Operating Field Dusters In Arizona

Circular 261

Agricultural Extension Service, University of Arizona

All agricultural chemicals must be considered as dangerously poisonous. Always read the label and follow instructions. The above operator is properly clothed for some chemical applications. With phosphate formulations he should have a complete head mask covering all skin areas. The concept of the "spaceman" suit for personal safety is no more important than in chemical application. Death is just as final and not near as glorious.

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Play It Safe

Insecticide dusts commonly used in Arizona include DDT, BHC, Aldrin, Chlordane, Dieldrin, Endrin, Diazanon, Malathion, Methoxychlor, Parathion, Phosdrin, Rotenone, Sulphur, and Toxaphene. Fungicide dusts include Karathane, Captan, Maneb, PCNB and Zineb. Diluents or carriers for their dust mixtures include sulfur, silica, pyrophyllite, diatomacious earth, Fuller's earth, talc, walnut shell flour and kaolin.

For recommended application rates see Agricultural Extension Service circulars listed on page 12 for control of insects and diseases. Any questionable application should be referred to the County Agricultural Extension Agent's office for recommended rates and to check timeliness of application with laws controlling agricultural chemicals.

Certain chemicals require time to break down and lose their poisonous properties to both man and animals. Certain minimum time limits before harvest have been set forth in laws regulating the use of agricultural chemicals. Violation of these limits may result in seizure of crops or livestock products.

Growers, in cutting application costs, often request a dust containing several insecticides, fungicides or both. This is not always possible as certain combinations are not compatible. Some chemicals lose their effectiveness when mixed with others and

there is always a danger of burning the plant foliage. **Follow carefully the instructions on the label.** All chemical dust formulations must be considered poisonous. The following practices will insure against serious trouble:

1. Always read the label and follow instructions.

2. Wear clothing that covers the entire body.

3. Wear gloves — with phosphates wear rubber or neoprene gloves.

4. Wear face mask. If a phosphate, wear a respirator.

5. Never breathe in large amounts when loading.

6. Change clothing after application.

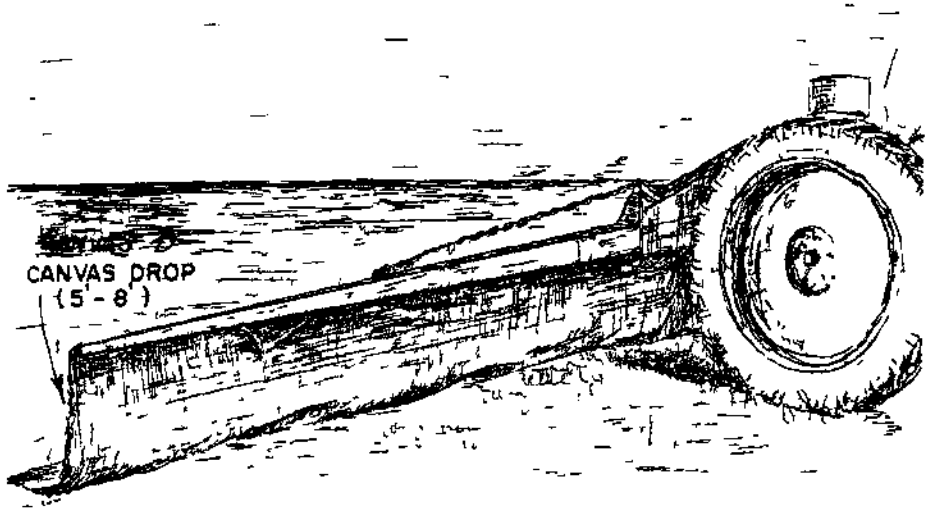
Duster Limitations

Low wind velocities in Arizona permit the use of dusters when advantageous. The weather must be calm for dusting, whereas spraying can be done with winds up to 10 mph. Late evening or early morning usually gives minimum wind influence. Night time dusting is recommended whenever practical. Lower wind movement and higher humidity make conditions for dust adhesion more favorable.

A good rule to follow is: "If you can tell from which direction the wind is coming, do not use a duster."

Dust drift and insufficient use of material are the most serious problems. Tests indicate an application efficiency of 10 to 20

A good rule to follow is: "If you can tell from which direction the wind is coming, do not use your duster." Dust drift not only means poor application efficiency but also may seriously damage other crops, shrubs, bees, animals and neighbors.



Canvas drapes dragging on the ground for several feet behind to form an area wherein dust can settle are recommended where excessive mechanical injury to the crop does not result. A five to eight foot canvas length behind the duster boom has materially increased control of aphids in alfalfa fields.

percent of the materials actually deposited on plant surfaces where conditions are unfavorable. To improve application efficiency and cut down on dust drift, canvas hoods may be mounted on the dust discharge equipment. Canvas drapes dragging over the crop for several feet behind to form an area wherein the dust can settle are recommended where excessive mechanical injury to the crop does not result.

Excessive wind and operational speed, poor calibration, and improper positioning of discharge outlets in relation to the crop, contribute to more application failures than the design performance of the dusting mechanism. Poor application makes the best chemical formulation next to worthless.

The application requirements established by entomologists and pathologists are becoming more rigid and exacting. Good coverage of the plants with a dust is necessary for good insect control, but **complete** coverage is a must for disease prevention and control. New combinations of dust material which are more difficult to apply demand the best equipment and operational skill possible for effective control.

Recent developments of duster attachments for cotton planters offer some promise for control of seedling diseases. Thorough distribution of certain chemical dust formulations in the soil above the seed through which the seedling emerges has been an effective control of "damping off" or "sore shin." Where seedling diseases are a problem, some sacri-

fices in ideal planter design, especially soil firming equipment, may be necessary to insure good dust distribution and disease control.

Duster vs. Sprayer

For most applications the sprayer is preferred. Uniformity of coverage and application efficiency of the reactive agents is in favor of sprayers. However, because of physical and chemical characteristics, some formulations are more effective in dust form.

A duster is simpler, less troublesome, usually much faster and less costly than a sprayer. Since dust applications are usually 10 to 50 pounds per acre, there is less weight to haul. Where water supply is inadequate or inconvenient, dusting is advantageous.

Features to Look For

Look for a duster made of high-quality corrosive-resistant materials. The blower and discharge arrangement should deliver equal pressure and quantity of dust to all discharge openings. The hopper should be of sufficient capacity, not only to minimize frequent refilling but to maintain uniform flow of dust to the blower.

A duster should have an agitator in the hopper to help maintain a uniform flow of dust to the blower. The height of the discharge equipment or outlets should be adjustable. The duster should be easily taken apart for cleaning and maintenance.

Feed Mechanisms

The rate of discharge is controlled by adjusting the opening in the bottom of the hopper which meters dust into the blower inlet. One or more agitators above the discharge opening assist in maintaining uniform flow and overcome bridging difficulties. With this arrangement, feed rate may still be uneven because of the density of the dust, degree of compaction, change of head as the hopper empties, or changes in the fluidity of the air-dust mixture due to compaction or the addition of air as a result of agitation.

An improvement in dust feed mechanisms is the vertical auger feed similar to a batch feed mixer. Dust is moved continuously from the bottom of the hopper to the top by a small vertical auger in a central tube open at both ends. The auger tube has an adjustable port near the top through which a portion of the circulating dust is metered into the fan outlet. This arrangement reduces the problems of compaction and changes of head, and gives more uniform feed rates.

Blowers

All of the many types of blowers and fans have been used on dusting equipment. Accurately built centrifugal or radial-flow fans with multiple blades are used, as well as the rougher, paddle type centrifugal with 4 or 6 welded steel blades. More recently, a number of dusters have appeared using propeller or

Here is a homemade agitator replacing a commercial model which was not aggressive enough to maintain uniform flow.

This dust feed mechanism developed by USDA researcher, Frank Irons, improves the uniformity of dust distribution.

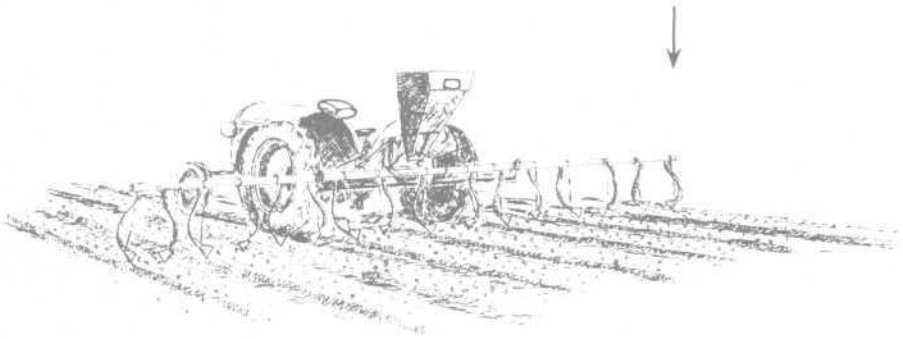
axial-flow fans with either double or 4 bladed propellers or the multiple blade of disk type turbines.

The more efficient blowers are higher priced but will handle more air per horsepower. The trend toward higher volume blowers and low air velocity is desirable to increase exposure time of dust, giving more uniform coverage.

Discharge Arrangements

Discharge equipment may be of the single-outlet, multiple-nozzle, or hollow-boom type. Multiple-nozzle units for field or row

Proper positioning of discharge nozzles according to the crop and size of plant is largely a matter of judgment and experience. A crossing fan pattern that hits the full plant from both sides is ideal.



Often the height of the boom above the plant adjustment is neglected, resulting in stripped application. Every good operator will spend a little time inspecting the uniformity of plant coverage.

crops have a group of flexible hoses connected to a manifold or to peripheral outlets around the fan housing. The nozzles are then spaced along a supporting boom with the outlets located for uniform coverage. Differences in delivery rates from individual tubes of different lengths and loops is sometimes a problem.

Hollow booms, 3 to 6 inches in diameter, are sometimes used in field crops to convey the material and distribute it through appropriately spaced openings. Some booms are tapered, whereas others have a uniform diameter and employ internal baffles in an attempt to improve uniformity of discharge. Short flexible hose and nozzle units are also used on hollow boom units.

Operation

The numerous kinds of dust materials used are of widely varying physical characteristics which affect duster performance. One study of 47 different dusts showed that the densities ranged from 9 to 96 pounds per cubic foot. Feed rate also is affected by depth of dust in the hopper. Feed rate is more constant for the material in the top half of the hopper.

Extreme changes in the condition of a given dust at the time it is placed in the hopper also affect the feed rate. For example, one dust formula which was well settled from standing was placed in the hopper with little disturbance to the material. The feed rate at a selected setting was 4.46 pounds per minute. A bag of the same material was conditioned to that which it obtains shortly after mixing, and placed in the same machine with the same setting. The feed rate of the conditioned dust was 11.49 pounds per minute or an increase of 158 percent.

The operator of a duster may obtain the maximum protection possible against uneven feed rate by maintaining the dust level well above the feed agitator at all times. This will require more frequent filling, but the operator should be amply rewarded in better crop protection and considerable saving in expensive and critical dust materials.

Calibration

Because of the wide variation in dust materials, calibration is important each time a new batch of materials is used and/or new application rate is applied. Accuracy is important to prevent

possible damage from over-dosage as well as assuring the application of sufficient material.

The amount of material applied per acre depends on (1) the ground speed of the dust rig, (2) blower speed, (3) type of dust used and handling, (4) depth in the hopper, and (5) size opening in the bottom of the hopper or discharge port adjustment. Ground speed, blower speed and the dust handling should be kept as constant as possible. Use only the top half of the hopper if possible.

With all other factors constant, use the hopper discharge opening to calibrate the machine.

The only practical method for duster calibration is the trial and error method that becomes quite methodical by following these steps:

1. Measure off a test area of at least one-half acre — 21,780 square feet or eight 38-inch rows, 860 feet long.

2. Fill duster hopper and level the material in hopper.

3. Dust the measured area at normal tractor-operating speed. Full throttle in the desired gear is recommended. If less than full throttle is used, note the exact throttle setting. If a tachometer is available, a fast idle motor speed of 200 to 500 rpm. below full throttle in the same gear may help facilitate calibration. (Fast idle motor speed is the motor rpm. recorded at some throttle setting between ½ and full throttle with the tractor out of gear).

4. After dusting the test area, carefully weigh the amount of dust needed to refill the hopper to its original level.

5. Convert the number of pounds of dust required to refill, to pounds per acre by multiplying by two. (Example: 17 lbs. per ½ acre equals 34 lbs./ac.)

6. If the rate is more than desired, either increase the tractor speed or decrease hopper discharge opening. If the rate is less, reduce the tractor speed or increase the hopper opening.

7. Repeat dusting test area after making adjustments until correct speed and hopper discharge opening settings are determined. Note these adjustments.

8. Each time the machine is used this calibration process must be repeated even though the recommended application rate is the same and the same material is being applied. Because of difference in density and particle relationships the flow rate will vary. This is why flow gauges on dusters are unreliable.

If a motor tachometer is available on the tractor, a short cut in calibration may be used. Example: On the first run 34 lbs./ac were applied at approximately 1350 rpm motor speed and 40 lbs./ac is the desired rate, then use the following formula:

$$\text{Desired tachometer reading} = \text{RPM} \times \frac{\text{test rate}}{\text{desired rate}}$$

$$= 1350 \text{ RPM} \times \frac{34 \text{ lbs./ac}}{40 \text{ lbs./ac}}$$

$$= \text{Approx. } 1150 \text{ RPM}$$

Set the throttle speed at 1150 RPM and make a re-run in the same gear. To be consistent, use tachometer readings at fast idling speed before each run. Motor rpm is reduced somewhat under load in field operation. Remember, that as engine RPM is increased PTO speed increases which, in turn, increases the blower speed and agitation, so that this proportion is not exact. The fact that the discharge port adjustment remains the same should make delivery approximately in the same proportion.

Ten percent accuracy is an acceptable duster adjustment.

Excess Speed

The maximum speed limit for dusting is about 5 mph. Your fine for exceeding this limit is a poor job of dusting.

Dispose of Chemical Bags

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Chemical bag disposal, storage, and handling is just as important a safety measure as is application. Here the operator burns a used bag. (Cans should be buried.) He wears a respirator because the fumes may also be lethal.

Ask your County Agricultural Agent for copies of the following Extension publications related to chemical control.

Circular 179 — Cotton Insect Control

Circular 210 — Arizona Insect Control Recommendations

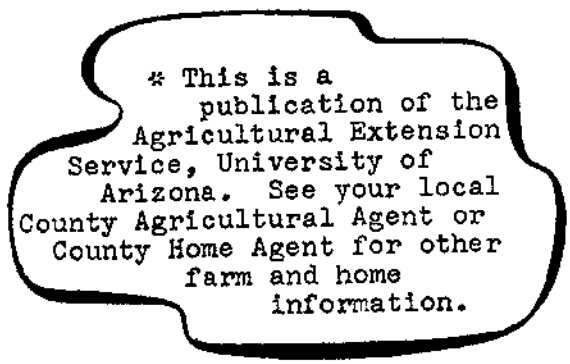
Circular 219 — Control Worms on Fall Lettuce

Circular 223 — Diseases of Cotton

Circular 225 — Grain Sorghum Insects and Diseases

Circular 239 — Controls for Vegetable Insects for Commercial Producers

Circular 249 — When You Buy or Build a Field Sprayer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