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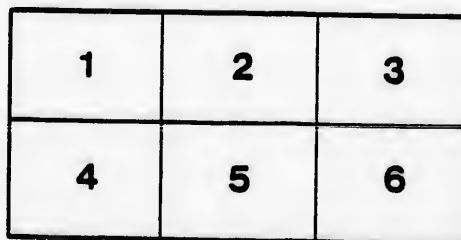
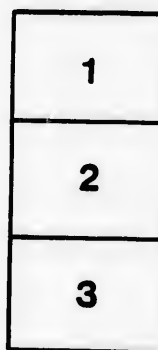
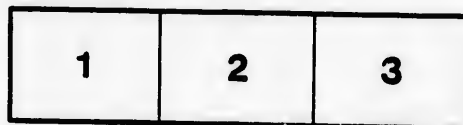
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1896

EVIDENCE OF MR. JAMES FLETCHER
ENTOMOLOGIST AND BOTANIST, DOMINION EXPERIMENTAL FARMS
BEFORE THE
SELECT STANDING COMMITTEE OF THE HOUSE OF COMMONS
ON
AGRICULTURE AND COLONIZATION
Session of 1896

PRINTED BY ORDER OF PARLIAMENT

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COMMITTEE ROOM 46,
HOUSE OF COMMONS,

WEDNESDAY, 1st April, 1896.

The Select Standing Committee on Agriculture and Colonization met this day, Mr. Sproule, Chairman, presiding.

Mr. JAMES FLETCHER, Entomologist and Botanist to the Dominion Experimental Farms, was present by request, and, on invitation, addressed the Committee as follows:—

Mr. Chairman and Gentlemen,—The annual appearance before the Committee is always one of the pleasant features of our work, because we find it very useful, as members of the Experimental Farm Staff, to come into direct communication with the Members of Parliament from all parts of the Dominion. In that way we have opportunities of making our departments useful to the constituents of those Members. Naturally, if a matter is brought before the attention of Members at the meetings of this Committee, they remember it, should occasion arise; whereas if we had not the chance of meeting the Members, many opportunities for useful work would be lost. The different officers of the farm staff naturally consider that their own particular work is the most important to the country. With regard to my own I know that it is, but I want to lose no opportunities for making this fact known to the public at large. The correspondence with all of the divisions of the farm is very large, and we are frequently able to trace the influence of Members of Parliament through many of the letters that we receive, from the fact that many of the farmers, when writing, seem to think they are under an obligation to us when receiving information, and they mention the fact that they have been told to write by their Member of Parliament. We wish it to be widely known that the more the farm is made use of, the better we are pleased. We wish to be referred to, and we wish the farmers of the Dominion to make use of the information that has been gathered by the members of the farm staff. I state this now, because the matter has been mentioned to me by one of the members of the Committee, and I am glad to have an opportunity of drawing attention to it.

INSECTS INJURIOUS TO FRUITS, AND THE REMEDIES.

The work in my own department during the past year has been carried out on very similar lines to those of previous years. There are to be recorded some triumphs in the way of practical remedies for some of the injurious insects. We are able, now, to speak definitely of many matters concerning which there was some doubt previously, as a result of experiments carefully carried out and compared with the accumulated experience of previous years. The work in the entomological division during the past year has been very largely with regard to insects injurious to fruits. This, I think, does not indicate that the injuries to fruit have been more serious than to some other crops, but that more attention has been paid to the matter of destroying injurious insects by the fruit growers than in some of the other branches of agricultural industry. The fruit growers of Ontario and Nova Scotia, particularly, have adopted very largely the improved methods of "spraying" with insecticides and fungicides to protect their crops against insects and fungous enemies. This simple and cheap operation has given such good results, that the work of a few has acted as an object lesson for the rest in the different districts where it has been conducted. Good careful work by a comparatively small number has convinced the rest of the fruit growers in the districts, of the efficacy of treating their trees in this manner. There is, now, nothing indefinite or doubtful about the effects of the use of some of the arsenites or compounds of arsenic for treating biting insects, that is, those which bite their food.

All insects, for economical purposes, come into two large orders, those which bite their food, and those which suck the juices out of it. For those which bite their food and eat the substance of the leaves, poisonous materials placed on the surface are effective remedies. By carefully conducted experiments we have found which are the best poisons to use and in what proportion they should be applied, the best time to apply those remedies, and the cheapest way to get good results. During the past two years particularly, a large amount of work has been done in spraying fruit trees and other crops, and exceedingly good results have followed. In addition to the work done at the Central Experimental Farm and the other stations under the control of the Dominion Government, the Provincial Government of Ontario are now helping this work along by publishing valuable instructions and reports, and I think it may be said now that there is no farmer or fruit grower in Canada who may not get much help from his own Government's reports on all the different parts of his agricultural work. The Ontario Government during the past year has carried out a very successful series of experiments in spraying orchards by means of object lessons conducted by Mr. A. H. Pettit, of Grimsby, a man of energy and intelligence and of great experience as a fruit grower.

In the province of Quebec there are a great many active farmers and fruit growers adopting the same methods. In Nova Scotia and British Columbia the same thing is going on, and the results are always satisfactory.

I have been preaching the gospel of spraying for ten years, and at the Experimental Farm we have done all we can to spread the requisite knowledge, by publishing bulletins, and by pushing the work along in every possible way. Last spring, Mr. Craig and I went to the Niagara district and held a series of meetings in the places most convenient for the fruit growers to meet us. This series of meetings took about a week and we were able to meet a large number of the best fruit growers of the district. This effort has had a good effect. At any rate it is evident from our correspondence that a great many have adopted spraying, which they had not before used, and with considerable success. I think spraying is now recognized as part of the necessary annual work of fruit growers. They recognize it now as a method to be adopted, as a matter of course, whereas, a few years ago, we had trouble to persuade them that it was a thing they ought to try and from which they would get good results.

The Canker Worm.—A large number of the insects one notices every year in Canada are not necessarily injurious, and experiments are necessary to find out which are injurious, and which are likely to be most injurious, so that particular attention may be paid to them. This work can only be done by specialists, but a good many are doing it, and there are no reasons why the farmers should not take advantage of the results. They can get information by asking for it and, by promptly applying the remedies advised, they may save themselves a good deal of trouble and avoid a great deal of waste in labour and in money.

Among the insects which have been brought very prominently to my notice from their frequent occurrence during the past year, I would just mention one or two. The canker worm, well known by that name, has been injurious in Ontario and Nova Scotia, and I bring it before the Committee because there is a good deal of difference of opinion in various parts of the country as to what is the best remedy of dealing with this pest. Now, there are very few insects concerning which there are not a dozen or even a score of different methods which may be tried by way of remedies, and the great object for everybody who wants to get practical results, is to get to know the *best* of these. If there are a dozen remedies before the public it is very likely that none will be used, because while you are making up your mind which is the best, the opportunity for applying any of them passes away. If there is only one remedy recommended, we are likely to get the good results that we wish for, because the farmers are in no doubt as to what ought to be done. In Nova Scotia the general opinion is that the best remedy for the canker worm is banding the trees with some viscid or sticky substances to prevent the moths climbing up the trees. With respect to nearly all these injurious insects it is of the utmost importance to study their life history. Unlike many others, the insects of which we are

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speaking appear late in the autumn or early in the spring. The females, which lay the eggs from which the caterpillars are produced in the spring, when the eggs are hatched and the caterpillars come out, appear late in the autumn. They have no wings, and they climb up the trees to lay their eggs on the branches. The eggs stay there during the winter, and the young caterpillars hatch during the spring.

There is another kind of canker worm, the moths of which lay their eggs in the spring instead of the autumn, but I need not trouble you about that because the treatments for both are similar. The method which has been adopted in Nova Scotia, and is a favourite remedy there, is to paint a band of some viscid material round the tree, such as printer's ink and oil or a mixture of castor oil and resin, which will remain viscid for some time. This is done in order to catch the spider-like female moths, which climb up the trees to lay their eggs. If the moths cannot pass, no eggs are laid on the tree, and no caterpillars can appear the next year.

In Ontario the general practice has been to spray with Paris green or some other of the arsenites, and it has always been my experience that spraying the trees with Paris green at the time the young caterpillars were on them, is by far the best remedy. I could not understand, then, why it was that many of the practical men in Nova Scotia, whom I knew were reliable, should keep on saying, the best remedy is banding the trees. It certainly is more expensive and involves a great deal more trouble. I found by making inquiries, and after a good deal of correspondence, that the difference was this: that in Nova Scotia the trees are very much larger, as a rule, than they are in Ontario, and it is a very different matter spraying a tree of 20 feet high, to spraying one of 35 or 45 feet high. With the smaller trees the apparatus which we have is quite useful and suitable, in fact answers all purposes for spraying a tree, we will say, 20 feet high. By raising the nozzle of the spraying pump on a light pole it is not too long to be conveniently handled and it can be raised sufficiently high to throw the spray over the trees. If you add another 10 feet, however, the additional height makes it a very inconvenient and troublesome operation, it is so much more inconvenient, in fact, that the work is only partly done or left undone altogether; therefore, this other remedy of painting the trees, where they are too large to spray easily, is quite effective.

On account of the natural life history of the canker worm, in that it has no wings and cannot fly, but must crawl up the trees before the eggs can be deposited, if we put an insuperable obstacle in its way, the female is destroyed below that, or can be kept from getting on the trees to lay her eggs. This fact accounted for one of the difficulties which I could not understand until I had inquired into the matter very carefully. We have, therefore, two remedies for this insect, which must be adopted according to the circumstances of the operator. In Ontario, therefore, a systematic spraying is the best remedy, but in Nova Scotia the trees are too high to be conveniently sprayed thoroughly, therefore the method of banding must be added to that of spraying. Statements very frequently appear in the newspapers that are not entirely accurate. The writers of these articles of course have not a special knowledge of many things they write upon, but they do the best they can. A very slight inaccuracy, however, may have very serious results, and statements are made in the newspapers, sometimes, quite misleading. Many such statements have appeared about this very matter.

By Mr. Cochrane :

Q. Do trees grow more quickly in Nova Scotia?—A. The trees in Nova Scotia orchards are older than we have in most parts of Ontario, although we have some very old trees. Around Lake Erie in particular there are some very old pear and apple trees. I think that in Ontario there has been a different method of pruning adopted in growing fruit trees and many new varieties have been introduced in the young orchards. The climate in Nova Scotia is certainly exceedingly favourable for the advantageous culture and development of apples, and when they have secured good varieties they have kept them up. The same trees by being taken care

of have lived a long time. I have no doubt though, that it could be done in Ontario, but I think we have in this province more new and young orchards than they have in Nova Scotia.

Q. Do you know how the trees in Nova Scotia are propagated, whether from the root or from the stalk?—A. The methods of propagation adopted there are just the same as we pursue in Ontario.

Q. You do not think there is anything in the theory that they are shorter lived from being grafted in the root?—A. Mr. Craig has studied that matter very carefully and I think he says it does not make any difference, in one of his bulletins. I know the matter has been considered and studied by him, and as far as I can remember his statement on the matter is that it does not make very much difference. Some hold very strongly that a tree grafted on a piece of root is not as good and strong as one grafted on a whole root, but I think Mr. Craig does not agree with that.

Q. I recollect seeing a tree at Niagara which a man told me was nearly 100 years old. It was as high as a maple?—A. Yes; I have seen similar large trees.

By Mr. Carpenter :

Q. Do you not think the system of trimming has more to do with it than anything else? People trim to keep trees down in our section?—A. It is very much a matter of fashion or fancy, and trimming is often done for the convenience of picking. Do you not think that the small size of the tree is also due to the large number of new orchards all through your country?

Recipe.—To resume, I may say that with these methods of banding the trees, under different circumstances, the best method may vary. The formulae which have been used most satisfactorily for making the mixtures I have mentioned are castor oil and resin, two pints of castor oil and 3 lbs. of resin and printers' ink and fish oil. In the last report of the Experimental farm, which is not yet distributed, these receipts are given in full. For five acres, Mr. Armstrong, a good orchardist in Nova Scotia, uses 20 lbs. of printers' ink, which he gets at from 10 to 12 cents a pound, and to that is added two gallons of fish oil. These are well mixed and stirred together and applied to the tree, by being painted on a strip of common roofing paper tacked around the tree.

By Mr. Featherston :

Q. What advantage is there in using printers' ink?—A. It remains viscid for a long time and does not dry up very easily. By mixing printers' ink with oil, it remains sticky longer than any other material, and it has been found as a result of experience that it is one of the best of cheap materials that are available.

By Mr. McGregor :

Q. How do you mix the oil and resin?—A. The castor oil is warmed and the materials are boiled together. Mr. O. T. Springer, of Burlington, has used this very satisfactorily. He uses a portable coal oil stove in the orchard and paints the material directly on to the trees with a whitewash brush.

By the Chairman :

Q. What about the use of tar?—A. I think sometimes it injures the young trees, and it also dries up quickly.

By Mr. Carpenter :

Q. Do the worms crawl over this sticky bandage?—A. They are not worms, but the female moths, spider-like creatures without wings which crawl up the trunks of the trees to deposit their eggs.

Q. And they stick fast?—A. Yes, they stick to the bands on the trees. There are many methods used, but this is the best, as far as I have been able to learn.

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By Mr. Featherston:

Q. Do they crawl up in the spring after hatching time?—A. There are two different moths, one that appears in the autumn, the other that does not emerge until spring. This latter is a different species, scientifically, but it is the same kind of moth to the ordinary fruit grower, and the method of controlling it is the same.

By the Chairman:

Q. The ordinary caterpillars' eggs are laid on the bark of the tree, are they not?—A. They are laid in a ring near the tips of the smaller twigs.

Q. Yes?—A. The kind you mean can be easily destroyed by Paris green.

Q. Is the mixture applied to the trees in the fall of the year?—A. The painting? Yes, it is put on both in the autumn and in the spring, when the moths appear. The same bands can be left on during the winter, and the material painted on to them again in the spring.

The Cigar Shaped Case-bearer.—I will now pass on to another insect injurious to the apple tree, which has been successfully treated during the past summer. It is the cigar shaped case-bearer of the apple, which is a small caterpillar that forms a case in exactly the shape of a very small cigar. It carries this case about with it and lives inside of it while it eats the leaves, the young buds and forming fruit of the apple tree. It does a great deal of harm from its habit of frequently attacking the flower buds just as they are opening. It is difficult to fight against this pest because although it eats some portion of the surface of the leaves, it is only a very small portion compared with the injury it does beneath the surface.

The method of attack is as follows:—The caterpillar eats a very small hole through the outer surface of the leaf and then extends itself inside between the two coverings of the leaf and eats out the cellular tissue, thus the only opportunity of poisoning it is at the time when it is eating its way through the skin of the leaf, when it makes a hole so small as to resemble the prick of a pin. Spraying experiments have been tried with Paris green mixed with the first sulphate of copper wash, which is applied immediately before the buds burst. Since spraying has become so generally adopted as a method of preventing injury by insects and fungous diseases, particularly the black spot of the apple, spraying with sulphate of copper first of all, and afterwards with Bordeaux mixture, is now well known as an effective remedy, and we have no difficulty in getting fruit growers to spray when they are asked to do so, because they have had it demonstrated to them that excellent results will follow the application of these mixtures.

The cigar case-bearer will be much checked if 4 ounces of Paris green be mixed in the first sulphate of copper wash, which is made by dissolving 1 lb. of sulphate of copper in 25 gallons of water.

Then again, following that at short intervals of about four days, either with another application or two of Paris green, or with a kerosene emulsion wash. This is a mixture of soap suds and coal oil. Many kinds of insects can be destroyed with the kerosene emulsion also, but from a different reason. Whereas the Paris green destroyed them from being an active poison, the kerosene emulsion kills them by suffocation, the coal oil running over their bodies and stopping up their breathing pores. As I have stated, this is not an easy insect to fight against, but requires persistent work and frequently repeated applications. Three or four would be required early in the spring, and the results are certainly slow to obtain, but in the end success will be attained if the applications are applied regularly. Mr. Worden, of Oshawa, has had great success in treating the same insect with a mixture of lye and Paris green, three pounds of concentrated lye in 45 gallons of water, to which three ounces of Paris green are added.

The Peach Bark-borer.—In the Niagara district, and at Queenston particularly, a great deal of injury has been done during the past four or five years by a very small beetle which bores into the bark of peach trees. The peach bark-borer, for some years, has defied all efforts to control it, but the past year a practical remedy

has been discovered. In trying a great many experiments, we found that by painting the tree with a carbolic alkaline wash, this pest can be checked. The wash is made of soft soap, diluted sufficiently to permit of its being applied with a brush, with a strong solution of washing soda which makes it more alkaline, Paris green is then added, and enough carbolic acid to give the mixture a strong odour. We have been trying now for three years to get some remedy by which this injury could be stopped, and I am glad to say that we have now succeeded, largely through the systematic efforts of Mr. Carl Fisher of Queenston. The present is the season of the year to apply the remedy 'or this troublesome insect.

Perhaps some of the Members living in Western Ontario know by sight the effects of the work of this insect without really being aware that the pest is at work in their orchards. Early in the spring, where the insect is at work, a large quantity of the gum exudes from the trees and falls in a mass below the peach trees. In some places two or three quarts will be found to have fallen beneath infested peach trees. This is the result of the work of this minute insect which is only about one-sixteenth of an inch long. By working in the bark it injures the forming wood, and the tree in its efforts to cover up the injury pours forth large quantities of gum. Under these circumstances the trees soon become exhausted, for it is not possible for the tree to lose all this amount of nourishment which may be called prepared food required for the next year's growth. The chief result then of the work of this insect is to weaken the tree by taking away the nourishment required for the use of the tree during the growing season.

By Mr. Carpenter:

Q. I have just been using washing soda and soft soap. How much Paris green do you put in the mixture?—A. I will give you the exact proportions used by Mr. Fisher—Five pounds of washing soda, three quarts of soft soap, water to make six gallons and then enough lime to show what trees have been treated. That will, of course, make the mixture thicker and also enable us to identify the trees which have been washed. Add to the foregoing three tablespoonfuls of Paris green and one ounce of carbolic acid. I think probably that the carbolic acid is the most important part of the mixture. The whole should be applied with a whitewash brush. The carbolic acid acts as a deterrent, preventing the insects from alighting to lay their eggs when flying through the trees, for this beetle flies readily from tree to tree. It was committing great injuries and drastic measures were required to prevent its spreading. Many experiments were tried with different substances, and at the end of last year, Mr. Fisher found that all the trees treated as above were greatly benefited and the attacks of the bark-borers upon those trees had almost ceased altogether.

By Mr. Carpenter:

Q. Do you recommend the application of this remedy when the leaves are coming out?—A. The first wash should be applied before that. The insect comes out early in the spring and immediately sets to work; as the injury begins early the application should therefore be made early in the spring, so as to be preventive.

By Mr. McGregor:

Q. Do you spray the mixture or apply with a brush?—A. It is applied with a whitewash brush.

Q. Does the insect go from limb to limb?—A. This insect works mostly on the rough bark of the trunk, but also occasionally on the larger limbs and even on young trees. There was an impression prevalent that it only attacked old and dying trees, but that is a mistake.

By Mr. Carpenter:

Q. The mixture is quickly put on?—A. Yes; very easily.

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The New York Plum-Scale.—Another insect which caused a good deal of injury in Canada last year is known as the New York Plum Scale. The attention of fruit growers generally has been drawn to it because it has increased so rapidly in some of our orchards. Luckily for us in Canada, we have found that it is badly attacked by a natural parasite which has kept it down, but not sufficient to check it entirely so as to prevent loss. Thanks to the good work of Mr. Slingerland, of the New York State Agricultural College, it has been shown that by the application of kerosene emulsion this insect can be destroyed. In Canada, Mr. Fisher, of Queenston, and Mr. William Orr, of Fruitland, adopted this method of fighting it and found last autumn that they had stopped its ravages. In this way it is shown that we had a practical remedy for this insect also.

Speaking of scale insects, there is yet another one to which I desire to draw the attention of the Committee. It is rather hard to recognize it as a scale insect. It has the appearance of a little tuft of cotton wool, and occurs on grass. I do not know the extent of the injury caused by this insect, but from the fact that the meadows where it occurred had the appearance as if there had been a fall of snow; when the egg-sacks were formed, the injury cannot be great. It affects grass entirely and the only places where it has been reported in recent years, have been during the past summer on Cape Breton Island and in Nova Scotia.

An interesting fact with regard to injurious insects, which has been frequently noticed, is that no sooner does any one species become unduly abundant than it is almost invariably brought down to a normal occurrence by its natural parasite. This sample of the Cottony Grass Scale which I have here, came from Cape Breton, and during the winter I saw several parasites in the jar. I bring it to the attention of the Committee now so that the members may be able to recognize it, if unfortunately, it should appear in their locality, and they may then be able to notify the department of its occurrence. The remedy is a very easy one, these white bugs which you see on the grass are very conspicuous. They appear late in the autumn, and if the fields where it occurs are carefully burnt over so as to do no injury to the roots of the grass, and of course care being taken that the fire does not spread, the insect will be effectually destroyed. It was not brought to my attention sufficiently early last fall, in all cases, to burn over the grass, but I have recommended our Nova Scotia friends who have complained of it, to burn over the meadows in the spring, and in that way the insect will be destroyed.

By Mr. Carpenter :

Q. Do you find them more prevalent in a dry than in a wet season?—A. There is very little known about it. It has never occurred in injurious numbers, to my knowledge, before, but the report on the field was that the grass was light, and it was on high and dry land. The grass would be light from the large number of insects having fed on its juices during the summer.

By Mr. Pridham :

Q. Would that be in pastured fields?—A. Hay fields.

By Mr. Featherston :

Q. The insect must stay on the grass if it is killed by burning the grass over?—A. The insect passes the winter in the egg state, inside those bags to which I call your attention, during the winter. In fact, each of the white cottony bags is an egg sack, containing a large number of eggs.

Q. On the grass?—A. On the grass, yes, about two inches above the surface of the soil. It passes the winter in the egg state, so that it cannot move, and burning over the grass will destroy the whole of the eggs with the grass.

Black Peach-aphis.—During the past summer there has been one introduction into Canada of a rather serious nature, although we have been able, I hope, to check it and have not allowed it to spread, that is the well-known fruit pest, the Black

Peach-aphis of New York State, where it has done a great deal of harm. It belongs to the plant-louse family, and, as its name says, it is black. It does injury to both the roots and twigs of the peach tree. When occurring on the twigs and branches it is very easily treated with the well known standard remedy for sucking insects, coal oil and soap suds. When found at the root the difficulties of treatment are greater, because any applications to the surface simply drive the insects further down towards the young tips of the roots, and there they do injury by sucking out the juice, and prevent the young feeding rootlets from performing their proper functions.

Professor J. B. Smith, of New Brunswick, New Jersey, has tried very extensive experiments with kainit, and he has found where it is applied the insect has been checked and the tree very much invigorated and improved in health. The application he recommends is 10 lbs. to each tree, spread over the surface of the soil where it is dissolved by rain and washed into the soil. This is another instance showing how we have the advantage, in dealing with many of the imported insects, of the experience of our friends to the south, and are able to check them upon their first appearance, with the remedies which experience has shown to be best. Some of the orchards near Leamington where this trouble has occurred have been treated with kainit, and further applications will be made in the spring.

By Mr. Carpenter :

Q. Have you estimated the probable expense of the treatment?—A. That is a matter that will depend upon the demand for kainit. The cost has been high in Canada heretofore, because there has been a very small demand for it. During the last year it has been very largely used in New York State and it is used to some extent in Canada as a fertilizer, but the price varies. I do not know if Professor Robertson is aware of the present price.

Professor ROBERTSON.—I think the last quotation I saw was very much lower than formerly, about \$16 a ton.

By Mr. McGregor :

Q. Would not fresh ashes have the same result?—A. To some extent they would but they have not been found as effective as the kainit. They have been used and are certainly a wonderful fertilizer for the trees, but the results are not so satisfactory, as far as the insects are concerned, as those obtained from the kainit, which, if Prof. Smith's experiments are confirmed, are very remarkable.

HOUSEHOLD INSECT PESTS.

Moths.—Another branch of insect life that has been brought prominently forward during the past year is household pests. In Toronto there seems to have been almost a plague of carpet moths, and this is a subject that is of interest to everybody, because there are very few of us that have not had the annoyance of finding that our clothes have been destroyed by carpet moths, and to find out the best means to prevent this loss is a matter that is well worthy of consideration by all. The chief thing, really, I suppose, is to keep our eyes open and notice when the moths first begin to appear. Moths are beginning to occur now, and those of us who have not put away our winter furs and clothes had better do so as soon as possible and put them away in a tight receptacle, so that the moths cannot get at them to lay their eggs on them. The life history is so well known, and perhaps is well known to everybody here as to make it clear that the moth itself does no injury to our clothes; it is all done by the little caterpillars which come from the eggs laid by the female moths. The moths are naturally attracted by any material which will provide suitable food for their young. They lay their eggs on any cloth or any material made of animal substances. Our clothes are made of wool and these form proper food for these minute caterpillars. Cotton is a vegetable material, so that it

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is not attacked. Paper also is chiefly made of vegetable matter and as it is not attacked, any box or receptacle can be made moth-proof by simply pasting old newspapers on the outside. In this district I know of several of our farmers' wives who have adopted this method of putting away their winter clothes and fur robes; any old box or packing case will answer. If there are no eggs laid by the moths before the garments are put away, there certainly can be none laid afterwards, because no moths can get inside to lay eggs after the box or other receptacle has been pasted up, and the caterpillars which do the damage can only originate from eggs laid by the mother moths. The moths are only beginning to appear now and there is yet time to put the clothes away without fear of their being infested. Packing away clothes with camphor or that abominable malodorant called "moth camphor" will have no effect in destroying the moths after the eggs have been laid. It makes an unpleasant place for them to live in just in the same way as it does for ourselves, but it does not kill the caterpillars. Clothes should be shaken or beaten thoroughly and then put away in a box made moth-proof in the way I have mentioned.

By Mr. McGregor :

Q. Would you advise the use of tar paper for robes?—A. It will help.

Q. I have tried successfully for years and I have found tar paper the very best thing you can get?—A. It is a good deal more trouble and expense to get tar paper than ordinary newspaper.

Q. Moths are so susceptible to its influence?—A. Yes, it certainly is a good deterrent, but it does not matter how susceptible they may be to the odour, if the moths do not lay their eggs upon clothes and robes, no injury can be done.

Q. But I mean to wrap them in tar paper in boxes?—A. Certainly, it is very effective if it is done soon enough, but if the robes were not wrapped up until the eggs were laid, even that would not prevent them being injured.

Q. I would suggest the robes be thoroughly beaten out before putting away. Farmers lose so many by leaving it a little late in the season?—A. They do most certainly, and that is the chief point I wish to emphasize.

Q. But if they are thoroughly shaken up and put in the sun, and then wrapped in the tar paper, I think they will be entirely cleared of moths?—A. Yes, but if the eggs are hatched all the beating and putting in the sun would not have the effect of destroying them. You might beat many out and destroy many more by the heat of the sun, but if any were left, damage would be done. The chief thing is to do it soon enough, and to recognize that directly the winter is gone, woollen things and furs should be put away as soon as possible. If there is any doubt about eggs having been laid, it is a good thing to keep robes and everything else in a convenient place where they will be frequently seen, and not wrap them up too soon, but keep them shaken and beaten frequently for some time before putting them away, so that you can examine them and see if they are safe. A caterpillar does not come except from an egg laid by a moth, and no conditions or susceptibility of the material can produce a caterpillar unless the eggs have been laid. If we put off wrapping up clothes till late in the season, we are liable to have injury. The thing is to shake and brush things well, and then put them away carefully.

Carpet Beetle.—Another insect which has appeared rather strangely in Canada, and has lately spread alarmingly through the Brantford district and west to London, and from London to Toronto in considerable numbers, is a little beetle known as the "Carpet beetle" or "Buffalo moth" (*anthrenus scrophulariae*). I have said that it is strangely distributed, because the only other places I have heard of it besides those mentioned are at Fort McLeod, North-west Territory, and here at Ottawa. It is called a "moth," because it destroys clothes, as does the carpet moth. It is, however, really a little black beetle with conspicuous white and red marks on it; it is less than one-eighth of an inch long. It affects carpets where they are nailed down close to the skirting board, and particularly those carpets which have any red in them. Evidently the red dye has an attraction for the insect, for it will eat out the red and leave the rest of the colours untouched. I have seen an account of injuries

to carpets in which this insect is described as having cut out strips right through the middle, as if cut with a knife. Evidently there is something pleasant in the red dye which the insect likes. This little beetle has lately spread very much in Canada, and has been very troublesome. It has been called "the despair of good housekeepers," as even good housekeepers cannot keep it down without a good deal of care. The remedy which is recommended in the Washington division of entomology in regard to carpets which are infested is a good one. The plan there recommended is to spread damp cloths upon the carpets and iron them with very hot flat irons. This has the effect of generating steam, and sends it down into the cracks in the floor, and in this way the insect is killed in all its stages. Another remedy which may be mentioned is sprinkling the carpets freely with gasoline or benzine. Neither of these would injure the carpets, and they would certainly destroy the insects. As these materials are very dangerous from their inflammability, great care would have to be taken not to carry a light into the rooms where carpets had been recently sprinkled with either of these inflammable liquids, until the room had been aired.

Croton Bug.—Another troublesome household pest, abundant in some places, to which reference might be made, is the Croton bug or small "cockroach." It is a frequenter of many large mills, and is found in hotels which are heated with hot water. It sometimes does harm in eating off the surface of boots and gloves, or anything in which faced leather enters into the manufacture. I saw a pair of boots at an hotel in Brandon, Manitoba, the surface of which had been eaten off in patches, the same as if it had been pared off with a knife. The remedy is powdered borax, which if sprinkled round the edges of the room where the insects generally run, not only drives them away but kills many outright.

By Mr. Powell :

Q. What is the colour?—A. A grayish brown or dusty colour.

By Mr. Featherston :

Q. It is the regular cockroach?—A. It is the cockroach of this country. It is not the same as the cockroach which is found in England, and at some of our seaports, which is much larger. Under any circumstances they are nasty things to have about a house. They smell nasty, get into food and destroy many things. Borax has been found to be a successful remedy. Mr. Rosamond, M.P. for North Lanark, had them in his Almonte mills at one time. He wrote to me asking for a remedy and I recommended him to apply borax freely about the floors of the mills. This he has done and reports to me that the insects have quite disappeared. They will probably appear again at some time and will require a second treatment.

By Mr. McGregor :

Q. In Western Ontario we are troubled with an insect which bores the soft maple tree. I got Mr. Craig to look at it when he visited us. This insect is spoiling all our nice shade trees; thousands of them. It is very troublesome and is now affecting the ash?—A. Mr. Craig brought some specimens of the affected bark of the trees to which you refer, with him to Ottawa, but the grubs were all injured. They had become mouldy and I could not learn anything from them. I wrote to Windsor for more but could not get any further specimens. I have no doubt it is one of the borers well known to attack the maple. Nothing can be done except painting the trees with an alkaline wash to prevent the beetles from laying more eggs next year. The female beetles probably appear in June. If the trees were treated the same as apple trees are for borers, the eggs would not be laid and the injury could not occur. Generally when the holes are observed in the trees it is too late to remedy the evil, because the holes merely show where a fully developed beetle has emerged.

Q. We often find them between the bark and the wood?—A. That is where the chief injury is done.

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Q. I suppose dozens of trees in our district have been affected by them?—A. I wrote to a gentleman whose name was given me in Windsor, and asked him particularly for all information possible as to the extent of the injury, but I got no reply.

Q. About a foot in diameter is the size of a 15 or 20 year old tree?—A. There is nothing can be done except painting with an alkaline wash in the spring—the time the beetles occur so as to prevent the females from laying their eggs.

Q. The same wash you spoke of?—A. Yes; soft soap and soda.

Q. We put in a little coal oil?—A. I do not think that would have much effect. If you made any addition at all I think carbolic acid would be better. I say that coal oil would not have much effect for this reason: Where I have tried the ordinary kerosene emulsion for the peach bark-borer it had not the effect of keeping it away. The effect only lasted for a little while, the odour of the coal oil, seemingly, soon disappearing.

Q. I used a syringe to the hole?—A. Where you can find the hole you can get at it in that way. But that hole is merely where one insect has come out, and while you are syringing that, hundreds of other borers may be at work and you could not get at them. With apple borers you can detect their presence owing to the thinner bark of a young apple tree, but with this other borer you cannot see what is going on, owing to the thick, rough bark of the maple tree.

GRASSHOPPERS.

By Mr. Semple:

Q. Can you recommend anything to be done to check the grasshoppers which are doing a great deal of injury in Western Ontario?—A. We can adopt the methods which are pursued in the Western States where the grasshoppers occur every year. In Ontario we have not often had serious occurrences of grasshoppers year after year such as occur regularly in the Western States. Where we have them it will certainly pay us to follow the plan which they have in the West, and that is to make hopper-doers. These are light pans, containing at the bottom a coating of sticky material. These hopper-doers or pans are drawn over the fields before the young grasshoppers get their wings and gather them up by the bushful. The pans are very light and can be drawn over the field quickly by a single horse. In the States of Dakota and Minnesota they have to adopt this method of drawing pans or hopper-doers over their fields nearly every year, and they destroy the grasshoppers there by the thousands of bushels. In that way, only, have they protected their crops. On Sable Island, during the past summer, the injury was so severe that the government had, last autumn, to buy large quantities of hay—a thing they had never had to do before—on account of the grasshoppers having eaten all the vegetation, and particularly all the hay upon which the wild ponies would have subsisted during the winter. They had to buy, I think, 50 tons of hay to feed these animals during this winter. That is mentioned in my report for 1895, with a diagram of a hopper-doer. The only method of preventing grasshoppers is to take action early in the spring, say at the end of May, just at the time when the grass is beginning to shoot up, and the young ones first appear. You will then see large quantities of the young grasshoppers in the grass. The pans of which I have spoken can be drawn over the fields without any injury to the grass, and large numbers of grasshoppers and other insects injurious to grass will be destroyed. In vineyards and gardens such a method is not practicable. You can only poison them there with active poisons in the same way as you do other insects which bite their food. There is a mixture of bran and Paris green with sugar which has been used satisfactorily in vineyards in California. It is claimed the grasshoppers will eat it in preference to vegetation. The same remedy can be applied with more or less success in the case of the cut worm.

EXPERIMENTAL APIARY AT CENTRAL FARM.

At the request of the Chairman, I have brought with me to-day some honey produced at the Central Experimental Farm. The work carried on in the apiary has been done almost entirely by Mr. John Fixter, the Farm foreman, and it has been very satisfactory. He has carried out certain suggestions that I made, and that were made also by Mr. Holtermann, of Brantford, who has helped us in this work.

The annual report of the Experimental Farm last year contained a statement of these operations, and during the past summer further experiments have been carried on. Mr. Fixter has brought here to-day some samples of the different kinds of honey. He has also brought some sections of comb made in the apiary, and I think perhaps the most interesting experiments which have been carried out have been those with regard to different kinds of foundation. When the apiary started last year, Mr. Holtermann wrote and asked us if we would carry out some experiments with the different kinds of foundation. The central portion of the comb is formed from the foundation. The foundation is produced artificially and is supplied to the bees, thus saving them a large amount of labour, time and energy in producing the foundation which is then "drawn out," as it is called. The wax in the foundation is drawn out and extended until it forms the cells of the honey comb, such as I have in my hand. Now, according to the nature of this foundation, so is the comb which is produced, and I have here, in my hand, two sections of the comb which was made last summer by our bees and filled with honey. The honey has been extracted, and we have the empty comb for examination. I have here a piece of the artificial foundation similar to that we put into the section. This is cut to the size of the section and is put in the centre; the bees then draw it out from either side and fill it with honey. We have found by supplying this foundation that it saves the bees a lot of time and energy. They are working all the time and we are getting all the meat without any bone. They draw out the wax we give them and add to it very little, and the whole of their effort is then given to producing the honey. It takes about 10 pounds of honey to make one pound of wax, so that by every pound of foundation we give the bees, we save 10 pounds of honey, and therefore it is a paying operation to give them the foundation, and we have also found that it pays very decidedly to supply bees with the best foundation which is procurable.

By Mr. Featherston:

Q. That is a natural comb, is it not?—A. Yes, it is drawn out from the foundation.

Q. It is natural comb, not an artificial one?—A. No, it is a natural comb, but it was drawn out from the artificial foundation given to the bees to work on.

Q. It is done by the bees?—A. Yes, certainly; another advantage is that it is always much straighter and more even. It is stronger and easier to handle. If you give them a good foundation they build their comb and section, as it is called, straight, so that it is more easily marketed, but in the old basket hives the comb was irregular, and you had to cut it out in pieces and sell it by weight, and there was a great waste, so that in every way there is a great advantage in supplying a good foundation, and in following the newer methods adopted by bee-keepers.

By Mr. Carpenter:

Q. Is it a new idea?—A. No.

Q. It has been done for some time?—A. It has been done for years, but the question we are trying to solve is as to the character of the foundation that should be used. Mr. Holtermann pointed out that the nature of the foundation had a very appreciable effect on the sales of the honey, because if the foundation was dark coloured and gave a dark "fish bone," as they call it, that is the central portion, it would sell for a cent or two a pound less than if that were not showing. Now, the Central Farm honey combs which I have with me this morning, some are made from good foundations, and some from bad ones. But perhaps you will see the difference better from this photograph I hold in my hand.

Really, the experiment was to find out which was the best foundation, and whether it paid the farmer to buy a cheap foundation, or a superior one at a slightly higher price. We found that, as in many other things, the best foundation gave the most satisfactory results and paid the best in the end. You will see here from the samples I exhibit, two combs made from bad foundations and one made from the best, and you would readily notice the difference at a glance. It shows how much better it is to get the best foundation you can, because you get better results

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from it, and that idea is illustrated right through the investigation. In the experiments for the past year, there was one very interesting point came out. Mr. Shutt, our chemist, has helped us very much by making the critical examinations and measuring the combs made by the bees during the summer, and he found that the bees deposited a very much heavier comb to hold buckwheat honey than to hold clover honey, so that there was a great deal more waste labour with the buckwheat honey than the clover, and, moreover, it sold for a very much lower price.

By Mr. Featherston :

Q. Is it because the buckwheat honey is thinner?—A. Well, no, I would rather say it was thicker, to look at it. It certainly appears thicker, but as to the reason why the bees should make a thicker comb for buckwheat than for clover, we have not found that out. Here is a specimen of the buckwheat honey and of the clover.

By Mr. Cochrane :

Q. Do they make a heavier comb when you furnish the foundation?—A. The foundation is now supplied by all bee-keepers.

Q. But do I understand you that the bees make a heavier comb for the buckwheat with the foundation you supplied?—A. Yes. I said it was waste labour because they had to do more to produce a less valuable kind of honey than they would have had if it had been clover honey. These samples of the combs were prepared by Mr. Shutt, who washed out the honey to find out the exact weight, and carefully weighed it with his delicate scales in the laboratory, where every care was taken to have the experiment accurately carried out.

By Mr. Pridham :

Q. How is the apple blossom as a honey producer?—A. It is very good. It not only produces large quantities of honey, but it is much more attractive to the bees than any other plant at that time of the year.

By Mr. McGregor :

Q. Do you know anything about the new production of honey from sugar?—A. I have heard of it, although I have never seen it. Sugar, undoubtedly, is supplied by some bee-keepers to be stored away by their bees and then sold as honey. I think there is no doubt that it ought not to be allowed. It is an adulteration, look at it in the mildest way you can. If a sufficient quantity of sugar is supplied to the bees, they will carry it straight into their comb, and fill up the comb with it without it being digested or changed in character at all, so that it will merely be sugar deposited in the comb instead of honey. I believe the Bill to prevent adulteration in this way has passed, and that we shall soon have nothing that is adulterated sold in Canada at all. Canada will soon be a synonym for perfect excellence in everything.

WEEDS AS AFFECTING AGRICULTURE,—MOST NOXIOUS SPECIES.

There are just two other subjects which I would like to refer to if I have time, viz., weeds and grasses. I will only speak of them for a few minutes, because it is merely the general subject that I wish to touch on. A great deal of attention has been given during the past summer to the subject of weeds. I had the opportunity last summer of travelling through Manitoba and the North-west, and I was very much struck with the tremendous headway that weeds have made in that part of the country. The farmers, growing the same crop year after year, and that crop, wheat or grain, have allowed the weeds to increase year by year. By alternate husbandry many of the weeds would have been destroyed, but when the same crop is grown year after year, naturally the weeds in those crops will keep on increasing, and the state of infestation by weeds in Manitoba and some parts of the North-west is a most serious matter to-day.

By Mr. Featherston:

Q. Do those weeds grow in the crops or after the crop comes up?—A. Both. A weed that ripens before the crop ripens drops its seeds on the ground year by year and causes great trouble by steadily increasing. Those that are cut with the crop are easily handled, but some of them ripen their seed before the crop is cut and thus they keep on increasing.

Q. What are they?—A. There are many and some of them most aggressive and serious enemies: tumbling mustard, hare's ear mustard, wild mustard, ball mustard, false flax, wild buckwheat, wild oats and many others.

Q. They have no rag weed?—A. Yes, indeed, they have in several places.

Q. The farmers say it is a great advantage to have it, because they plough it down as a green crop in the fall?—I have not much faith in that mode of treatment. I have seen it grow eight and ten feet high in the Southern States, and when once I asked a farmer in Virginia why he did not cut it, he smiled on me as an ignoramus, said: "why, that is my manure for next year." But the miller who gets rag-weed seed in his wheat will tell you that this weed gives him the greatest trouble of all. The seeds are just about the same size as the grain of wheat, and the Keewatin Milling Company say that this is the weed they like least of all the many kinds of which the seeds appear among wheat.

By Mr. Pridham:

Q. Are they much troubled with the Russian thistle?—A. The Russian thistle occurs only in Canada along the southern borders of the Northern Pacific Railway in Manitoba and every effort is being made by the railway company to destroy it. If farmers in Manitoba and the North-west did one-quarter as much as the Northern Pacific Railway Company has done to keep down the weeds, it would be a great thing for Manitoba. The railway company recognized the fact that they are accused of having brought this weed in, and they have certainly made every possible effort to destroy it. I was along the railway last July, and I saw a gang of men going along from Brandon to Winnipeg right through, to stamp out this weed, and not only the Russian thistle, but any other dangerous weed, wherever it might occur along the line. They were mowing and keeping the weeds down all along the line and giving a grand object lesson to the farmers in the neighbourhood. I understand, too, that they did not do this spasmodically but regularly all the time, and it would be a good thing if the farmers would follow their example. I think probably the Russian thistle scare is one of the best things for Manitoba that has ever happened, because, it has awakened the farmers there to the fact that they have got to do something with their weeds, and that they are menaced by a great danger. I detected for miles and miles, as I went along the Northern Pacific Railway the worst weed ever introduced into Manitoba and the North-west—Tumbling Mustard, which was first introduced, it is alleged, about Indian Head. During the past summer this was allowed to get such headway out there on the big Brassey farm, that they actually mowed down and ploughed 1,500 acres out of 2,000 and got no crop from it. The rest of the farm was kept sufficiently clean to get a crop, but this 1,500 acres they lost altogether. I asked Mr. Robert McKay, of Indian Head, to make a photograph for me of a large specimen, and here is a picture of that sample, it was three feet high and two feet across.

Tumbling Mustard has now spread all over that country round Indian Head, so that when you look out of the window as you pass by in the train, the country is just one sea of yellow with it. The trouble is that the farmers are not doing nearly as much as they ought to be doing to keep it down. Some told me I was running down the country by drawing so much attention to this weed. I reply to this: "It is absurd to talk like that. My duty is to call your attention to this, or any other dangerous enemy and make as much of it as I can." It has spread for miles and miles up there and also Southern Manitoba is now a sea of tumbling mustard, over hundreds of thousands of acres where this weed has been allowed to spread, and for a very trivial reason.

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Tumbling Weeds. We have in Canada a weed called "tumbling weed, one of the pig weeds, which does very little harm. At the end of the season the dried up plant bearing its ripe seed separates from the ground and "tumbles," or is rolled along over the prairie by the wind and that is how it gets its name.

By Mr. Featherston :

Q. It is a kind of soft grass?—A. It is rather a soft thing in its earlier stages, but it gets very hard when it is ripe. It does very little harm because it develops late in the year and the farmers in this part of the country are not troubled by it at all. When the farmers in the North-west were warned about the weed, which I have spoken of, which I have called "tumbling mustard" but which was also called "tumbling weed," they said "Oh, it is only tumbling weed, that won't do any harm." I was talking to a farmer about it in the west, and I spoke of it as "tumbling mustard." He said, "Oh, well, if it is a mustard we have got to see to it." This showed me how much there was in a name, and I have called it mustard ever since. Three years ago, I sent to Mr. McKay, our superintendent at Indian Head, for a large seeding specimen, and we found by actual count that there were over half a million seeds borne by that single plant. The seeds are held sufficiently tight in the pods when the plant is blown across the prairie for the seeds to be dropped only a few at a time. I have no doubt that a dry plant of this tumbling mustard could be blown a hundred or a hundred and fifty miles over the snow and leave a trail of seed behind it all the way. It has spread now, as I saw myself, more than twenty miles from the railway in one direction.

By Mr. Pridham :

Q. It is an early plant, is it not; it comes early in the season?—A. Yes, it comes early in the season, like the other mustards.

By Mr. McGregor :

Q. Would not ploughing and summer fallowing have overcome it?—A. Yes, it would if they had attended to it at once.

Q. When this little old-fashioned mustard gets in, it is very hard to remove, but by ploughing and summer fallowing it can be removed largely?—A. It is the great extent of the farms and the comparatively small number of settlers in that part of the Dominion which is the difficulty, also the vast area of prairie over which the tumblers can be blown without meeting any obstruction. Wherever there is a badger hole, or an unevenness of the ground, the seeds are left there, and if they get to a cultivated spot the plants spring up vigorously. I saw it at Fort Qu'Appelle and other places north of that. By this habit of blowing and tumbling across the prairie, it has a great means of spreading.

Hare's ear Mustard. There is also another weed in the west, the Hare's-ear mustard, which is going to be one of the worst pests they have had in the North-west, unless they at once set to work to get rid of it. It is not a tumbler, but is very troublesome in binding grain, and also chokes out grain crops. I procured, from the Keewatin Milling Company, of Rat Portage—a very large company—which receives grain from many districts, about thirty or forty samples of seeds from as many different localities, and made a critical examination of them. Only in one of these samples did I find a few grains of the tumbling mustard. The reason was this: The seeds were so small that the ordinary methods of cleaning were effective, but with regard to the Hare's-ear mustard, the seeds are larger and not so easily cleaned. The small seeds of tumbling mustards, however, would not appear among the small grain and larger weed seeds, but would be left with the dust and rubbish where the grain was threshed.

There was one point with regard to weeds, which I found was not sufficiently recognized in Manitoba and the North-west. There is no doubt what a marvellous country we have there for the production of grain crops. We should have the mag-

nificent crops like we had last season, every year, if—that little “if”—the rainfall and snowfall were always sufficient, that is, just a little heavier every year. Now, then, one of the great injuries weeds do to a district, is to pump up the moisture out of the earth and give it out by evaporation through their leaves. The Hare's-ear mustard has big leaves, as large as my hand, and these plants are continuously pumping up the moisture from the soil and evaporating it through their leaves. Yet while this is well known, farmers, many of them at least, do not recognize the importance of keeping the weeds down, if only to prevent the moisture from being drawn from the land. If the land was cleared of those coarse succulent weeds they would be able to save, at any rate, the amount of moisture they use up to help to grow good crops. This should be an inducement to the farmers of the North-west to use greater efforts to get rid of the weeds. Mr. Richard Waugh, of Winnipeg, was the only man I met in the west who realized the importance of this aspect of the value of keeping down weeds on account of the moisture which they extract from the soil. What a difference it would make to the whole Dominion if all our farmers in the North-west could be got to realize the importance of keeping the weeds down, if only to save the large amount of moisture they take from the soil. Figures could be easily given of the amount of moisture extracted by different trees and plants, but it would not be advisable to detain the committee now.

DURATION OF VITALITY IN SEEDS.

By Mr. McMillan :

Q. Has the seed of the tumbling mustard as much vitality as the common mustard with us?—A. We do not know sufficient about it to answer that question. It has only been in the country six or seven years. In Nova Scotia, from one experiment which came under my observation, I know that the seed of the ordinary wild mustard or cadluck will live for 20 years at least without being injured. Colonel Blair, the superintendent of the Branch Experimental Farm at Nappan, told me that, when a boy, his father's farm was infested with cadluck. His father determined to clear the farm and year by year had every spear of it taken up and buried six feet deep in a marsh, so that the farm was at last made a perfectly clear farm; not a spike of mustard was to be seen. Twenty-one years after the farm was sold, the whole farm burst out suddenly into mustard again. It was such a strange thing that it drew forth much comment and the question naturally arose as to how it occurred. It is well known in Nova Scotia that they get alkali as a fertilizer for their land by digging marsh-mud. The purchaser of the farm had dug his marsh-mud from where the mustard had been buried 21 years before, at any rate. So you will see that the mustard seeds had retained their vitality all this time and possibly longer, because the seeds which grew when exposed to the air by being spread on the land may have been buried some years before the period of 21 years which had intervened since the farm was sold.

While, of course there are a great many instances reported of the longevity of seeds, this is an actual fact. In artificial treatment we have never been able to keep seeds of any kind longer than about 20 or 25 years. Statements are frequently made in newspapers and elsewhere about mummy wheat. I suppose I have been shown a hundred times, to be moderate, different kinds of plants that were stated to have been grown from seeds taken by some man's father or some other reliable authority out of a mummy. Now, unpleasant as it is to say so, not one of the statements was true, although those who made them may have thought so. People sometimes reflect upon a certain matter or statement they have heard and talk it over until they actually begin to believe it to be a fact they have witnessed, but there was never a grain of wheat or any other seed taken out of an old Egyptian mummy that has ever been grown. Yet, probably, all of us have been shown, all over the world, wheat said to have been grown from grain taken from a mummy. The Royal Society of England some time ago conducted some very careful experiments, and I think, if I remember rightly, that beans retained their vitality longest of any seeds; I think for these it

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was about 40 years and the average of others was 20 to 25 years. Since I have been at the Experimental Farm I have had samples of "mummy" wheat sent to me from different parts of Canada. I made this statement at a farmers' meeting last year and a gentleman got up in the audience and said, "I have got some wheat, at any rate, that is 40 years old, and you can try that and see if it will not grow." Well, it did not grow, and I do not think you will ever get wheat or any other grain of that age to grow. But weed seeds in the state of nature buried deeply in the soil will certainly last much longer than by any method of artificial preservation. I have a suspicion, too, that the stories about wild goose wheat having been taken out of the crop of a wild goose, are very much of the same nature as mummy wheat. Any curious kind of wheat is liable to have the wild goose story tacked on to it—particularly the very strange looking Polonian wheat.

By Mr. McGregor :

Q. I have seen an old meadow turned over after a lapse of ten years and the mustard came up freely afterwards?—A. Yes, I have no doubt of that. I think, too, that weed seeds or any other seeds, buried deeply in the soil will germinate when the soil is turned up and exposed. We know that in destroying weeds one of the best methods is to scarify or cultivate lightly the surface of the soil, so as to bring those seeds that are a little too deep to germinate to the surface, when they will get air, light and moisture. They will germinate at once, and should be ploughed or cultivated down immediately.

Q. In the west, after the first crop is taken off and the land is left idle, it frequently happens that in two or three years the grass will come up and kill the weeds?—A. Naturally the grass will come back to the land and destroy the weeds. Many of the grasses are perennial and have strong running rootstocks by which they increase rapidly, and they would, in that way, produce again the old prairie which existed beforehand.

By Mr. Carpenter :

Q. Can you account in any way for the mustard seed lying in this marsh you speak of for 20 odd years without its productive qualities being destroyed? It seems something remarkable to me, seeing that it was a moist place. Considering that it was moist all the time one would suppose that the seed would rot and become perfectly harmless?—A. I think the reason that the mustard seeds retained their vitality so long, is that they contain a large quantity of oil. This is a well-known fact, as any one can find out by crushing them.

Q. I think there must be something in that. Any other seed would be destroyed in a very short time?—A. Then it must be remembered that it was six feet deep, and the seeds would not be subject to changes of heat and cold, and would get very little air.

By Mr. Powell :

Q. Then there is a remarkable preservative power in the marsh mud. The fence posts sunk in the marsh never rot. The remains of the old French tramway down there are still preserved as perfect as ever. There may be something in that?—A. Yes, that is very true; it certainly was a remarkable occurrence. It was not that a few plants grew, but the whole farm sprang out with mustard, so that it seems likely that most of the seeds were preserved.

By Mr. McGregor :

Q. I do not think it uncommon at all. I have known case after case where mustard has been turned down for 10 or 15 years, and has come up again as strong as ever?—A. Yes. I believe it is frequently so, but the point Mr. Carpenter brought out was that of it lying in the wet mud all that time.

PRESERVATION OF BEES IN WINTER.

Mr. Fixter has reminded me of one thing I had forgotten to mention. That is that we are carrying on an interesting series of experiments on wintering bees. One of the great difficulties of keeping bees is the winter, and we are carrying on, this year, a series of experiments in wintering them, in addition to the other to which I alluded. There are some 8 or 10 experiments with bees out of doors and in the cellar which are all detailed in the annual report, and which, I think, will be of interest to the bee-keepers. Of course I need not say here to any of the Members of Parliament that we are always very much pleased to see any one that will come and visit the different departments. During the past summer a great many people showed their interest in bee-keeping by visiting the apiary and seeing for themselves what is being done. They have given us suggestions and we have been able to give much information in return.

By Mr. McMillan :

Q. How do you preserve the bees during the winter?—A. We are trying several experiments with regard to that. I am afraid I am rather a heretic among the bee-keepers, but it may be that I do not know anything about it, but I think it is worth following up an idea I have. The method of wintering the bees in the past has been to keep them as warm as possible. They say: "You must keep your bees indoors in winter and keep them nice and warm and comfortable," and all that sort of thing. Of course, my opinion may be very far wrong, simply because I do not know much about bees, but my idea is that the right line is quite in the opposite direction. All the efforts of bee-keepers in the past have been to keep the bees warm. Now, I am trying to keep them as cold as I can. I know that I have had in my office two bees which stood 20 degrees below zero without any protection at all. They crawled out of the combs which had been put in a cold open shed to destroy bee-moth grubs. These combs were put in a very cold dry shed for this special purpose and these two bees it was found had crawled into the combs. They must have been kept in that shed for about a week, during which the thermometer was below zero all the time, and for two days touched 20 below zero. When the combs were brought in they were noticed and pulled out with a pair of forceps. I kept them in my office, where it was, of course, warm. The next day they were sufficiently recovered to sip honey and water from my fingers. From that circumstance, I am led to the conclusion that bees will stand much more cold than is supposed, and I think the nearer we can bring the conditions of our hives to those in which wild bees pass the winter, the more successful we shall be.

By Mr. McGregor :

Q. They will hardly stand the cold, if the Chairman's Bill, now before the House, prevents us from feeding them with sugar in the fall?—A. We will feed them with honey then. I think our bees have been very successfully wintered by Mr. Fixter. As to other things, I have followed the general methods. As to weight, I have tried to get them as near as possible to 50 pounds per hive or colony when put in the cellar for the winter, and we have had no trouble in wintering them. Last winter we lost only one colony, and we could not find out what the cause of this was. It was probably a weak colony or may have had no queen. Mr. Fixter, who has the practical management of the apiary, is here to-day, and I am sure he would be glad to give you any further information that members might ask for with reference to this matter.

Q. We have been keeping our bees for some years in the house?—A. Yes; that is a common practice.

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Mr. JOHN FIXTER, Experimental Farm Foreman, called and examined.

By Mr. Carpenter :

Q. This is a new experiment, is it not; I think you have only been keeping bees about a year?—A. Two years.

By Mr. McGregor :

Q. How many hives have you?—A. About 23.

Q. And what is about the average of the honey taken at the time?—A. Last year we had \$97. That is about 54 pounds to the hive.

Q. Fifty-four pounds to the hive?—A. Yes.

Q. And how many new colonies did you start of the 23?—A. In the spring we had 15.

Q. Fifteen new colonies?—A. Yes. The \$97 worth of honey is what we sold and then, of course, these sections which have been kept for experimental purposes are not included in that at all.

Q. Then you had about \$100 of honey from 23 hives?—A. About \$110 worth I think.

Q. \$7 a hive is considered a good product?—A. Yes.

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

JAMES FLETCHER.

Entomologist and Botanist of the Dominion Experimental Farms.

