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O. S. Bare

Nebraska
COOPERATIVE EXTENSION WORK
IN AGRICULTURE AND HOME ECONOMICS
U. of N. Agr. College & U. S. Dept. of Agr. Cooperating
W. H. Brokaw, Director, Lincoln

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# SPRAYING AND DUSTING RECOMMENDATIONS FOR CONTROLLING INSECT PESTS OF POTATOES ON COMMERCIAL PLANTINGS IN NEBRASKA

(By O. S. Bare, Extension Entomologist)

## Introduction

The principal insect pests of potatoes in Nebraska may be listed as follows: psyllids, flea beetles, Colorado potato beetles, blister beetles, grasshoppers, potato leafhoppers, wireworms and white grubs. No single control measure can be expected to be effective against all of them. Lime sulfur sprays are effective against psyllids and at least partly effective against leafhoppers. They also seem to be more or less repellent to flea beetles, blister beetles, and grasshoppers. Certain arsenical poisons are effective against Colorado potato beetles, potato flea beetles, blister beetles and grasshoppers. Consequently a combination lime sulfur-zinc arsenite spray is fully or at least partly effective against all of the potato pests named above, with the exception of wireworms and white grubs. The grower will find in the majority of cases that a lime sulfur-zinc arsenite spray, applied first when the potato plants are 6 to 8 inches tall, and repeated from 1 to 3 times at proper intervals, as conditions demand, will give satisfactory control of psyllids, flea beetles, Colorado potato beetles, blister beetles, leafhoppers and grasshoppers.

Formula for the lime sulfur-zinc arsenite spray is as follows:

| | |
|---|---|
| Liquid lime sulfur (32° Baume) | 1 gal. |
| Zinc arsenite | 2 lbs. |
| Water | 40 gals. |

From 4 to 5 lbs. of dry lime sulfur may be used in place of the gallon of liquid lime sulfur. If liquid lime sulfur of less than 32° Baume test is used, the amount must be increased proportionately. Best results are obtained when the spray is applied under at least 250 to 300 pounds pressure, or more, and spray nozzles should be adjusted to give complete coverage of plants.

## Potato Psyllid

This is a small, jumping plant louse only a tenth of an inch long. The color varies from tan to gray, with white or yellow lines on the head, thorax, and abdomen, and a Y shaped white mark at the abdomen's tip. They usually appear in May on wild host plants such as buffalo-bur and wild ground cherries, but move to potato plants as soon as they are available.

The adults lay tiny yellow eggs that are placed on short stalks, usually along the leaf edges. These soon hatch, producing tiny, flat, orange nymphs that feed by piercing the plant leaves with their sharp beaks and sucking out the sap. As they grow their color changes to yellow, and finally to green. When nearly mature they attach tightly to the underside of the leaf, much like scale insects.

Both the adults and nymphs weaken the plants by sucking out the juices, but greatest damage appears to be due to the injection of a poison that causes "psyllid yellows" or "purple top". After this appears, control measures are at best only partly effective. Most of the damage by psyllids occurs in western Nebraska.

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Control is best secured by spraying with lime sulfur, using the following formula:

Liquid lime sulfur (32° Baume)..... 1 gal.
Water.....40 gal.

The first spray should be applied when the plants are 6 to 8 inches tall, and may need to be repeated from 1 to 3 times at intervals of 2 to 3 weeks. Best results are secured when sprays are applied under high pressure, 300 to 400 pounds pressure being desirable. Wettable sulfur sprays, using 1 pound of wettable sulfur to 10 gallons of water, have been reported as giving good control. Spray nozzles must be adjusted to give complete coverage of plants, or good control cannot be secured. Dusting with fine dusting sulfur appears to give at least partial control, and with improved methods of application may prove to be fully effective under Nebraska conditions.

Prolonged hot weather tends to reduce, or prevent development of, large psyllid populations, and lengthy periods when day temperatures commonly go above 90° F. may render control measures unnecessary in some years. On the other hand, prolonged cool periods during the summer months are favorable to increase of psyllids, and often result in heavy infestations and consequent damage.

## Potato Flea Beetles

The common potato flea beetle is a small, oval, hard-shelled black and brown insect only one-sixteenth of an inch in length. A second flea beetle that sometimes is a serious pest on potatoes is considerably larger, and in color is black with distinct white stripes. Both kinds apparently winter mainly in the soil and come out of hibernation in May or early June. The adults feed not only on potato plants, but also on numerous related wild plants and several garden crops.

The eggs are laid mainly in the soil around the plants, and under favorable conditions may hatch within a week. Considerable moisture is necessary for the hatching of the eggs and the development of the tiny white larvae or "worms" that they produce. These "worms" feed on the plant roots and developing tubers, and are responsible for the potato injuries commonly called "worm track." They feed for 3 or 4 weeks, and when mature, change to the pupal or resting stage in the soil. In another week or two they emerge as adult beetles. Usually there is only one brood per year, but in long, favorable seasons a second brood may be produced.

Control is best secured by persistent use of poison sprays, and zinc arsenite is probably the most effective poison. The formula recommended at present is:

Zinc arsenite..... 2 lbs.
Water.....40 to 50 gals.

Where psyllids also require control, the addition of 2 pounds of zinc arsenite to the recommended psyllid control formula of 1 gallon 32° Baume test lime sulfur and 40 gallons of water makes a satisfactory combination spray. A Bordeaux mixture spray plus 3 pounds of calcium arsenate to each 50 gallons of prepared spray also gives effective control of flea beetles.

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Where a dust is preferred, a mixture of 1 pound calcium arsenate with 8 pounds of hydrated lime will give fairly satisfactory results if applied with a mechanical duster to secure complete plant coverage. If psyllids also are present, dusting sulfur may be used in place of hydrated lime. Recent experiments indicate that a dust of 1 pound barium fluosilicate and 4 pounds of cheap, low grade flour is as effective as a zinc arsenite spray, and is much easier to use.

In localities where flea beetle damage commonly occurs, or in any case where they are found in considerable numbers, the first spray or dust usually should be applied when the plants are 6 to 8 inches tall. If beetles still continue numerous, later sprays or dusts may be applied at intervals of 10 days to 2 weeks, depending on severity of infestation and rate of plant growth. Complete coverage of the foliage is necessary for satisfactory control.

## Colorado Potato Beetle

These large, oval, striped beetles, about three-eighths of an inch long, winter mainly in trash or rubbish in or around the fields where they developed. They come out of hibernation in the spring and attack potato plants as soon as they are available. The beetles feed on the foliage, and lay their large yellow or orange eggs in clusters on the under sides of the leaves. These soon hatch, producing the soft-bodied more or less grub-like larvae that also feed on the foliage and may completely strip the plant. These larvae are heavy-bodied, brick red in color, and have rows of black spots along the sides.

Control is not difficult, as practically all arsenicals are effective. A zinc arsenite spray or calcium arsenite-hydrated lime dust such as is recommended for control of flea beetles is fully effective, as is also the combination lime sulfur-zinc arsenite spray that is used to control both psyllids and flea beetles. A dust composed of 1 pound Paris green, 10 pounds hydrated lime, and 5 pounds flour also is very good.

## Blister Beetles

Blister beetles are long, cylindrical, slender-bodied insects, varying from a half inch to over an inch in length, and having a much constricted thorax that gives them the appearance of having a long, slender neck. Their color may be black, gray, brown, purplish green, spotted or striped. They appear in late spring or summer, often travel in "armies", and may move into and completely strip a potato field before the owner discovers their presence.

The young are more or less grub-like in appearance, and live entirely in the soil, where they appear to feed mainly on grasshopper eggs and other insect material.

Control of blister beetles is difficult as they do not eat poisons readily, and are very resistant to contact insecticides. Dusting with undiluted sodium fluosilicate or equal parts by weight of sodium fluosilicate and flour gives fair control if the material is dusted directly on the beetles. Full results will not be apparent for at least 48 hours. A dust of 1 part barium fluosilicate and 3 parts flour by weight also gives fair control. Very strong Paris green sprays, using 3 or 4 pounds Paris green and 8 pounds hydrated lime to 50 gallons of water have been used successfully. Bordeaux mixture sprays are repellent to blister beetles, and the addition of 3 pounds of calcium arsenite to each 50 gallons of the spray increases its effectiveness.

Many growers have reported excellent control of blister beetles by use of the lime sulfur-zinc arsenite spray that is recommended for controlling both psyllids and flea beetles.

## Potato Leafhopper

This is a small, jumping and flying, wedge-shaped insect that appears on the potato plants when they are about 6 inches tall. The adult leafhopper is approximately one-eighth inch in length, and is green in color with fine white markings on head and thorax. They apparently are unable to winter here, but migrate to Nebraska each spring from the south. Eggs are laid in slits in the stem or leaves of the plant. Both the adults and the tiny wingless nymphs that hatch from the eggs feed by sucking juices from the plant. They evidently inject a poisonous substance that causes the injury commonly called "tipburn" or "hopperburn". Potato leafhoppers are usually of little importance in western Nebraska but often cause considerable damage in the eastern half of the state.

Control can usually be secured by spraying with Bordeaux mixture. This repels the adults and apparently results in death to the small nymphs. Wettable sulfur sprays, using 1 pound wettable sulfur to 10 gallons of water, are effective, and lime sulfur sprays also are good. Dusting sulfur is at least partly effective, and if applied before heavy infestations develop, apparently gives excellent results.

## Grasshoppers

The grasshoppers that are rated as serious pests of potatoes hatch in spring from late April to July 1, and require from 60 to 90 days to reach maturity. Greatest crop damage is done during the last half of this period of development.

Control is best secured by use of poison bait. No other method compares with it in effectiveness. Bait mixed according to the following formula is very effective:

| | |
|---|---|
| Coarse wheat bran..... | 100 lbs. |
| White arsenic..... | 6 lbs. |
| (or sodium arsenite..... 2 qts.) | |
| Blackstrap molasses..... | 2 gals. |
| Water..... | 10 to 12 gals. |

The above formula is enough to treat 10 acres. Scatter thinly and thoroughly, when temperatures are between 60° and 75° Fahrenheit. From daylight to 9:00 A.M. on a bright day usually is best.

Twenty-five pounds of millrun bran and three times that bulk of fine sawdust may be used in place of the bran in the above formula, but will not be as effective as pure, coarse wheat bran.

Many growers have reported that the lime sulfur-zinc arsenite spray that is recommended for control of both psyllids and flea beetles is repellent to grasshoppers and gives sufficient control to greatly reduce or prevent serious damage by them.

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## Wireworms

Wireworms are the larvae or young of small flat-bodied beetles that are, in themselves, usually of little importance. The beetles lay their eggs in the soil, and the wireworms that hatch from them may require 2 or 3 years to complete their growth. They are slender, yellow to dark brown, hard bodied worm-like larvae that feed on vegetable materials. They bore or tunnel into the potato tubers and may greatly reduce the market value of the crop.

Control is difficult and seldom entirely satisfactory. Clean cultivation, or summer fallowing before planting ground to potatoes will reduce danger of injury. Potatoes should not follow small grain, nor be planted on or immediately following either wild or tame grass sod. Alfalfa sod is not likely to be infested unless it has carried also a growth of grasses.

## White Grubs

These are the larvae of the large May beetles or "June bugs" that are common throughout the state. The beetles lay the eggs in the soil, preferring sod or grassy, cultivated ground. The larvae of most kinds of May beetles require 2 or 3 years to complete growth. They often burrow into and render unmarketable a considerable percentage of a potato crop planted on newly broken sod or following it.

Control consists mainly in avoiding planting potatoes on grub-infested soil. Directions given for control of wireworms are applicable also to white grubs.

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