

**CIHM
Microfiche
Series
(Monographs)**

**ICMH
Collection de
microfiches
(monographies)**



Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

© 1997

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

- Coloured covers / Couverture de couleur
- Covers damaged / Couverture endommagée
- Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- Cover title missing / Le titre de couverture manque
- Coloured maps / Cartes géographiques en couleur
- Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- Bound with other material / Relié avec d'autres documents
- Only edition available / Seule édition disponible
- Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- Additional comments / Commentaires supplémentaires:

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- Coloured pages / Pages de couleur
- Pages damaged / Pages endommagées
- Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- Pages discoloured, stained or foxed / Pages décolorées, tachetées ou piquées
- Pages detached / Pages détachées
- Showthrough / Transparence
- Quality of print varies / Qualité inégale de l'impression
- Includes supplementary material / Comprend du matériel supplémentaire
- Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- Opposing pages with varying colouration or discolorations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below / Ce document est filmé au taux de réduction indiqué ci-dessous.

	10x		14x		18x		22x		26x		30x	
									✓			
	12x		16x		20x		24x		28x		32x	

The copy filmed here has been reproduced thanks to the generosity of:

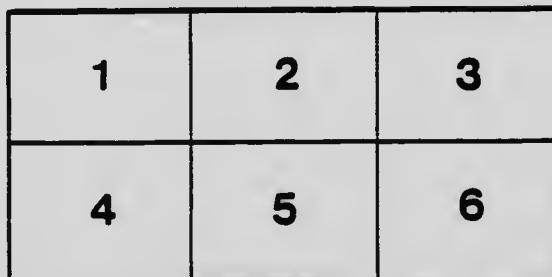
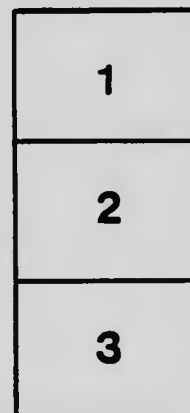
Library
Agriculture Canada

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche sheet contains the symbol \rightarrow (meaning "CONTINUED"), or the symbol ∇ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:



L'exemplaire filmé fut reproduit grâce à la générosité de:

Bibliothèque
Agriculture Canada

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

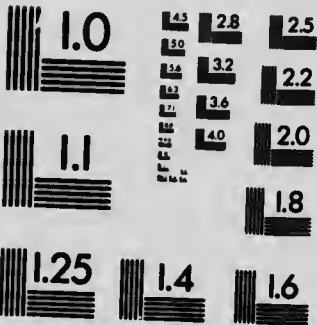
Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier feuillet et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second feuillet, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole \rightarrow signifie "A SUIVRE", le symbole ∇ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc

1653 East Main Street
Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

DOMINION OF CANADA.
DEPARTMENT OF AGRICULTURE.
EXPERIMENTAL FARMS.

J. H. GRIDALE, B. Agr.,
Director.

H. T. GÜSSOW,
Dominion Botanist.

DIVISION OF BOTANY

THE CONTROL OF POTATO DISEASES

BY

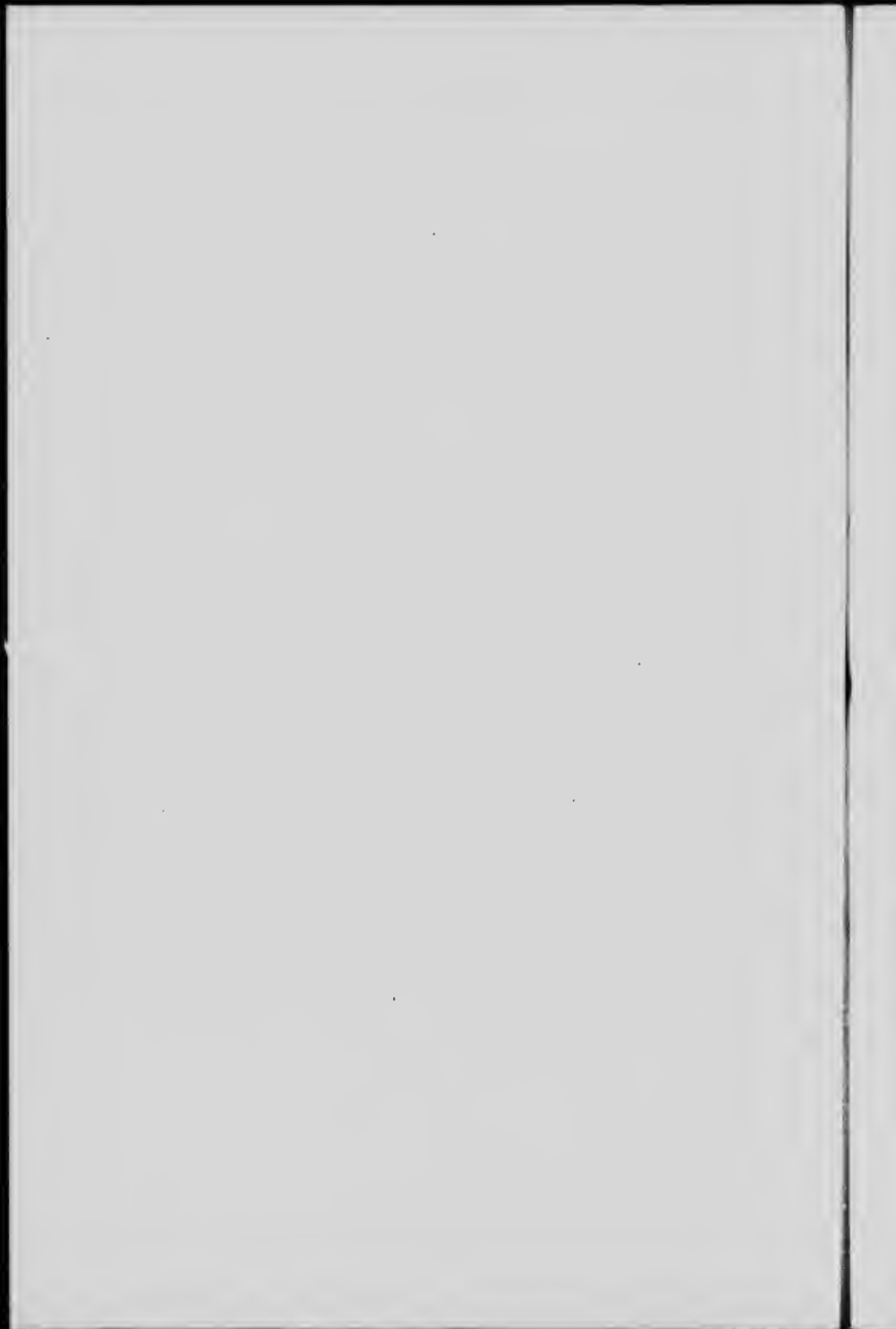
H. T. GÜSSOW,
Dominion Botanist.

CIRCULAR No. 9.

Published by authority of Hon. MARTIN BURRELL, Minister of Agriculture, Ottawa, Ont.

OTTAWA
GOVERNMENT PRINTING BUREAU
1915

76198



THE CONTROL OF POTATO DISEASES.

85

H. T. Güssow, *Dominion Botanist.*

It is a difficult matter to give an actual estimate of the annual losses for the Dominion, due to plant diseases affecting the potato crop. Judging from a considerable number of cases, the total loss must be enormous in some years particularly.

The loss from the so-called "storage rots" amounted in some cases to 40 per cent. The yield, owing to the use of diseased seed, as far as can be judged from "misses" in the fields, has been occasionally reduced by some 30 per cent, and diseases affecting the growing plant may also cause considerable damage to the crop.

In order to prevent such loss and make the cultivation of potatoes more profitable, it is necessary to strictly follow certain lines laid down for the elimination of diseases, when it is reasonable to expect that the diseases will be eventually exterminated or reduced to a minimum. Any objections a farmer may have to carrying out the following suggestions will disappear when he finds from experience that their observance results in a greatly increased yield and higher profits to himself.

A. The Diseases of the Seed Tuber.*

1. The presence of the following diseases or insect pests, scheduled under the "Destructive Insect and Pest Act" of the Dominion of Canada shall disqualify any lot of potatoes for seed purposes, viz.: Potato Canker, Powdery Scab and Potato Tuber Moth.**

Potato Canker is not known at present in Canada.

Powdery Scab occurs in the Maritime Provinces; no cases of this disease have been observed west of the province of Quebec. In order to prevent the dissemination of this disease, all potatoes grown in the "infested area" are being officially inspected and certified before shipment.

All bags or other containers of "First Grade Potatoes" will contain inspected potatoes that were grown in the infested area, from seed not infected by powdery scab and on land that has not previously produced an infected crop. Only potatoes so certified may be safely used for seed.

The Potato Tuber Moth is not known to occur in Canada. Information concerning same may be secured by writing to the Dominion Entomologist, Department of Agriculture, Ottawa.

2. Potatoes entirely free from all diseases or blemishes are the ideal potatoes for seed purposes.

3. When selecting potatoes for planting, all bruised, decayed, externally diseased or unsound tubers should be removed.

* Attention is here directed to Farmers' Circular No. 4 entitled "Potato Diseases transmitted by the use of unsound seed potatoes," which shows the more common diseases of the potato tubers in natural colours, and which will be found useful for references when reading these lines. Copies may be obtained free of charge from the Publication Branch, Department of Agriculture, Ottawa.

** See Circular No. 6 entitled "Regulations under the Destructive Insect and Pest Act" governing the importation, sale, shipment and exportation of the Common or Irish Potato (*Solanum tuberosum* L.). For copies apply to the Dominion Botanist, Experimental Farm, Ottawa.

4. Tubers showing Common Scab should, preferably, be all removed. The chances are that scabby seed will produce a scabby crop. (See Note 2.)

5. After the first two applications have been made, we continue spraying regularly seed should be soaked in bags or bulk for three hours in a solution of bichloride of mercury, 1 part in 2,000 parts of water. After treatment, spread out and dry. (See Note 1.)

6. When dry, cutting the potatoes for "sets" will commence. Provide each person engaged with a potato knife, and keep a number of knives in a wooden pail containing a solution of 1: 1000 bichloride of mercury.

7. The stem end of the tuber is the seat of several internal diseases. Cut a thin slice off the stem end of each potato; if perfectly sound and free from brown streaks, rings or spots, continue cutting it up to required size.

8. Discard at once all tubers showing discolouration, when cut as above, at the stem end, and throw out those showing any kind of spotting inside, though the stem end itself may have shown no disease.

9. Having used the knife on a tuber showing any kind of discolouration inside, throw it at once into the disinfecting solution, and take out another knife before cutting up a new tuber. A knife that has cut through a diseased tuber conveys certain diseases to the new tuber, hence it is very important to change the knife after having thrown out a diseased tuber. It is waste of time to cut out brown spots and use the rest of the tuber.

After following these precautions, everything has been done to eliminate diseases conveyed by unsound seed potatoes. The sets are now ready for planting.

B. Disease-infected Land.

In the case of Powdery Scab and a number of other potato diseases, the causal organism persists in the soil for a number of years; it is, therefore, necessary to avoid too frequent succession of potato crops. Ordinarily potatoes should not be grown oftener on the same land than every fourth year. Where Powdery Scab has existed, it is advisable to change to land that has not previously produced a diseased crop of potatoes. The infected land may be used for any other crop with the exception of potatoes. (See Note 2).

C. The Diseases of the Growing Plant.

The recognition of diseases noticeable only in the growing plant will invariably be most difficult. Where doubt exists, a specimen showing the suspected trouble should be mailed to the Dominion Botanist for his advice, but, generally speaking, careful attention to the elimination of disease in the seed tubers will have largely reduced the disease affecting the growing plant. Farmers should make it a rule to immediately remove any individual hill that may show signs of yellowing, curling-up of leaves or otherwise feeble growth, as well as any individual plant with flowers of a different colour from the rest, in order to keep varieties pure.

D. Spraying (See Note 5).

1. Spraying is practised for two main reasons: First, to control the Colorado Beetle; and, second, to control Late Blight. There are other minor reasons.

2. Experiments have shown that several solutions will destroy the Colorado Beetle, but the solution acting most rapidly is the one to use.

3. Spraying must be done thoroughly. All plants, and all parts thereof, must be well covered. A plant with one half sprayed and the other half missed will have the unsprayed part eaten off by the beetles very quickly. This will leave enough beetles to continue the pest. One spray thoroughly applied is better than several carelessly applied.

Circular No. 9.—Experimental Farms.
"THE CONTROL OF POTATO DISEASES."

ERRATUM.

Transpose first line section 5, page 4, and first line section 5, page 5.

Four pounds of lime or more, if necessary (See Note); 6 pounds Sulphate of Copper, 12 ounces Paris green, 40 Imperial gallons of water.

6. Do not spray on very windy days. Spray early in the morning, or commence two hours before sunset. Postpone spraying in unsettled weather, but spray thoroughly particularly after a period of rain.

E. Storing Seed Potatoes.

1. Avoid bruising tubers through careless digging.
2. Remove all bruised, damaged or frost-touched tubers before placing potatoes in storage, else decay is likely to follow.
3. Before the potatoes are being stored over winter in cellars or other storage places, clean same thoroughly, removing all refuse and dirt left over from last year. Whitewash floors, walls and ceilings with a fresh lime wash containing one pound of bluestone in every fifteen gallons of wash.
4. Storage places should be dry, well ventilated and cool. The temperature should be uniform and not below 33° F. and not above 38° F. Store potatoes in bulk, not in barrels or bags. Providing the tubers were mature when harvested, the loss in storage amounting sometimes to more than one-third of the crop, will be greatly, if not entirely reduced, if the above conditions are fulfilled.

NOTES.

1. Using Bichloride of Mercury.

Bichloride of mercury is a deadly poison. While treating or drying treated potatoes and when disposing of used solution, keep all farm animals away.

1 pound of bichloride will make 200 Imperial gallons of solution. The crude bichloride of mercury dissolves very slowly. Prepared bichloride, ensuring rapid solution, is costly. Use crude bichloride and reduce it by grinding to a fine powder, care being taken not to inhale the dust from the chemical. When one pound has been pulverized, divide it roughly into 16 equal parts. Provide many old bottles (white glass preferable); put one part of the powder into each, and fill them up with hot water. Shake or roll them about occasionally until dissolved. The contents of each bottle added to 12½ gallons of water will make a solution ready for use.

200 gallons of solution will suffice for the treatment of about 40 bushels of potatoes.

Use solution only once. Formalin vapour and formalin solution are often recommended, but bichloride of mercury has given the best results all round.

2. Stable Manure and Artificial Fertilizers in Relation to Common Scab.

From the disease point of view, stable manure should not be used for potatoes. This is likely to result in a scabby crop, which is largely averted by the use of fertilizers. When there is a lack of humus in the soil, an application of crumbled peat will be found useful. This will also retain the moisture in light soils.

8. Discard at once all tubers showing discolouration, when cut as above, at the stem end, and throw out those showing any kind of spotting inside, though the stem end itself may have shown no disease.

9. Having used the knife on a tuber showing any kind of discolouration inside, throw it at once into the disinfecting solution, and take out another knife before cutting up a new tuber. A knife that has cut through a diseased tuber conveys certain diseases to the new tuber, hence it is very important to change the knife after having thrown out a diseased tuber. It is waste of time to cut out brown spots and use the rest of the tuber.

After following these precautions, everything has been done to eliminate diseases conveyed by unsound seed potatoes. The sets are now ready for planting.

B. Disease-infected Land.

In the case of Powdery Scab and a number of other potato diseases, the causal organism persists in the soil for a number of years; it is, therefore, necessary to avoid too frequent succession of potato crops. Ordinarily potatoes should not be grown oftener on the same land than every fourth year. Where Powdery Scab has existed, it is advisable to change to land that has not previously produced a diseased crop of potatoes. The infected land may be used for any other crop with the exception of potatoes. (See Note 2).

C. The Diseases of the Growing Plant.

The recognition of diseases noticeable only in the growing plant will invariably be most difficult. Where doubt exists, a specimen showing the suspected trouble should be mailed to the Dominion Botanist for his advice, but, generally speaking, careful attention to the elimination of disease in the seed tubers will have largely reduced the disease affecting the growing plant. Farmers should make it a rule to immediately remove any individual hill that may show signs of yellowing, curling-up of leaves or otherwise feeble growth, as well as any individual plant with flowers of a different colour from the rest, in order to keep varieties pure.

D. Spraying (See Note 5).

1. Spraying is practised for two main reasons: First, to control the Colorado Beetle; and, second, to control Late Blight. There are many minor reasons.

2. Experiments have shown that several solutions will destroy the Colorado Beetle, but the solution acting most rapidly is the one to use.

3. Spraying must be done thoroughly. All plants, and all parts thereof, must be well covered. A plant with one half sprayed and the other half missed will have the unsprayed part eaten off by the beetles very quickly. This will leave enough beetles to continue the pest. One spray thoroughly applied is better than several carelessly applied.

4. We recommend two special applications for beetles: one when the plants are from four to six inches high, to be followed by another from one to two weeks later. The interval between the sprays will naturally vary according to the severity of attack. The solution we use and recommend is made up as follows:—

8-10 ounces of Paris Green, 14-2 pounds arsenate of lead to 40 Imperial gallons of water. (See Notes 3 and 4.)

This solution adheres satisfactorily to the foliage and controls the ravages of the beetle. Spraying will generally commence towards the 1st of July.

5. After having removed all externally diseased and otherwise injured tubers, the once every two weeks right up to harvest time, using "poisoned" Bordeaux mixture of the following composition:

Four pounds of lime or more, if necessary (See Note 5); 6 pounds Sulphate of Copper, 12 ounces Paris green, 40 Imperial gallons of water.

6. Do not spray on very windy days. Spray early in the morning, or commence two hours before sunset. Postpone spraying in unsettled weather, but spray thoroughly particularly after a period of rain.

E. Storing Seed Potatoes.

1. Avoid bruising tubers through careless digging.

2. Remove all bruised, damaged or frost-touched tubers before placing potatoes in storage, else decay is likely to follow.

3. Before the potatoes are being stored over winter in cellars or other storage places, clean same thoroughly, removing all refuse and dirt left over from last year. Whitewash floors, walls and ceilings with a fresh lime wash containing one pound of kieselguhr in every fifteen gallons of wash.

4. Storage places should be dry, well ventilated and cool. The temperature should be uniform and not below 33° F. and not above 38° F. Store potatoes in bins, not in barrels or bags. Providing the tubers were mature when harvested, the loss in storage amounting sometimes to more than one-third of the crop, will be greatly, if not entirely reduced, if the above conditions are fulfilled.

NOTES.

1. Using Bichloride of Mercury.

Bichloride of mercury is a deadly poison. While treating or drying treated potatoes and when disposing of used solution, keep all farm animals away.

1 pound of bichloride will make 200 Imperial gallons of solution. The crude bichloride of mercury dissolves very slowly. Prepared bichloride, ensuring rapid solution is costly. Use crude bichloride and reduce it by pounding to a fine powder, care being taken not to inhale the dust from the chemical. When one pound has been pulverized divide it roughly into 16 equal parts. Provide as many old bottles (white glass preferable); put one part of the powder into each, and fill them up with hot water. Shake or roll them about occasionally until dissolved. The contents of each bottle added to 12½ gallons of water will make a solution ready for use.

200 gallons of solution will suffice for the treatment of about 40 bushels of potatoes.

Use solution only once. Formalin vapour and formalin solution are often recommended, but bichloride of mercury has given the best results all round.

2. Stable Manure and Artificial Fertilizers in relation to Common Scab.

From the disease point of view, stable manure should not be used for potatoes. This is likely to result in a scabby crop, which is largely averted by the use of fertilizers. When there is a lack of humus in the soil, an application of crumbled peat will be found useful. This will also retain the moisture in light soils.

3. Arsenate of Lead.

Use "Swift's" arsenate of lead; it comes in kegs in form of a soft paste. It readily dissolves with stirring.

4. Paris Green.

One pound packages are very handy. It does not dissolve, and should be held in suspension by constant agitation. Paris green is a deadly poison.

5. Preparation of Bordeaux Mixture.

1. Slake a quantity of quicklime in one or more barrels and fill them with the paste almost to the top, keeping the lime covered with water—or the lime surface will dry up and become lumpy and interfere with straining.

2. Prepare a "stock solution" of Bluestone (Sulphate of Copper) in such concentration that, when using one gallon of (stirred) mixture, 1 pound of the chemical in solution is contained therein. To do this, dissolve 2 pounds of sulphate of copper in 2 gallons of hot water, and empty the two gallons into a barrel; repeat the process until you have one or two barrels full with the "stock solution." If you take for use one gallon of "stock solution", you will have 1 pound of copper sulphate.

Procedure when making 40 gallons Spray of the Required Strength.

To make 40 gallons spray, you will require 6 pounds of copper sulphate with an "excess" of lime, i.e., an amount sufficient to prevent injury to the leaves. Therefore, have a barrel containing some 33 gallons of water, and add to this 6 gallons of the sulphate of copper "stock solution" (or 6 pounds of dissolved chemical). Next, add a quantity of lime paste with a shovel and stir well until dissolved. When dissolved, use a testing fluid to ascertain excess or deficiency of lime. The "test solution" is as follows—

One-half ounce potassium ferrocyanide (poison!) dissolved in one-half pint of water. Fill this solution into a dropping bottle.

Having added and dissolved the lime in the copper sulphate solution, as described above, stir well the contents of the barrel and allow one minute to settle, then drop a few drops of "test solution" into it. If these, on striking the surface, colour the liquid brownish, add more lime, stir until dissolved and test again; if the mixture does not change colour, the solution contains the proper amount of lime.

There is no need to add accurately 4 lbs of lime. Lime will vary in composition, hence the test above prescribed is better than relying upon lime by weight.

Finally, add to each 40 gallons of spray, the required quantity of Paris green, strain through brass wire cloth strainer into pump, and solution is ready for spraying. Replenish stock solutions as required.

Spray Pump.

We use a double-cylinder, two horse sprayer, 40 gallons' capacity, and have found it satisfactory after careful adjustment, but there are other sprayers on the market just as good. The more pressure you use, the finer the spray, but the more solution is required.

Forty gallons of solution should spray one acre thoroughly. Spraying one acre takes from one and one-fourth to one and three-fourths of an hour. Attend to the spray nozzles; keep them free from clogging.

