, special attention must be given to the fall cultivation of the soil, to prevent seeds from ripening. Gang-plow or cultivate, and harrow stubble ground immediately after harvest, and repeat cultivation at intervals until late in the fall; then plow or rib up, and follow with a hoed crop. Care should be taken with the hoed crops that no specimens of Ragweed go to seed. When in grass, go over with a mower in September or October, if any plants are likely to mature seed. Do not sow late maturing crops. Ragweed when eaten by cows causes bitterness in milk.

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FIG. 26.
RAG WEED.
(*Ambrosia artemisiifolia*.)

FIG. 27.

YELLOW DAISY, CONE-FLOWER, BLACK-EYED SUSAN, OR NIGGERHEAD

Rudbeckia hirta (L).

A biennial and sometimes annual weed found in pastures and meadows. It grows about 1 to 3 feet high. The stems are sparingly branched and very bristly. The leaves are thick, hairy, oblong and tapering towards the point. The flower is about 1 in. across, with orange yellow rays or petals (10 to 20 in number) and dark purple brown discs almost spherical or cone-shaped. The seeds are dark brown, almost black, flattened, angled, and about 1-8 in. long, with no pappus, or tuft of hair (Fig. 27). An average plant produces about 2,000 seeds.

Time of flowering, June-August.

Time of seeding, July-September.

Dispersal—As an impurity in seed grain.

Eradication. It can generally be killed by mowing, but it is sometimes necessary to break up meadow or pasture land, as suggested in note to Mr. Rennie's method of cleaning land (see page 7), and follow with a hoed crop. If this is well cared for, it will destroy all Cone-flowers.

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FIG. 27.
CONE FLOWER.
(*Rudbeckia hirta*.)

FIG. 28.

OXEYE DAISY, WHITE DAISY, WHITE WEED, OR POVERTY WEED.

Chrysanthemum leucanthemum (L).

The Oxeye Daisy is a weed naturalized from Europe, and is very closely related to the *Chrysanthemum* or national flower of Japan.

It is a perennial with short, thick root-stocks, possessed of much vitality. Very many stems spring from one root. It grows from 6 inches to 3 feet high. The leaves slightly clasp the stem, the lower ones, narrow, long, and toothed along the edges, the upper ones, small and without teeth. They are slightly aromatic, more perceptibly so if bruised. The flowers are 1 to 2 inches broad, on long stalks, with from 20 to 30 white rays and bright yellow disc. The seed is about 1-12 in. long and angled, with alternate white and black longitudinal ribs. It has a short point but no pappus (Fig. 28). An average plant produces 7,500 seeds.

Time of flowering, June-August.

Time of seeding, June-September.

Dispersal—Chiefly in grass seeds and by birds.

Eradication. The Daisy is most troublesome in pastures, and can be got rid of only by breaking up the sod. It can be eradicated by the method outlined for Canada Thistle (Fig. 30); or by seeding down to clover and plow up after one crop has been cut and taken off. The clover should always be cut before the Oxeye Daisy has had a chance to mature seed.



FIG. 28.
OXEYE DAISY.
(*Chrysanthemum leucanthemum*.)

FIG. 29.

BURDOCK, GREAT BUR, CLOT-BUR, OR BEGGAR'S BUTTON.

Arctium lappa (L).

A biennial weed with tremendous roots, probably the largest of all weed roots. This root is uniform in size for a foot below the surface; further down it is much branched and has a great hold on the ground. The stem is much branched (from 4 to 9 feet high) and rough, with broad rounded leaves, the lower surface of a lighter green than the upper. The flower heads occur in clusters and are purple in color. The flower receptacle, or involucre, as it is called, is composed of hooked spines, which are very adhesive and do much injury to the wool of sheep. The seeds are brown, 3-8 in. long and spotted with darker brown (Fig. 29).

Time of flowering, July-September.

Time of seeding, August-October.

Dispersal—Chiefly by animals carrying the seed from place to place.

The plant when burned yields a good quality of alkaline ash, equal to the best potash; and a decoction from the roots is said to be equal to the juice of Sarsaparilla as a blood purifier, etc.

Eradication. Cut below the crown with a spud and burn the tops.

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FIG. 29.
BURDOCK.
(*Arctium lappa*.)

FIG. 30.

CANADA THISTLE, OR CREEPING THISTLE.

Carduus arvensis (L. & ROBS).

This weed was originally introduced from Europe, and hence is correctly named Canada Thistle. It is a hardy perennial, with numerous underground stems which bear a large number of shoots. (See Fig. 29 illustrating two of these shoots.) It grows to a height of 1 to 3 feet. The leaves are narrow and long, deeply indented into very prickly, lobed segments. The leaf has a crimped appearance, and at the base slightly clasps the stem. The under surface of the leaf is woolly, the upper surface less so. It produces numerous heads containing flowers, which are $\frac{1}{2}$ to $\frac{3}{4}$ inches across and of a lilac-purple color. The flower is smaller than that of other thistles. The seed is grey, oblong, and about 1-8 inch long, with slight longitudinal markings. Attached to the top is a conspicuous tuft of long hairs (the pappus) (Fig. 30). The seed is carried long distances by the wind. An average plant produces 3,500 seeds.

Time of flowering, June-August.

Time of seeding, July-September. Many plants produce no seed.

Dispersal—Chiefly by the wind.

Great care should be taken to prevent Canada Thistle from seeding.

Eradication. The Canada Thistle can be eradicated in several ways if thorough work is done at the right time :

1st. By careful and persistent spudding, done in such a way as to prevent the plant from developing top above the ground.

2nd. By early after-harvest cultivation of stubble ground.

3rd. By the frequent introduction of hoed crops into the rotation.

4th. By the seeding much with clover, taking one or two crops of hay, plowing the clover sod shallow early after harvest, and cultivating frequently throughout the fall.

5th. By summer-fallowing.

Assuming that all land should be plowed in the fall, we may outline briefly one or two methods of destroying thistles :

(1) *In stubble ground for spring crop.* Gang-plow shallow and harrow early after harvest (immediately after the crop is off); and as soon as seeds have had time to sprout or thistles begin to appear, cultivate thoroughly with a broad-share cultivator, the points or shares overlapping far enough to cut all plants; and harrow again, to pull up and expose the plants that have been cut. Repeat the cultivation at intervals throughout the fall, and plow in the usual way, or, if possible, rib up with a double mould-board plow just before the frost. This systematic cultivation from harvest till winter, will check thistles and other weeds very much, and when followed by a hoed crop (mangels, corn, turnips, carrots, beans or rape), properly cultivated, it will not only clean the land, but put it into good shape for a crop of grain (oats, barley, etc.), the next spring which crop should be seeded with red clover.

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FIG. 30.
CANADA THISTLE.
(*Carduus arvensis*.)

(2) *In sod (meadow or pasture) for spring crop.* After one or two but not more than two, crops of hay or pasture, plow shallow (not more than four inches) early after harvest, say the 1st to the 15th of August, and harrow at once. Let it stand a couple of weeks, and then cultivate the same way it was plowed, two or three inches deep, with a spring-tooth cultivator. After a while cross-cultivate a little deeper. If possible cultivate a third, or even a fourth time, going a little deeper each time. Then, if you can manage to do so, rib it up with a double mould-board plow the last thing in the fall. This will make a good foundation for any crop the following spring—grain, roots, corn or rape—and if the position in hoed crop is thoroughly cultivated with horse and hand hoe very few, if any, thistles will be left. The portion intended for rape must be kept clean by surface cultivation till the time for putting in the crop, say the last half of June or the 1st of July, after which it should be treated like other hoed crops.

Some recommend a crop of fall rye on land which is intended for rape the following summer, but the rye takes so much moisture from the soil in the spring that the rape after it is apt to be a poor crop, unless in favorable seasons.

If summer-fallowing is resorted to, it will be well not to plow any more than is necessary, but to rely on surface cultivation with the broad-share cultivator and the harrow, done in such a way as to cut the plants two or three inches below the surface, without bringing up any of the numerous rootstocks which run along a little lower down. It will also be well to keep the fallow covered part of the summer by growing some kind of green crop, say a crop of buckwheat, sowed rather thick and plowed under when coming into bloom. This will help to prevent the loss of nitrates which bare land suffers from washing, and will improve the soil by increasing the supply of vegetable matter in it.

When necessary at any stage in the above method of cultivating either stubble-ground or sod, say for mangels, use a grubber or subsoil plow to stir the soil to a greater depth than is reached by the surface cultivation.

FIG. 31.

CHICORY, OR WILD SUCCORY.

Cichorium Intybus (L).

A perennial weed introduced from Europe, with long, deep tap-root which, when dried and ground up, is used in adulterating coffee and as a substitute for it. The stems are almost leafless, from 1 to 3 feet high, much branched, slightly hairy and whitish in color. The leaves, spread out on the ground, are long, with irregular edges. The flower heads are numerous, occurring in clusters, without flower stalks, on the naked branches. The flowers are about $1\frac{1}{2}$ inches across, bright blue in color, and are usually closed by noon. The seed is about 1-8 in. long, tapering

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FIG. 31.
CHICORY.
(*Chicorium intybus*.)

to a blunt point, the opposite end having a fringe of minute hairs around the crown. The body of the seed is corrugated. An average plant produces about 3,000 seeds.

Time of flowering, July-October.

Time of seeding, August-October.

Dispersal—Frequently as an impurity in clover and grass seed.

Eradication. The method outlined for Canada Thistle may be followed in eradicating this weed, but the plow may have to be used more frequently than is advisable in combatting thistles.

FIG. 32.

WILD LETTUCE, SOUTHERN THISTLE, OR TRUMPET-MILKWEED.
(Erroneously called Prickly Lettuce.)

Lactuca Canadensis (L).

An annual or biennial plant with a leafy stem, which may attain a height of seven feet. The leaves are deeply lobed, terminating in an acute point, and have stalks or petioles, the lower ones being smaller than those near the top of the stem. The stem branches at its summit into a compound flower-cluster. The flowers are small, yellow in color, and open only a few at a time. The seed is dark brown in color, flat and oval, with longitudinal ribs and a threadlike beak at the apex, and possesses a small white tuft of hair (Fig. 32).

Time of flowering, June-October.

Time of seeding, July-October.

Dispersal—Chiefly by the wind.

Eradication. Where there is not much of it, pull and burn before ripening. Where this cannot be done, use the same method as for Mustard (Fig. 15).

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FIG. 32.
WILD LETTUCE.
(*Lactuca Canadensis*.)

FIG. 33.

PRICKLY LETTUCE.

Lactuca Scariola, (L).

Prickly Lettuce is a native of the old world, and has invaded this Province both from New York and Michigan. It is a winter annual; it springs from seeds in the fall, and survives the winter. The plant grows to a height of $3\frac{1}{2}$ feet; the stem is leafy and usually smooth; the leaves are oblong, and slightly pointed, often clasping at the base; the under surface of the midrib of the leaf is spiny: Heads are numerous and yellow.

Time of flowering, July-September.

Time of seeding, August-October.

Dispersal—By means of its seeds, which are provided with a pappus or tuft. An ordinary plant may produce 8,000 seeds.

Eradication. The best methods of destroying the weeds are: 1. To mow repeatedly as it comes into bloom, or earlier; 2. To cultivate thoroughly with a hoed crop. By this method the weeds in the soil will be induced to germinate. They should not be covered deeply in plowing. Mature plants should be cut down and burned lest the seeds be blown about and scattered by the wind.

Farmers should be careful to buy only clean clover, millet and grass seeds, and the weed inspector should insist on the fulfilment of the law, and have all fence-corners, roadsides, and waste lands cleared of the pest.

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FIG. 33.
PRICKLY LETTUCE.
(*Lactuca scariola*.)

FIG. 34.

ORANGE HAWK WEED, DEVIL'S PAINT BRUSH.

Hieracium aurantiacum (L).

A plant introduced from Europe, and a pernicious pest in pastures, meadows and roadsides in the eastern portion of the Province. The heads are bright red orange in color, and are clustered. The stems grow to a height of 12 inches. The leaves are oval, downy, and greyish-green in color. The seeds are provided with tufts of down, whereby they are scattered by the wind.

Time of flowering, June to August.

Time of seeding, June to September.

Dispersal—This plant is propagated by roots, runners, and tufted seeds; also by seeds purchased in clover seed.

Eradication. Salt at the rate of $1\frac{1}{2}$ tons per acre will kill this weed in pastures.

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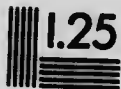


FIG. 34.
ORANGE HAWK WEED.
(*Hieracium aurantiacum*, L.)



MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



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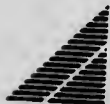


FIG. 35.

ANNUAL SOW THISTLE, COMMON SOW THISTLE, OR MILK THISTLE.

Sonchus oleraceus (L).

An annual weed introduced from Europe. It grows 2-3 feet high, has fibrous roots and leafy stem, and is not quite so large or coarse as the Perennial Sow Thistle. The leaves are much lobed, and have short soft spines. Each head is many-flowered; but the flowers are small, about $1\frac{1}{2}$ in. across, and of a pale yellow color. The seeds are broadly oval, dull or roughened, and about 1-8 in. long, with 5 longitudinal ridges, finely wrinkled crosswise, and attached to the top is a large tuft of fine hairs united at the base.

Time of flowering, June-August.

Time of seeding, July-August.

Dispersal—Chiefly by the wind.

Eradication. Cultivate stubble-ground and sod early after harvest and throughout the fall as for Canada Thistle (See Fig. 30). Follow with a hoed crop, preferably corn or roots, and cultivate thoroughly throughout the growing season. Use the cultivator, instead of the plow, after roots or corn; sow a crop of grain and seed with clover; if practicable, pull the weeds by hand out of the grain crop; take one or two crops of hay or pasture, and again break up the sod, plowing, harrowing and cultivating as for Thistle (Fig. 30).

Spiny Sow Thistle (*Sonchus asper*) usually grows with the Common Sow Thistle. Its leaves are more entire, more spiny, more waxy, and a darker green on the upper side with a rounded, clasping base. Its seeds are thin, smooth, and light brown, with three veins on either side.

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FIG. 35.
ANNUAL SOW THISTLE.
(*Sonchus oleraceus*.)

FIG. 36.

PERENNIAL SOW THISTLE, FIELD SOW THISTLE, OR CORN SOW THISTLE

Sonchus arvensis (L.)

A perennial weed, 1 to 3 feet high, with large and vigorous roots and stocks, full of milky white juice. The stems are rough, and the growth of the lower part of the plant is rank. The leaves are deeply cut and furnished with small spines, and at their base clasp the stem. The flowers are bright yellow, of fair size, $1\frac{1}{2}$ in. across, and quite similar to those of the Dandelion. They close up in strong sunlight. The calyx, or flower cup, is green and covered with yellowish bristles. The seed is brown in color and about 1-8 in. long, with both longitudinal and transverse markings (See Fig. 33, p. 19). To the top, a tuft of silken hair is attached (Fig. 36). An average plant produces about 2,000 seeds.

Time of flowering, June-August.

Time of seeding, June-August.

Dispersal—By running root-stocks, and the scattering of seeds by the wind.

The Sow Thistle draws much water from the soil and is a heavy soil feeder. It is less troublesome on stiff clays than elsewhere.

Eradication. The method used for the eradication of the Canada Thistle is recommended for this weed. Its roots spread more rapidly and bud more frequently than the Canada Thistle, however, and it threatens to become one of the worst weeds in the Province. The cool, wet season of 1905 gave it an advantage that made it the most-talked-of weed of the year. Every farmer should realize the importance of completely eradicating the first patch of it he discovers on his farm. Collect the slender creeping roots with a garden rake, and stack or burn them.

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FIG. 36.
PERENNIAL SOW THISTLE.
(*Sonchus arvensis*.)

FIG. 37.

CANADA FLEABANE, HORSE WEED, OR BUTTER WEED.

Erigeron Canadensis (L).

A tall hairy plant, very common in meadows. It is a winter annual. The stem is much branched, hairy, and may vary from 3 inches to 10 feet in height. The leaves are downy, from 1 to 4 inches long. The flower heads are numerous, about $\frac{1}{4}$ in. broad, with white flower rays. The seeds are small, light in color, and 1-16 in. long, with a pappus of short tufted hairs. An average plant produces 120,000 seeds (Kerner).

Time of flowering, June-September.

Time of seeding, June-September.

Dispersal—Chiefly by the wind.

Eradication. Having a small root, this weed can be easily pulled up. Hence, where there is not very much of it, hand-pulling is a satisfactory means of eradication. As a rule, the weed is troublesome only in meadows, and the frequent breaking up of meadow land tends to keep it under control.

Daisy Fleabane has larger and fewer flowers, $\frac{1}{2}$ inch across. It is common in meadows and along roadsides from May to November.

Wild Tares, or Perennial Vetch, (*Vicia cracca* L.) This is a perennial plant, with a deep system of root-stocks. It is often reported as being difficult of eradication. The flowers are blue, and there are 10 to 15 pairs of leaflets to each compound leaf. This plant appears to persist most tenaciously in damp soil. The same cultivation which is used in controlling the Canada and Perennial Sow Thistles will subdue the Perennial Vetch.

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FIG. 37.
FLEABANE.
(*Erigeron Canadensis.*)

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