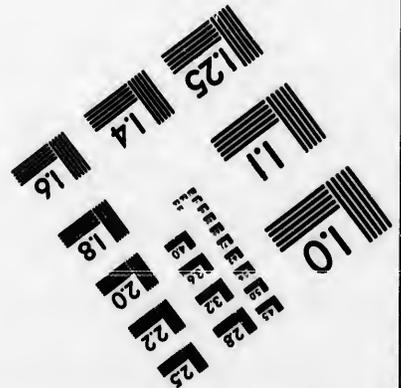
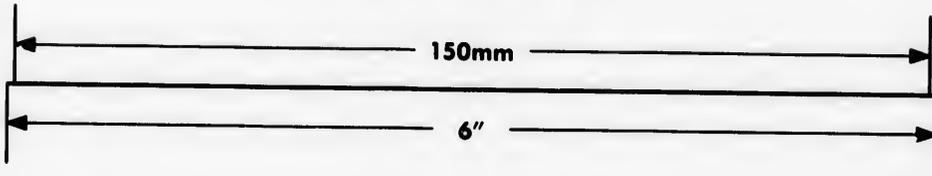
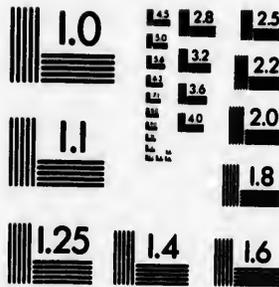
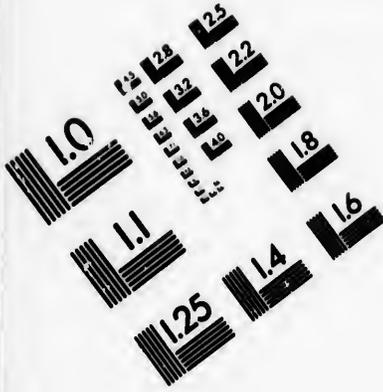


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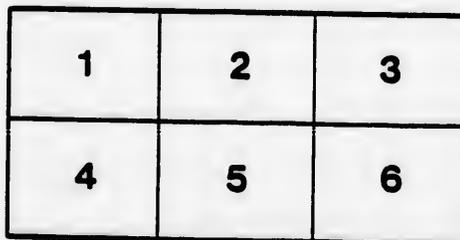
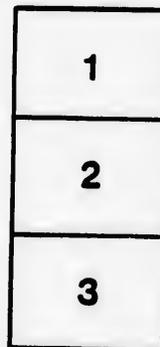
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SELE

1897

WITH THE COMPLIMENTS OF
DR. JAMES FLETCHER

Revised

EVIDENCE OF DR. JAMES FLETCHER

ENTOMOLOGIST AND BOTANIST, DOMINION EXPERIMENTAL FARMS

BEFORE THE

SELECT STANDING COMMITTEE OF THE HOUSE OF COMMONS

ON

AGRICULTURE AND COLONIZATION

Session of 1897

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COMMITTEE ROOM 46,
HOUSE OF COMMONS, Friday, 23rd May, 1897.

The Select Standing Committee on Agriculture and Colonization met this day at 10.45 a.m., Mr. Bain, Chairman, presiding.

Mr. JAMES FLETCHER, Entomologist and Botanist, to the Dominion Experimental Farms, was called and addressed the Committee as follows:—

MR. CHAIRMAN AND GENTLEMEN,—I am sure you will thank the Chairman for asking Mr. McKay to address the Committee to-day because he has given such an interesting account of his work in the North-west, and has shown particularly what is of great importance, the advantage of summer-fallowing to conserve the moisture of the soil, a matter of the utmost importance in the west.

By Mr. Wilson:

Q. Does the same thing apply to Ontario?

A. Yes, but not to the same extent because there is a greater rainfall in Ontario.

By Mr. Sempie:

Q. It is the practice in some parts of Ontario, to kill off the weeds?

A. Yes. It is a very efficacious means of eradicating weeds, but the most important thing in the west, and what makes it essentially necessary there, is, that this operation holds the moisture in the land. The whole theory of cultivation of crops is to keep the moisture in by stirring up a thin layer on the surface of the soil so that it may dry up and, being of a different texture to the soil below it, check evaporation.

VALUABLE FODDER GRASSES.

Awnless Brome Grass—Origin of, in Canada.—I wish to draw the attention of the Committee to two samples of grass of which I have brought fresh specimens. We have been experimenting for about nine years with Brome grass. I might mention that it was our own Canadian farms which introduced this valuable grass into American agriculture. Several samples were imported from Russia at the beginning of the Experimental Farm work. Since then it has been distributed in small packages all over the country, wherever we thought it would be useful. It is to-day the best grass of all that we have imported and has given good results wherever it has been tried. The quality as ascertained by chemical analysis is certainly good. It has the advantage of giving a large crop where very few other varieties will grow. It is extremely early and continues growing late into the fall. More than that, it is not only suited to low-lying lands, but has given excellent results in the high dry lands of the North-west and British Columbia. Mr. Cornwall, of Ashcroft, which is in one of the dry sections of British Columbia, writes to me in a letter received only yesterday, and tells me that he has cultivated it there, and that it is doing particularly well. Down the Okanagan valley, which is another dry section, this grass is also being grown. A small packet containing a few ounces of the seed was sent to Messrs. Rose Brothers, of Kelowna, and when I visited them it was a conspicuous object on their farm, and was doing better than any other grass grown there. Similar reports on its qualities come in constantly from all over Canada. One of the chief characteristics of this grass, and one which makes it valuable in the North-west, is its root growth. Mr. McKay did not lay as much stress on this point, perhaps, as he intended, because when speaking of it he was drawn off by a question. The Brome grass makes a sod which will prevent the soil from blowing.

In Manitoba Timothy is now grown to a large extent in some sections, and by forming a sod much improves the condition of the soil and prevents blowing, which gives it a special value. Brome grass has this quality and to a larger degree. It has, too, another characteristic I should like to mention, indeed, it has so many good qualities that one is apt to think we may be exaggerating when describing them. This characteristic is that, unlike Timothy and nearly all other grasses, there is little decrease in the value of the hay for feed even when it is left standing until the seed is ripe. This is owing to a peculiar habit of growth by which after the flowering stem has been produced, several other supplementary barren shoots which do not flower spring up from the root. These shoots are very leafy and add much to the value of the hay. Mr. Shutt, our chemist, has found that the hay from which the ripe seed has been threshed, is almost of the same value as that cut at the proper time just after flowering, and the grower has besides a large supply of valuable seed for which he can always get a ready sale. The hay is of fairly good quality and smells sweet like English hay. Mr. McKay speaks of from one and a half to two and a half tons as an average crop. Here, we have had at the rate of four and a half tons of hay. I have a letter from Mr. Wm. Hull, who has an irrigated farm near Calgary, in which he tells me that he cut 900 tons off 200 acres, from which he would have got nothing without irrigation.

Mr. MCGREGOR.—With the native grasses one ton of hay is good growing.
 Mr. FLETCHER.—Yes, but that is without irrigation.

By Mr. McMillan :

Q. Have you reference to a small plot ?

A. One-twentieth of an acre.

Mr. McMILLAN.—As farmers we would rather see an acre.

Mr. FLETCHER.—Ye, we have that this year.

By Mr. Douglas :

Q. Has any experiment been made with this grass on alkaline land ?

A. Not on land classed as alkaline, but at the same time it has been grown on lands containing a great deal of alkali, and has given good returns. Mr. McKay is now testing it on "alkaline" spots at Indian Head.

Mr. DOUGLAS.—That is an important point, because so much land is now going to waste, and it would be important if a success was made in this respect.

Mr. MCKAY.—We have some alkali on a very low part of the farm and it is growing there as well, if not better, than on other parts. I believe it is a great success on alkaline land.

Mr. FLETCHER.—With regard to the hay, it is particularly sweet and palatable. Any one going into Mr. McKay's barn notices the sweet smell like English hay and moreover the cattle are very fond of it. It holds its leaf which gives it a peculiar value. Most grasses after they flower deteriorate rapidly, but as soon as this is in flower it begins to increase in value from the numbers of supplementary shoots which are produced, so that when it is threshed for seed you have a valuable fodder in the straw.

By Mr. Rogers :

Q. When and how should it be sown ?

A. In the west, it requires to be sown alone, because the young plants dry out in August when sown with a mother crop.

By Mr. McMillan :

Q. As it grows from the bottom, would it not be too troublesome ?

A. It may probably be some trouble to get rid of it again, from the running root-stocks; but if you examine the root I have here, you will see that it is near the surface, and for the same reason it, like couch grass or "Quack," can be taken out of the land by shallow ploughing.

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VALUABLE FODDER GRASSES, AND WEEDS.

Mr. McMILLAN.—Quack takes a great deal of labour to take out; we have tried it all ways.

Mr. TALBOT.—We can only do it by summer-fallowing.

Mr. FLETCHER.—Well, you can get at it a great deal better by shallow ploughing than by ploughing deep.

Northern Blue Joint.—*Origin*.—And now, Mr. Chairman, before the meeting closes, I have one more sample I wish to show, as I have a fresh plant here which will be faded by next meeting. On the grass plots at the experimental farm we have growing about 300 different grasses every year. This (showing sample) is one of the native grasses called Northern Blue Joint. I collected the seed originally on the North Shore of Lake Superior. It is a close relative of the ordinary Blue Joint which grows in this part of the country, but has a decided difference of habit, inasmuch as it is very much more leafy. It will grow on wet land and also on rather drier land under proper methods. This is a grass which it would pay seedsmen to sell and farmers to grow. These two grasses, the Brome grass and the Northern Blue Joint are the grasses that catch the eye of every one who visits the experimental farm at this time of the year. They are very early, being, as you see, considerably over 2 feet high, and give excellent hay. They are leafy from the bottom up to the very top, have a large quantity of leaves and are good in quality.

By Mr. Semple :

Q. That is certainly an excellent growth for the 28th of May ?

A. Yes, it is a very good growth, and particularly this season.

By Mr. Rogers :

Q. Does it become sodded ?

A. Yes it forms a thick mat by the second year. This is the fifth year for the plot from which this was taken, and that is too long to leave any land in grass to give the best results.

By Mr. McGregor :

Q. How is it as a feeding grass ?

A. It is a very good one, indeed, both for meadow and pasture. The value of Brome grass also is very great as a pasture grass after having been used for 2 or 3 years as meadow.

By Mr. Cargill :

Q. In order to get a crop of that for hay for the first season you would prepare your land and sow it alone ?

A. All grasses do better, I think, when sown alone, but you have the trouble of keeping down the weeds, and it is necessary to mow the weeds to give the grass a chance. All grasses would do better if they were sown alone, but it does not with us, here, pay quite as well. If you sow some grain with the grass you can cut that at the same time as you would the weeds; but you must sow a very small quantity of grain,—one bushel or even less, of barley, rye or wheat.

By Mr. Martin :

Q. Did you ever try Brome grass on low ground ?

A. Yes, it has been tried on low ground. It cannot stand as much water as the Blue Joint grass, but it will stand more than Timothy under irrigation, but, of course, any of these grasses can be drowned out. There is one thing that we must not lose sight of in speaking of irrigation at Calgary and other places in the West near the Rocky Mountains, which is, that the water of the Bow River is very near to the freezing point all through the summer, so that the grass cannot stand as much water there as in other districts.

By Mr. McMillan :

Q. Would it not be better where it is cut, to leave it for a good covering of the soil in the field? Would you have anything off it next year?

A. It is a very hardy grass. I think it is hardier than most grasses we have tried, and is killed out less, so that it would not require that protection.

By Mr. Calvert :

Q. Does it mature about the same time as Timothy?

A. Yes, about the same time, but can be left a little later without so much loss.

By Mr. Rogers :

Q. We have heard about all the good qualities; are there any bad qualities?

A. Really, I do not know of any or I should have mentioned them, so as to give a little variation. For the West it is a most valuable introduction. It is not going to be quite so valuable in the East, where we use the whole of our farms for crop; but in the West it will be especially valuable. In the East, too, the running root-stocks will be considered troublesome by a certain class of farmers.

By Mr. Cargill :

Q. For Ontario, would you recommend it ahead of Timothy or Clover?

A. No, Clover and Timothy have a special value in Ontario. In addition to their intrinsic value, they have an artificial value, from the hay always having a good market. Wherever a man can get more money for Timothy and Clover than for anything else, by all means let him grow them.

By Mr. Rogers :

Q. It would not do to mix clover with Bromegrass, would it?

A. It grows too heavily, I think; but I have them growing mixed this year.

Mr. McMILLAN—Having visited the Indian Head Farm, and having gone over it with Mr. MacKay, it has given me very great pleasure to hear him to-day. I can assure all the gentlemen who have never been to Indian Head, if they go there, they will find the farm in capital condition. I was much pleased with everything I saw on the farm and everything in connection with it. There is no doubt but that Mr. MacKay is doing good work. I have also visited the farm at Agassiz. Both of these farms are doing excellent work for the farmers in those parts of the country.

Mr. MCGREGOR—I was at Moosejaw for several years, and they had the difficulty there, that Mr. MacKay has spoken of. It was so dry that the farmers could not get a crop and were moving away from the district. I had an interest in the Bell farm. We had difficulty in getting enough grain to gather a crop. I am pleased beyond measure to know that they have introduced this system of summer-fallowing, and that it has been attended with such satisfactory results. I have not the least doubt that this is going to be a great country. Qu'Appelle and Indian Head were troubled with the drought, but with the experience of ten years they have largely overcome the disadvantages. Summer-fallowing is largely overcoming the drought.

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COMMITTEE ROOM 46,
HOUSE OF COMMONS, TUESDAY, 8th June, 1897.

The Select Standing Committee on Agriculture and Colonization met this day at 10.45 a.m., Mr. Bain, Chairman, presiding.

By the CHAIRMAN, — I may say for the information of the committee before we proceed that it was deemed desirable to call this meeting for this morning instead of Wednesday. You are aware that the House proposes to adopt morning sittings, and that except by special permission, it is not allowed to us to meet during the sittings of the House. We have with us this morning, by re-call, Mr. James Fletcher, Entomologist and Botanist to the Dominion Experimental Farms, who will make a short statement to us of the range of his observations and duties during the past year.

Mr. FLETCHER, — Mr. Chairman and Gentlemen: The work in my department during the past year has been in connection with injurious insects, the eradication and control of weeds and the carrying on of some experiments upon which I have reported somewhat on several occasions in regard to native and imported grasses. I spoke at the last meeting when I had the honour of appearing before the committee, of the success which had attended the introduction of Brome grass into Canada and how the reports received nine years ago of the satisfactory nature of this grass had all been confirmed. As a matter of fact, I think it is not saying too much when it is stated that this grass has solved to a very large degree the question of providing fodder and hay in the North-west Territories and Manitoba, even in the arid districts. Its value in the eastern provinces will not be so great, because there is not the same need for a useful, succulent grass. In the east we have many grasses which will give us good returns if proper mixtures are made and they are treated properly and the meadows are not left too long in grass. But in the North-west and Manitoba the success of Brome grass has been a matter of very great importance. During last summer in Manitoba I saw many large fields of this grass; on one particular farm there were about fifty acres of it, which were producing a very heavy crop of hay, far heavier than any other crop that had been grown there. In the dry regions of British Columbia where it has been tried, and upon land with some alkali, it has shown itself to possess special value. It also succeeds well on low, rich lands where, of course, almost everything will grow, but the fact that it will succeed better than any native grass and better than any crops which have been sown there for fodder purposes, is additional proof of its importance. As long ago as nine years, Mr. Routledge wrote me from Virden, Man., that from his own experience of one year, if it continued to succeed as it did then, it would entirely settle the question of providing a large supply of succulent feed and hay when it was required. During the present year, our collection of grasses at the Experimental Farm has been very much reduced in number, on account of the severe winter that we have passed through. During the last winter we have lost more kinds of grass fodder plants and other plants than in any other winter that we have experienced. Plants which have been in the beds for eight or nine years were entirely killed. One plant known as Wagner's Wood Vetch that had stood for nine years, giving us good crops, was killed out, the roots being entirely destroyed for two feet down. Some other new plants were also unable to stand the winter, but they could not be compared with others already tested because these latter plants were likewise killed. The beds have been refilled, and now we have in them over 200 kinds of fodder plants either newly sown or newly planted or received from botanical gardens and from students in different parts of America. We have now at the Experimental Farm, either growing or which have been grown and records kept of them nearly all the varieties of fodder plants which have been advertised and others which have not been advertised, such as our native grasses. The one perhaps of the greatest value amongst the native grasses is that

to which I referred at the last meeting. It is called the Northern Blue Joint. It is not quite the same as the ordinary Blue Joint, which is common in low lands and marshes, and grows along streams and rivers. This is a northern variety and has a greater value as a fodder plant. It has more leaf and the stems are rather finer, and I believe it will prove a very valuable grass. One of the problems which has to be considered is to find a grass that will grow in the flooded meadows particularly along the banks of the St. Lawrence, where there are a great many acres which are flooded in the spring. The question is as to what kind of grass can be sown profitably to take the place of the coarse sedges and marsh grasses which grow there naturally. This grass will be valuable for use in this way, as well as the common Blue Joint grass. A variety known as the Canary Reed-grass will also be a valuable grass for this purpose. This is one of the problems we are considering now.

WEEDS.

The next subject which has been studied in the Botanical Department at the Experimental Farm particularly during the last two years is that relating to weeds. That a deep interest has been shown in this subject is evidenced by the large number of letters received from farmers in all parts of Canada, but particularly in Manitoba. Weeds in Manitoba had increased so much that the farmers saw they had to take some very decided measures to eradicate them or they would become a source of very serious loss. The Minister of Agriculture, the Hon. Mr. Greenway, published a very excellent bulletin, decidedly the best bulletin that has ever been published for the purpose for which it was required and one which has done a great deal of good in the country. During the last two summers for a short time, with the permission of our Minister of Agriculture, I have been in Manitoba lecturing upon weeds, and in that way a considerable interest has been stirred up in the subject; and a large number of farmers have become acquainted with the habits of weeds and have been enabled to identify them. I think there is no more important information about weeds, looking to their eradication, than to understand the nature of their growth. Although there are a large number of plants which are sometimes aggressive enemies to farmers, the principles upon which they are to be fought are simple, and really all depend on the nature of the plant, *i.e.*, on one or two very important characteristics of each kind,

CLASSIFICATION OF WEEDS.

The division of all plants into three classes is, of course, very important, namely: Those plants which live for one year, those which have a life of two years, and all others which live for many years. For those which live for one year, the eradication is simply a matter of preventing them from seeding and this again applies to those that live for two years. If seeds are not produced the plants, of course, must die out. The most difficult class of all to fight against is that known as perennials, or plants which live for many years. Again, we find that we can divide these up again, for purposes of considering how to get rid of them, into those which root near the surface of the ground, and those which root deeply. To get rid of those which root near the surface of the ground, we have only to prevent their seeding and by ploughing throw them up to the air to dry out; but with those which root deeply it is a more difficult matter; we must plough deeply, so as to prevent the formation of leaves as long as possible so that they may starve; the leaves are necessary to the plants to absorb food from the air. These general principles cover the whole of weed eradication; but we know that in different sections of the country the same plant may develop different characteristics. As an illustration of this, I need only refer to the Canada thistle. The Canada thistle about Winnipeg and for a few miles beyond is very troublesome, and is just as aggressive to farmers there as it is here. But farther west on the drier lands the Canada thistle is not a weed, is not aggressive, does not produce many seeds and is no trouble to keep down. That is largely a matter of climate. There are many plants which give no trouble here; but which under different climatic conditions would become weeds. In the eastern provinces of Canada to prevent the Canada thistle from becoming our master, we find that mowing early and again about September to prevent the leaves from performing their functions and storing up nourishment in the rootstocks,

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is the best treatment we can give it. In the West, with this, as well as with the wild sunflower, we find that if summer fallowing be done early in June, or late in May, there is no trouble with them. These plants produce a great deal of sappy succulent growth, and if the land is broken up in May or June they can be eradicated easily; but if you delay summer-fallowing for only a fortnight, leaving it until late in June or July, the fallows of the land ploughed will be full of these by the end of the season. This can only be explained by supposing that the succulent condition of the plant at that time renders it more susceptible to injury, and decay sets in and the weed rots out. This plan does not succeed with us here. So it is not such a simple matter as at first seems. Not only every plant needs to be studied according to its growth and district; but plants may be pests in some places, and in other cases not be weeds at all. The farmers of Manitoba seem to have recognized this, and are now finding out all they can learn about weeds, and working according to the experience of others. This they get from the publications of specialists who have studied them.

Nomenclature.—An important matter I have referred to before, is the calling of weeds by their right names. It is not the unimportant matter it seems at first sight. It is important, and important for this reason, that there is a great deal published in regard to noxious weeds, and any one who requires information is referred to one of these publications, and if he does not know the right name of the weed he has to deal with, he will get the wrong information. I will give you an illustration. In the West, the grass generally called "quack" or "couch grass" is what is elsewhere called "Holy" or "Sweet" grass, the native hay from which the Indians make scented baskets. This is a very deep rooted grass and almost always called quack grass in the West. In the East we have another quack grass, too well known to us. The treatment of these is diametrically different. To get the best results, however, here we plough as near the surface as possible, getting to the roots, and throwing them on to the top of the soil to dry out. On the other hand, in the West, they would not be reached by that shallow ploughing, but simply pruned and helped in their growth, just as a worn out meadow will give good results if harrowed when you don't want to plough it until the following year.

Quack grass in the prairie provinces is far more abundant than in Ontario—and yet in Manitoba quack grass is not a weed—because there the usual method of ploughing is shallow and here we plough deep and try to go a little deeper each time, than before, and as a consequence quack grass is ploughed under and grows vigorously. The statement has been made that if you throw quack grass on a fence and leave it for a week it will grow. This is not the case. It has not much vitality, if you take it out of the soil. But our experience shows it does grow if covered up, owing to its succulent underground roots, which dry up if thrown on the surface. It is very often disseminated in a field by ploughing deep and being dragged by a harrow across the field, lying more in the head-rows and around the fields than through the crop. It is not, certainly, an easy grass to get rid of, but it is not as difficult as some of the farmers in the country think.

The different characteristics of weeds are sometimes hard to recognize, but it is well to have some knowledge of their bad points. One is that where a weed is prevalent and occurs in large numbers, even if it is not difficult to get rid of, its very abundance will make it a source of danger and loss to the farmer, particularly in the West, from absorbing the moisture from the soil, which is required for the crop; but the fact of its being in large numbers does not prove that it is difficult to eradicate. I am reminded of a little weed—the small Rag Weed of Ontario. This is not the giant Rag Weed of the West, the seed of which is well known to millers as "crown weed." In the Southern States the farmers regard consider the Rag Weed as their manure. It grows there to a height of six and eight feet, and farmers would think a man foolish who told them that the Rag Weed, with which their fields are covered, should be eradicated. They say that it is their manure and they plough it in. It is a mistaken notion for any farmer to entertain, that it will make an addition to the soil by ploughing in this weed. There is no weed, except perhaps clover, which does not take more from the soil than can be put back again by ploughing it in. It is too dangerous a thing to recommend, because farmers, and indeed everybody, is apt to choose the easy course, if two courses are open to him. It is far easier to leave weeds growing with the idea that at some future time you will plough them in, than to keep your land clean all the time particu-

larly if you can persuade yourself that it is a wise plan to do so. It is a dangerous plan because in this way many weeds are allowed to ripen seed and are then ploughed in.

Some plants produce an enormous quantity of seed. Here is some seed I have with me, of a plant called the Tumbling Mustard, and one plant is capable of producing one and a half million seeds, and you see it is a very small seed. A remarkable point in regard to this is the large number of seeds it produces, and also the large development of the plants which come from these. Millers do not mind this weed, because the seed is easily cleaned from grain. The method of distribution of the seed is an important point with regard to a weed. The downy seed of the Canada Thistle, for instance, is distributed largely by means of winds, and some seeds which have hooks or barbed spines on them are distributed by reason of these, through the agency of various animals; some for instance are very troublesome if they get into wool. The obnoxious characteristics of some weeds are indicated by such means as Devil's Weed, Blue Devil, White Devil and similar names.

POISONOUS PLANTS.

Some few plants are obnoxious from their poisoning qualities, and we should be particularly careful with these. They are not many in number, but some of our native plants are very poisonous, and on the north-western prairies and in British Columbia I have known some instances of cattle and horses being poisoned from eating wild plants. One, Cowbane, wrongly called "Wild Parsnip", which has white flower, grows in wet lands all through the prairie region. This is one of the common species, and farmers should carefully clean the land of these poisonous and injurious plants. There are some seeds which have great vitality to resist all ordinary methods of eradication, and then we must use some special means of cleaning the land; these have to be modified according to the species. A method which has been used with advantage is the use of "smother crops."

Rape.—Some good work has been done in Western Ontario by growing rape. It has to be cultivated till late in the season and covers the ground very heavily, and I think it would be a useful plant for much more general use in cleaning land as well as for producing a large quantity of good feed for stock.

Clover.—To seed down heavily with clover is an excellent plan, and clover adds so much to the fertility of the soil, that I think it would be wise if the principle was established that clover should be sown with all crops. It can be sown advantageously in that way, if only for the value it adds to the fertility of the soil as well as for its usefulness in cleaning the land. Certain weeds are introduced with clover seeds, and we have to be on the watch for these. None of them are very noxious weeds, and, although a good many weeds have been introduced through clover, this has been due more to seedsmen selling dirty cheap seed than to the practice of growing clover in the way I have mentioned.

The prevalence of weeds is a cause of loss to farmers on account of the difficulty in separating their seeds from grain. Millers have now a special invention for cleaning grain of seeds that are injurious. The cockling machines have been found very good in bringing down the number of injurious seeds which were very troublesome in the mills, through their similarity in size to grains of wheat.

Another seed which is very troublesome and the one most disliked by western millers, is that of the Giant Rag Weed, this seed is detested by millers because it is about the same size and weight as a grain of wheat, and they can neither sift nor blow it out. It is very desirable that farmers should, if possible, use clean seed grain, and I am glad to say that more care is now being taken to clean grain thoroughly before sowing. If farmers do not give their attention to this very soon, the millers will refuse to buy from them altogether. Grain has been much cleaner this year than last. A knowledge of the seeds of weeds is very important, because if a farmer finds foul seeds in his grain these should be recognized, so that he may not sow his grain in a dirty condition.

The percentage of weed seeds in a sample of grass seed may be very high and yet be hardly noticeable without careful examination with a magnifying glass. It is with the seeds of crops that many weeds are introduced into the country, this only shows what

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great care should be exercised by seedsmen in purchasing and distributing seeds, and also by farmers in buying. If the farmers would demand that they should have clean seed from seedsmen, the seedsmen naturally will take special pains to have their seed well cleaned. Some of the weeds in Manitoba which have proved of considerable trouble have not been found very bad in the Eastern provinces.

False Flax.—There is a plant called False Flax which has been introduced widely into Manitoba in flax seed, which we have known in Ontario for many years and which has not proved a very troublesome weed here, but it has shown in Manitoba by its power to spread that it is a bad weed. It has spread from Manitoba to the Rocky Mountains. It is an aggressive weed which belongs to the mustard family, and having spread very fast over hundreds and thousands of acres it has to be recognized as an enemy and dealt with accordingly. It ripens early in the same way as mustard does.

Ball Mustard.—Another weed of the same nature has been called Ball Mustard, because the seeds are contained in a little round pod about the size of No. 6 shot, which does not open at all; this plant has spread all through the country where wheat is grown. I saw one area of 200 acres, quite orange in colour, with this new weed. A farmer said to me "it does not do much harm," but when he came to thrash his wheat he found that he had reaped off that land many bushels of grain less than he would have got had that weed not grown there.

Pepper Grass.—Weeds apparently not injurious, under special conditions, develop into bad weeds. One of the weeds most inquired about in Manitoba last year is what is known as Pepper Grass, belonging to the same family as Mustard. The seeds are small but produced in enormous numbers. It is a slender plant growing from 6 inches high with a great many branches covered with pods, each of which bears two seeds. It is what is called a Winter Annual. The plants are of either one or two years duration. There are some plants which ripen their seeds in the first year and these germinate in the autumn, and, instead of being killed by the frost, live through the winter in the shape of a flat rosette of leaves on the ground, in the same way that two year plants do; they are then ready the next year to throw up their stems and produce seeds quickly. In wet seasons this plant instead of being a small plant with few branches develops into a large tree-like plant, 18 inches high, which overtops the young wheat and prevents its proper development. This calls attention to the fact that it is not wise to continue the practice which some have followed in Manitoba and the North-west Territories, of sowing their grain on stubble, instead of ploughing their stubble land and then sowing; they sow with a press drill on the stubble. If there happens to come a wet spring, there is a risk that these biennial weeds or winter annuals will develop ahead of the grain and a large loss will occur therefrom. There are several plants belonging to this same class. The value of the method of summer-fallowing in the Western country where there is sometimes not quite enough rain, was shown very vividly by Mr. MacKay at the meeting at which he addressed the Committee, and I also referred to the subject at that time so that it is not necessary for me to add anything now. But the idea generally held in regard to summer-fallowing in this part of the country is that we are not making the best use of our land, and that by higher cultivation utilizing the labour which we have available, we shall produce better results. It is considered that more moisture is not necessary. This is probably the case in many parts of Ontario but in the West it has been shown that summer-fallowing is an essential necessity. Mr. MacKay told us that the farmers who summer-fallowed got good crops, and those that did not summer fallow, did not get good crops. The greatest advantage is in the moisture which is retained in the land by this method. Summer-fallowing in Manitoba is sometimes done too late on account of the large amount of work to be done by each individual farmer. It should be done before the 12th of July, after which date most of the weeds which grow in summer-fallows have ripened their seeds, and there are only one or two which have not ripened their seeds by that time, but these are better described as weedy plants than as weeds, and there is a difference. Some weeds are aggressive, and there are some few plants which have a weedy appearance, but which have a mode of growth which renders them less injurious or destructive than some others. Instances of such plants are the Biennial Wormwood, Evening Primrose, etc

The Biennial Wormwood.—This weed is called False Tansy from its resemblance to that well known plant. It produces a larger number of seeds but it does not flower as early as many other plants, so that by the use of spring ploughing or summer-fallowing it can be kept down. In Manitoba, Timothy is now being very much more grown than it was in the past. I saw many excellent Timothy fields in Manitoba, of, sometimes, 150 and 200 acres. The farmers that were growing Timothy wanted, of course, the hay that it would produce, but the chief object they had in view when sowing it was to turn the sod into the ground to increase the amount of fibre, so that if there were heavy winds in the spring it would hold the land, and more than that, the best wheat that is produced is on sod land which has been ploughed down.

By Mr. McMillan :

Q. What do you do to exterminate the Ox-eye Daisy? It is spreading rapidly.

A. Yes; the Ox-eye Daisy is spreading rapidly in Ontario and has spread to a marvellous degree all over the Maritime Provinces. The best treatment that I have tried is to seed to clover, and cut it early. The Ox-eye Daisy belongs to the perennial class of plants, it does not spread by running roots but by off-sets growing near the surface. Thus if the infested land is seeded down to clover, and then after cutting one or two crops of clover, the land is ploughed up, the roots of all the plants are killed, and you only have to fight new seeds brought in. It is a curious thing, but I believe that the spread of such a weed as the Ox-eye Daisy is largely due to the beauty of the flowers, so many ladies pick them as they go along the roadside and wear them. And like many other plants similar to the sunflower, there is sap enough in the stalk to ripen the seeds after the flowers have opened. If you root up Ox-eye Daisies and throw them on the ground, there is often enough sap left to ripen the seeds. A great many people grow the plant for ornament, and thus the seeds are scattered. I persuaded three people in Manitoba to root up plants of Ox-eye Daisy which they had growing in their gardens for ornament. They have not this plant as a weed yet in Manitoba. But one thing is certain: it is a plant able to thrive there if it once gets a footing, and it will do so unless they take steps to prevent it. For over 20 years it has been one of the greatest pests in the East, particularly in New Brunswick, and efforts are being made to get farmers to eradicate it by seeding down their land to clover.

A Model Farm.—Mr. Fisher is my Minister now, and it may be thought bad taste to refer to him, but I cannot help remarking upon the fact that on his farm, which is in the middle of a district infested with Ox-eye Daisy, you cannot find a plant. That is simply the result of turning out every year with his men, on one day—their daisy day—and seeing if there is a daisy to be found; and they look for every plant and cut it out and destroy it. To-day there is not a plant of daisy to be found on his farm. It is a most troublesome weed, and one which has shown by its power of spreading to be very dangerous. I have seen it stated in some books that it makes good feed for animals. It does nothing of the kind, for cattle won't eat it, and though they may eat it mixed in hay, they won't eat it in a pasture; sheep won't eat it either. I saw in one book that the writer said it was better than even clover for renovating worn-out lands. No one could think the Ox-eye Daisy a good plant to grow after seeing its prevalence in Canada.

Mr. McMILLAN.—I bought a farm and on it was a spot covered by Ox-eye Daisies, four rods long and two rods wide, where a fence had been set. I took up the fence, summer-fallowed the land for two years and kept the surface clean. The first year I got no plants but the second year they were as bad as ever. I took salt and used it with very fair effect; but these plants were soon as bad as ever. The only remedy is to seed down with clover.

By Mr. Sproule :

Q. Does it propagate by seed?

A. By seeds and off-sets.

By Mr. McGregor :

Q. Do you not think that Mustard might be dealt with in the same way ?

A. Mustard can be prevented from forming new seeds by seeding down, but it will appear again when the grass is broken up. I am working a garden now, which I have worked for 10 years. I am certain that never a spear of the plant went to seed, but I have mustard every spring and it keeps me going.

The Paint Brush.—Referring to what Mr. McMillan, said of salt, there is in the Eastern Townships an extremely aggressive weed which is one of the hawk weeds, and is known as the Paint Brush, or the Devil's Paint-brush, as Mr. Parmalee will know. It has been studied at the Vermont Experiment Station and they found that the most practical treatment was using one and one-half tons of salt broadcast, to the acre. They found this did not affect the grass injuriously, but rather improved it, but it destroyed the weed. The trouble in the Eastern Townships and in the mountains of Vermont, is, that on many upland mountain pastures it is impossible to break up the land, so that when this weed becomes established it spreads rapidly and crowds out the grass. Top-dressing with salt is the only satisfactory treatment yet discovered to get rid of the weed. Some small experiments have been tried in Canada, but too much salt was used. However, after some years of experimenting, Professor Jones, of the Vermont Experiment Station, finds that one and one-half tons of salt to the acre is about the right quantity. I think this is an important discovery, because it makes it possible for the farmers of the Eastern Townships and Vermont to save their pastures; for, though the remedy is rather expensive, it well repays its use. Some of our farmers have tried it, and have obtained equally good results.

The Cow Cockle.—I will now draw your attention to a newly introduced weed of which I have here a specimen. It is the Cow Cockle, which belongs to the Pink family, and is a pretty plant, which is sometimes grown in gardens, it was introduced into Manitoba by the Mennonites. Many of these people were poor and they bought cheap seeds, with which they introduced those of many troublesome plants, among them the Cow Cockle. This plant grows to two feet high and its seeds are one-twelfth inch in diameter, black and perfectly round. It is troublesome in grain fields. It has spread in Manitoba, and in South Manitoba now covers large areas, crowding out wheat. It forms a large succulent plant, two feet high and two feet across. In going through the Mennonite settlements, last year, I was pleased to see the industrious way the farmers were fighting against the weeds which they had undoubtedly introduced by purchasing poor seed from Russia and elsewhere. They are doing their best to eradicate the weeds. All speak German and consequently did not learn so soon as some of the English speaking settlers the danger of neglecting these enemies; but when the Manitoba government sent out a man to tell them what to do, they set to work with German pertinacity to stamp out the pest. In driving through the country, one may often see whole families pulling weeds systematically, walking abreast all through the crop until the whole field has been covered. They don't do as our farmers here often do with mustard—pull it up and throw it down on the ground, where it smothers the crop and ripens its seed. But the father of the family carries a large flax sack over his shoulders, and all the others walk over to him when their hands are full and empty them into the bag. When the sack is full it is carried to the side of the field, where the weeds are piled up and burnt. As you are probably aware, the method of life among these people is to live in villages, driving out to their farms in the morning, and taking their dinners with them. They leave their wagons at the side of the field, have dinner around them in the middle of the day, and go back to their villages at night. Every night they carry back in their waggons a load of weeds, and in front of every house in the Mennonite villages there is a big charred spot where they burn their weeds. This shows what these people are doing, and it cannot but have a remarkable result on the condition of that country in the future. When I met the farmers in Manitoba three years ago and told them I was studying weeds, they said to me, You want to go down to the Mennonite country; it is there you will see the weeds. All I can say is, that the Mennonites can set an example in methodical work to some of

our farmers in the better parts of Canada. Millers tell me that they are getting much cleaner grain now from southern Manitoba. The farmers have learned that it will pay them to get rid of these weeds, and their industry has proved to them the truth of what had been told them, namely, that with care every weed could be eradicated.

By Mr. McMillan :

The Morning Glory.—Q. We have a creeping weed with a little pink flower ; do you know what it is ?

A. Is the flower about an inch across like a small Morning Glory ?

Mr. ERB.—It is a wild Morning Glory. We have it in our neighborhood and it is a very bad one.

Mr. FLETCHER.—It is one of the worst weed pests and one of the most persistent which has been introduced from Europe. I am trying some treatment this year with salt to see if I can find a means of eradicating it. It does not produce in this country very many seeds or flowers, but it has an enormous development of underground stems. I have a specimen in my office, the underground stems of which are over four feet in length. The underground system of stems and roots is very extensive and leaf-bearing shoots are thrown up freely all over the patch when once established. We have a patch on the farm which we have been fighting for three years, and we have found that it is one of the most persistent weeds, and none of the treatments in the way of applying salt or chemicals have succeeded so far, but we hope soon to get a remedy.

The Perennial Sow-thistle.—There is another weed, which is rightly causing much alarm among farmers, the Perennial or Field Sow-thistle. This generally makes its appearance on a farm in a more or less restricted patch ; each plant will throw out fifteen or twenty shoots around a central stem which bears three or four large conspicuous flowers about the size of those of the ordinary dandelion, these also develop large quantities of seeds which when ripe will be blown in every direction. It is an extremely persistent weed and very hard to fight. I know of one instance where a patch was smothered out by piling straw on the top of it. We sometimes use a pile of manure and that will smother anything.

By Mr. Parmelee :

Hard Hack Weed.—Q. Have you any treatment for the Hard Hack weed ?

A. None, except pulling it out and burning it. Mowing seems impossible. The stems are so hard that it would be just about like mowing wire. Luckily it grows in patches with the roots close to the surface, and with gloves it can be pulled out by hand. We get a large number of enquiries about it. It is not a serious matter to pull out even a big patch by hand, but when it covers large areas this is very expensive. Stock does not seem to eat it, except when it is very young.

Q. Does it occur elsewhere ?

A. Yes in Ontario ; but not as a troublesome weed. In British Columbia there is a closely allied species, Douglas's Spirea, which is sometimes troublesome. Hard hack is a pest in the Eastern Townships owing to the climate there being very suitable for its vigorous growth. The same reason allows the Scented Fern (*Dicksonia*) to become a weed, while in Ontario it is in most places rare.

DESTRUCTIVE INSECT PESTS.

San José Scale.—I will now refer to one or two insects which are very destructive. I have here specimens of the celebrated San José Scale, probably one of the most injurious insects known on fruit trees. The piece of limb I have here is encrusted all over with this scale, but the insects are so inconspicuous that, although there are thousands of specimens, unless looked for very closely they might be easily overlooked. This character of being hard to notice until the scales become very abundant is one of the great dangers with regard to this pest, because it may be introduced into a new locality, get established

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firmly and even spread widely before it is detected. The introduction of this insect into the peach growing districts of Canada is a very serious matter; and, although we are not yet in a position to say to what extent it will spread in our climate, yet every body concerned should know something about a danger which may bring enormous loss to the country. You, Gentlemen, will go out among your constituents and you may be asked about this, and it is just as well if you are in a position to answer. The scale is exceedingly difficult to fight and very hard to detect. The best remedy we have been able to find is to wash the trees with a strong solution of whale oil soap. There is some agitation in the West to have prohibitive legislation by Parliament, to prevent nursery stock, through which this scale is introduced, from being brought into the country at all. After studying the matter I have not yet seen my way to advise the Minister to recommend such legislation. All I can say is, I have watched it spread very carefully in the United States, and I think I know of all the instances in which it has been proved to have been introduced into Canada. Resort should only be had to legislation, I believe, when public opinion demands it; so far, this is not the case; our chief efforts should be directed towards finding out the best remedies without interfering with the established business of fruit-growers and nurserymen. If our fruit-growers and nurserymen could grow all their stock, and would grow it, then legislation of this kind might be considered more seriously. We know that our Canadian nurserymen have not got this insect, but we also know that they cannot yet supply all the fruit trees their customers require. They have to get them from the United States nurseries, and if we enact prohibitive legislation before it is possible for them to do without the importations, we are going to interfere with both of these businesses at once, and I do not see my way to advise the Minister to enact this legislation; but he wants the matter thoroughly investigated, and I have instructions from him that, directly my work will allow of my getting away, I am to go to the west again and examine all the known occurrences of the scale. There is one at Niagara, one at Chatham, and another in British Columbia, which is of course too far off to visit; it is not necessary either that I should go there as I was there three years ago, and, besides this, Mr. Palmer, the British Columbia Entomologist and Fruit Inspector, a very efficient officer, is watching it very carefully. The occurrence at Niagara and that at Chatham have been established probably for two or three years but so far have not spread; at least, I have received letters from the owners of these orchards, who are naturally very much concerned, saying that the insects have not spread very far in their orchards. They are on the original trees, which they have traced back to New Jersey nurseries.

Life Zones.—The distribution of plants and animals is limited by what are known as floral and faunal life-zones. The limits of these are arrived at by the examination of large numbers of the plants and animals occurring over wide areas, and certain well defined belts have been mapped and special names applied to them. The greater part of Canada is included in what is known as the Boreal Zone. Then we come to what is known as the Transition Zone, of which we have some outliers running up into our country. Along the northern portions of some of the United States lying south of us and a little strip north of Lake Erie, including our best peach country, there are parts of what is called the Austral Zone in which the San José scale may increase rapidly if once introduced, owing to the fact that it will there find all the conditions necessary for its rapid development.

It is a serious danger, I will not deny, but up to the present, by the fruit growers exercising the ordinary care that men of common sense should exercise, they have not introduced to any extent this injurious insect, though it does certainly occur in the country. We cannot prevent its introduction because it is here already but we only need common sense to see that it does not spread widely from the few localities where it has gained a foothold. In case I may be wrong in this, the Minister of Agriculture has instructed me to go to Niagara and consult with the fruit-growers of the St. Catharines and Grimsby districts. We shall go to the infested orchards, make an examination and ascertain what is the exact state of affairs. I have said that the San José Scale is one of the most injurious insects that has ever been discovered on fruit trees. It showed that it was so in California many years ago, as well as in the Eastern States on our southern borders since its introduction there. Those who have studied

it most, and particularly the United States Entomologist, say that we shall probably never exterminate it any more than the Oyster-shell Bark-louse, because there will never be concerted action on the part of the fruit-growers; still, at the same time, by the methods that are recommended, this pest, like that insect, can be kept down, within reasonable limits. Of course, it has not done any appreciable injury in this country as yet, but no stone must be left unturned to control it.

By Mr. Calvert :

Q. What effect has it on the trees?

A. Judging by the experience in California, trees once affected by this scale die rapidly, in from one to three years.

By Mr. Sproule :

Q. What species of trees is it most natural to?

A. It is most noticed on fruit trees, but it occurs on almost all deciduous trees, that is, all those trees that drop their leaves in the winter. It has most wonderful powers of increase. I do not quite know how to explain the wonderful increase to you, because the numbers are so enormous, but it has been calculated that one female would produce three trillions of young in a year. How that was ever computed without error, I do not know, but I know that one female will keep on producing young at the rate of ten a day for six weeks. One female will produce about 400 young in 30 days. These again are ready in a short time to produce young, and these continue growing and propagating all the season. The wonderful calculation above mentioned was made by Mr. Pergande, a man of remarkable accuracy and one of Mr. Howard's assistants at Washington. I have been asked by a member of the committee to say something about the caterpillars now in such numbers on the trees around Parliament Hill.

The trees are being attacked by the ordinary American Tent Caterpillar. They are in extraordinary numbers so that not only have members of Parliament and others frequenting the Parliamentary buildings noticed them; but items have appeared in the newspapers. When I went to examine the trees I found a gardener spurting a mixture of Paris green and water over some of the trees near the walk around the top of the hill; I pointed out to him that this was of very little use and recommended him to ask his chief to supply him with a good strong force pump. A suitable pump can now be got for 10 or 12 dollars. In this instance, as is frequently the case, a good deal of money and time had been wasted to little effect, because the person whose duty it was to look after the matter had not taken the little extra trouble to find out what was the best way to treat these insects to prevent them from destroying the trees.

By Mr. Sproule :

Q. Is this scale insect on a piece of apple branch the same as the San José scale you were speaking of?

A. No; that is the ordinary Oyster-shell Bark-louse.

MR. FLETCHER.—Before closing, Mr. Chairman, there is one other matter which I should like to bring before the committee. It is a remedy which has proved very effective for those only too-well-known pests of the farm and garden cutworms. There are many remedies which may be tried with more or less success; but one in particular has been so useful during the last few weeks that I wish to make it known as widely as possible. What are known as poisoned baits are very useful where plenty of succulent vegetation can be procured; but in some places, as for instance near Calgary and Edmonton this year, there is very little vegetation of any kind to make these with, and the new remedy which consists of a mixture of bran poisoned with enough Paris green to give the mixture a green shade (about one pound of Paris green to fifty pounds of bran) has proved most satisfactory. This mixture may be used either slightly moistened and distributed in small quantities among or along the rows of an infested crop, or it may be applied in a dry condition. A plan which has been recommended is to fill the drum of

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a Planet Jr. seeder and run lines of the dry poison along rows of such crops as onions, carrots, beets, etc. If the caterpillars are very numerous, cross rows may also be run to those in the same direction as the crop. This mixture seems to have a great attraction for the cutworms, and they actually eat it in preference to the green plants. It has also been used with much success against grasshoppers in California.

By Mr. McMillan:

Q. I saw a field this year where they found last year this little gray worm. What do you do for that?

A. You could not do anything in a grain crop. If the grain is destroyed, I should sow to millet, or, if it could not be ascertained whether the crop was destroyed, until too late to sow to millet I would sow rape. The caterpillars are full grown and do no more harm after the middle of June.

Having examined the preceding transcript of my evidence, I find it correct.

JAMES FLETCHER,

Entomologist and Botanist to the Dominion Experimental Farms.

