Horticulture
Section

SPUD NOTES

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SPRAYING FOR CONTROL OF LATE BLIGHT

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In seasons when heavy dews and rains are frequent, together with periods of relatively low temperatures (55° to 75° F.), late blight can become very destructive and cause enormous losses in potato-growing districts. Even though weather conditions exist which favor the development of late blight, timely and adequate coverage of the potato vines with Bordeaux mixture spray (4-4-50) will control the disease. Bordeaux mixture has proved to be a much more effective control for late blight than other copper sprays and copper dusts.

How to Make (4-4-50) Bordeaux Mixture

It is a well-known fact that the quality of home-made Bordeaux mixture spray is considerably superior to the commercially mixed dry copper-lime product. In making (4-4-50) Bordeaux mixture certain steps should be followed.

1. Place 4 pounds of copper sulphate crystals in a loose meshed bag, and suspend them in 4 gallons of water until the crystals have dissolved. Usually they will dissolve over night. (Use 1 pound to 1 gallon.)

2. Dissolve either 4 pounds of lump-lime, or 6 pounds of hydrated lime, in 4 gallons of water. Strain the lime-water through a cloth or fine screen to remove the insoluble particles that plug the nozzles.

3. Put 44 gallons of clean water in a barrel.

4. Slowly pour the 4 gallons of copper sulphate solution and the lime-water, at the same time, into the 44 gallons of water in the barrel. Stir the mixture with a paddle when the lime-water and copper sulphate are being poured into the barrel. This makes a very high grade of (4-4-50) Bordeaux mixture.

5. For best results make fresh Bordeaux mixture each day it is to be used.

6. Never mix 1 and 2 together directly before pouring them into the barrel of spray water.

Spray Program

The extent of control of late blight is in direct proportion to the time of applications and completeness of the coverage of vines with Bordeaux mixture spray.

The time to make the first spray application depends upon the time the first late blight infected plants appear in the district. When such plants have been found, it indicates that weather conditions in the district are favorable for the development of the disease. Since it is far more important to prevent infection of plants than to try to cure them after they become diseased, anyone who finds a late-blighted plant in his field should take it to the county extension agent for positive identification. Should the disease prove to be late blight, the agent should immediately notify all the potato growers in the entire district to make the

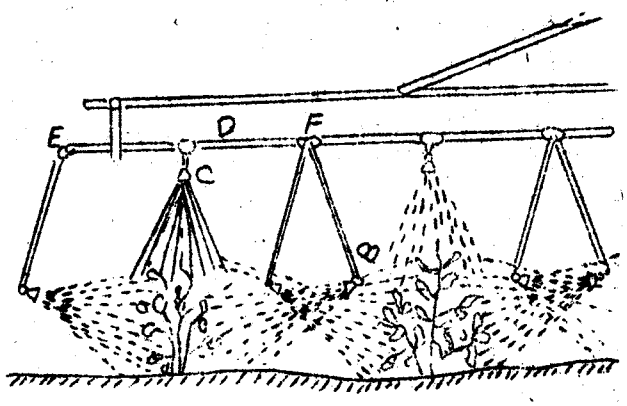
first application of Bordeaux mixture, regardless of where the diseased plants were found. Such cooperation on the part of growers and county extension agents can easily be a means of preventing a late-blight epidemic in a district.

Subsequent applications of the Bordeaux mixture spray should be made at 10-day intervals until the crop has been harvested. In order to protect the plants from infection it is necessary to keep them constantly covered with Bordeaux mixture. It may be necessary to revise time intervals between applications to meet this requirement. For instance, during the period of very rapid growth, the applications should be made at weekly intervals. Furthermore, an application should be made after each heavy rain.

Bordeaux mixture should be applied at 125 gallons per acre. Bordeaux and zinc arsenite will mix, but Bordeaux will not mix with lime-sulphur.

Spray Equipment

In order to apply the proper amount of spray and obtain adequate coverage, power sprayers capable of developing 350 to 400 pounds pressure should be used. They should be equipped with a boom having three nozzles per row. A No. 3 disc should be used in each nozzle. All three nozzles, A, B, and C, in the diagram, should be on the same side of the main boom line, D. Excellent coverage will be obtained when nozzle A is 42 to 44 inches from nozzle B, and when nozzles A and B are set so that the top line on the spray is on a line between these two nozzles, as shown in the diagram. Nozzle C should be at least 14 to 16 inches from a line connecting nozzles A and B. This arrangement allows for good spread of the spray from nozzle C before it strikes the spray line of nozzles A and B. It will be noted in the diagram that the nozzles for the next row are on the other side of the boom line D from those which spray the row at the end of the boom. With such an arrangement the nozzles for every other row are on the same side of the boom. The distance from E to F must be governed by the width of rows used by individual growers.



Spraying to Kill Vines

Potato vines that are sprayed with Bordeaux in the latter part of the growing season remain green longer than unsprayed healthy plants. Tuber contamination by late blight from infected green vines is a serious problem at digging time. In the East, an answer to this problem has been sought in spraying with a sodium salt of pentachlorophenol solution just prior to harvest to kill the vines.

Dr. J. Muncie, plant pathologist at Michigan State College, reported the killing of potato leaves in 4 to 6 days after spraying the vines with this solution. This material is most effective when applied on dry vines during bright days, but will also kill the plants during periods of wet weather with drizzling rain and low temperature. Dr. Muncie states that, "last season this material was used on several hundred acres of potatoes in northern Michigan, particularly on the certified seed crop."

RECOMMENDATIONS

At the annual meeting of U.S.D.A. and State potato research workers of Colorado at the Horticulture Department, Fort Collins, on January 28, 1943, the following recommendations were drawn up for prevention and control of further losses from the late blight disease of potatoes:

Seed:

1. Buy the best seed obtainable and as free from late blight as possible.
2. Discard all discolored or rotten seed tubers.
3. Continue planting same varieties.
4. Do not allow late blight infected seed to become wet or to "heat" at any time, especially between cutting and planting. (Seed treatment is not effective in late blight control.)

Spray:

1. Apply 4-4-50 Bordeaux mixture on first warning from county agent at heavy rate of application (at least 125 gallons per acre).
2. Use a combination of lime-sulphur for psyllids and zinc arsenite for flea beetle on present spray program.
3. If late blight shows up, use a combination of Bordeaux mixture and zinc arsenite for spraying.
4. If late blight appears after regular spray program is completed, spray with Bordeaux mixture. (Bordeaux mixture will not mix with lime-sulphur. Zinc arsenite can be applied with Bordeaux spray.)

Irrigation:

1. Use light irrigation with good drainage to reduce chances of tuber infection or decay.
2. Use deep irrigation furrows also to reduce chances of tuber-infection or decay.
3. If late-blight is present avoid late heavy irrigations.
4. Avoid irrigation of late-blight-infected potato fields at night or early morning.

Storage:

1. Ventilate storage so that water does not condense and form or drop on potatoes.
   a. Introduce air near floor of cellar to avoid condensation of water on potatoes. (Higher humidities can be carried in well insulated cellars before ceiling condensation of water occurs.)
2. Repair cellar roofs so they will not leak.

General:

1. Spread cull potatoes out so freezing will kill late-blight organism.
2. Do not dump cull and diseased potatoes out where they will grow.
3. Eliminate all volunteer potatoes.
4. Do not harvest late-blight infected potato fields until all vines are dead.
5. Report anything that looks like late blight immediately to county agent.

fore, night ventilation is more desirable in the fall as it lowers the temperature and maintains high storage humidity. Day ventilation may be more desirable in winter as it lowers the humidity and reduces ceiling condensation while maintaining desirable temperature. During the winter months in well-designed storages, usually little ventilation is required but may be needed during unseasonably warm weather in winter, or in storages filled beyond their normal capacity. In the spring months, night ventilation may be employed to keep the storage temperature below the outside average daily temperature. In general, it is advisable to take advantage of outside temperature and humidity below those inside the storage for fall ventilation whether it be day or night.

Need for Air Circulation.--Adequate air circulation within a storage is necessary to obtain reasonably uniform conditions in the various parts of the house. Moving air is the principal means of carrying heat and moisture between the cold and warm spaces and between the wet and dry areas. Storages should be designed so that there is adequate space between the top of the bins and the ceiling to permit free circulation of air. It is especially important that there be circulation spaces between the stored potatoes and the exterior wall whether it is above or below ground (See the figure). To make wall circulation effective, the wall circulation space should be open to the air above the bins, and at the bottom it should connect with a horizontal flue extending entirely around the storage area and opening into the work alley near the air-intake door. Air circulation in these spaces serves to remove heat from both the outside wall and the potatoes, thus permitting more rapid cooling to the desirable holding temperature. In the winter the spaces serve to carry the heat from the center of the house to the cold wall space and prevent freezing of potatoes adjoining these walls. Moisture in the form of water vapor is also conveyed back and forth between the storage interior and the air space around the wall. Present information indicates that with well-designed wall circulation, very little air movement through the mass of potatoes is needed to maintain desirable temperature and humidity conditions.

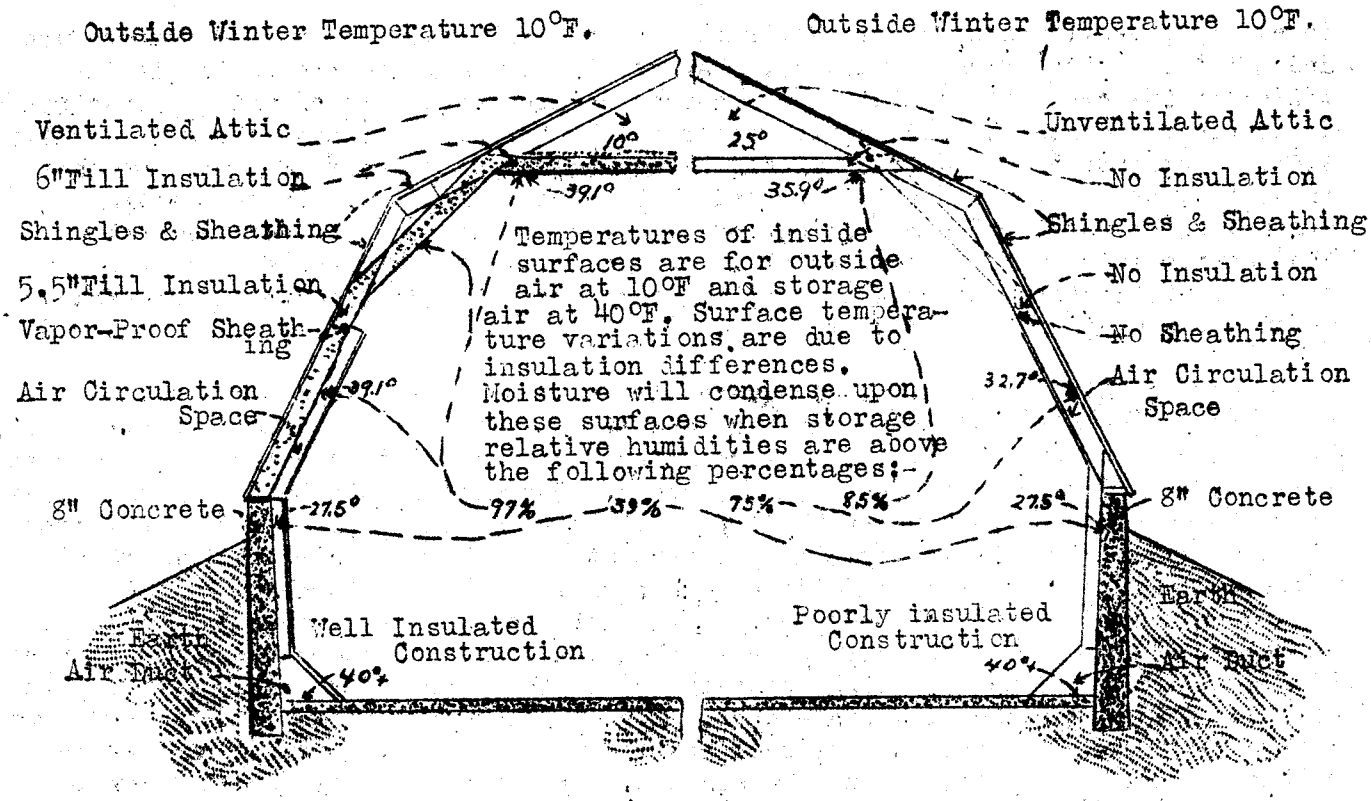
Condensing Surfaces.--During the course of this and previous studies, it has been found that condensation of moisture upon the inside walls of a potato storage may be used to advantage in controlling humidity.

Condensation occurs where there is a large difference between the inside air temperature and the temperature of the inside surface of the outside walls. The inside surface of insulated walls will be warmer than similar surfaces of uninsulated walls. Therefore, condensation will collect first on the colder, uninsulated surfaces.

When the outside temperature rises, the uninsulated surfaces will become warm and some of the condensed moisture will be again evaporated. Thus a higher storage humidity will result than if ventilation is used to remove moisture and prevent condensation throughout the storage period.

This condensation factor can be used to control storage humidity if some uninsulated sidewall areas are provided. This has been done in the new plans, and is shown in the figure, by leaving from 12 to 18 inches of uninsulated concrete wall. The rest of the wall is protected by banking it with earth.

Condensation on these outside walls will not drip back onto the potatoes as it would from condensation on the ceiling, and it does no damage to the concrete wall. Furthermore, condensation on these surfaces does not materially increase the loss of heat from a storage, but the removal of moisture from a storage by ventilation results in relatively large heat losses.



HITS AND MISSES

A. M. Binkley

The potato is one of the five most important world food crops, and probably no food article is more common in the daily diet of the white race than the potato.

Virus diseases are caused by extremely minute disease agents and cause trouble in nearly every kind of living organism; for example, mosaic in potatoes; smallpox in man; and foot-and-mouth disease in cattle.

About one-third of the people of the United States could produce a large proportion of the food needed for home consumption.

In 1942 it was estimated that about 8 to 9 percent of our food production would be needed for military and Lend-Lease purposes, and about 13 percent was used.

In 1943 about 25 percent of all food produced in the United States will be used to feed our soldiers and allies. About 50 percent of all commercially canned fruit and vegetables will be needed for that purpose in 1943.

Treating cut potato seed with hormones or chemical growth substances has not as yet increased yields of the crop.

Deep eyes, second-growth knobs, russeting of the skin, cracks, swollen lenticels and oftentimes tuber color are all more often influenced by growing conditions than by the type of seed planted.

Seed produced under irrigation and seed produced under dry-land conditions will yield equally well if both are of the same variety and there is no difference in disease content of the seed planted.

INFORMATION "PLEAS"

Question: Is research being done on spread of late blight by cutting knife and pick-point planter? (Does it spread like ring rot?)

Answer: The disinfected cutting knife (hot water or mercury) will not spread late blight (or ring rot.) Cutting with a knife which is not disinfected will spread ring rot, spindle tuber, and may spread late blight. A pick-point planter will spread spindle tuber and ring rot. It probably will not spread late blight if the seed showing any pinkish to red streaks or rot is discarded at cutting time.

Neither of these considerations are serious in the control of late blight, although both are serious in the spread of ring rot and spindle tuber. Some late-blight-infected seed will be planted regardless of all precautions at planting time (this happens every year in Maine and other eastern states). The danger comes in spread in the field when temperature and moisture conditions are favorable (SPUD NOTES, January 1943) and when seed is stored through the winter or between cutting and planting. TO PREVENT LATE BLIGHT SPREAD IN SEED, DO NOT ALLOW WATER TO STAND ON THE SEED AT ANY TIME, ESPECIALLY AFTER SEED IS CUT (see p. 3). When treating seed, dry it out as quickly as possible and be sure that the seed treatment material is effective. If, for example, mercuric chloride is used, be sure there is always mercury present. If you continue to treat after the mercury is weak or used up, the water which is left will provide an excellent method of spreading late blight.

Question: Who is eligible to receive SPUD NOTES?

Answer: SPUD NOTES will be sent to anyone interested in growing, shipping, or even talking about spuds. We don't have a complete mailing list as yet, so if you know anyone who is interested in reading SPUD NOTES send their name and address to Horticulture Dept., Colorado State College, Fort Collins, or tell your county agent.

We will send an index to the material in SPUD NOTES in the December issue, so keep your old copies for reference.

Question: Is SPUD NOTES going to discuss anything other than late blight? The first issue didn't include material of interest to all potato growers.

Answer: In this issue there is an article on storage. For future issues the subjects will cover irrigation, scab and rhizoctonia, insects, sprayers and dusters, commercial fertilizers, cutting and handling seed, and other phases of potato production in Colorado.

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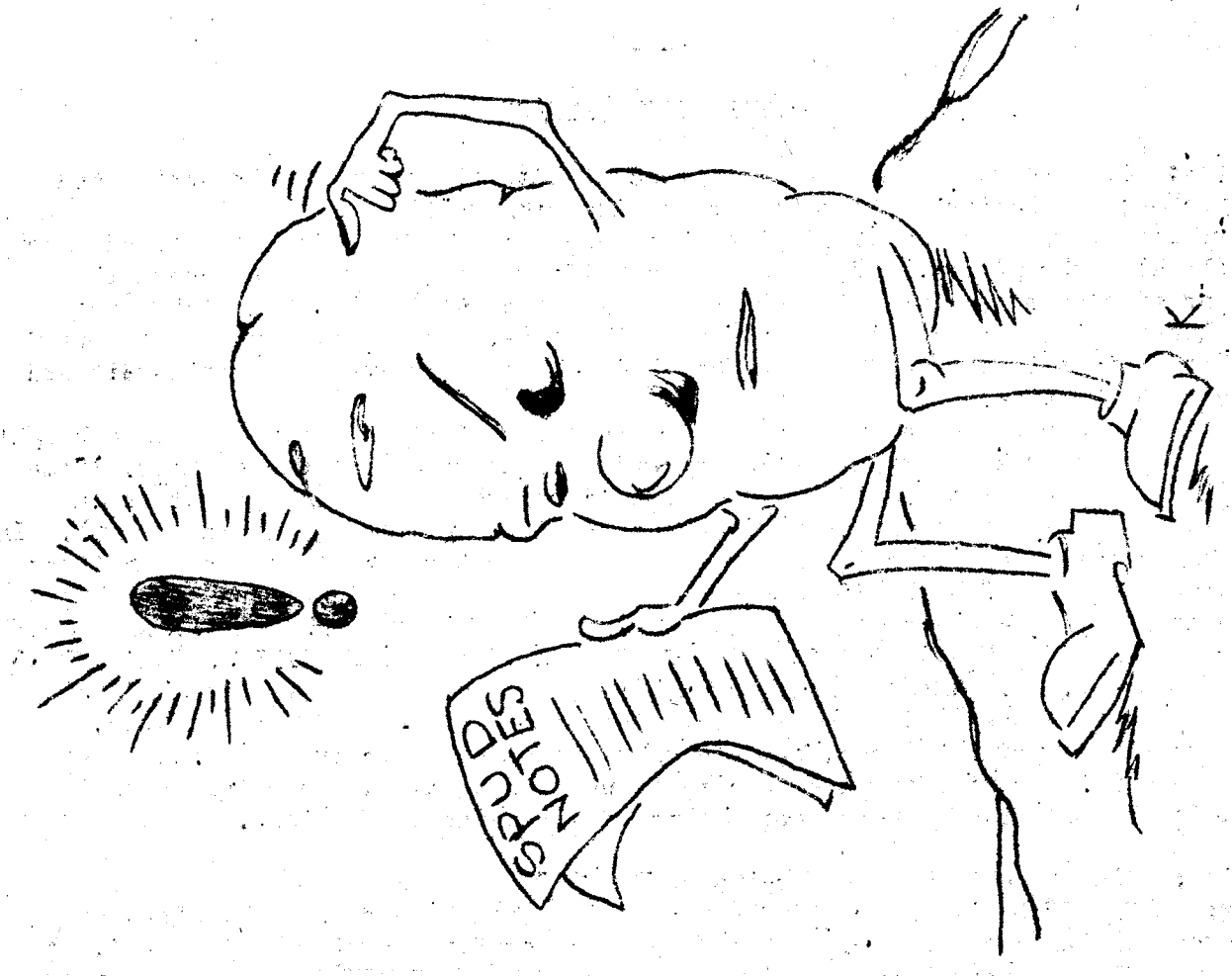

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