

Revised Recommendations for Azobenzene

Dr. W. E. Blauvelt
Department of Entomology, Cornell
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The best method of fumigating with azobenzene in houses having steam is the use of 70% azobenzene powder, made into a paste with water and painted on the steam pipes. The 70% azobenzene powder is available from the following companies and through most dealers in florists' supplies, under the following trade names.

Azofume 70-Plant Products Co., Blue Point, N.Y.
ABZ Fumigant-Atlas Powder Co., Wilmington, Del.
Hypozone-Hydroponic Chemical Co., New York 18, N.Y.
Mite-Y-Fume-Andrew Wilson Inc., Springfield, N.J.

Hot water pipes are not satisfactory for vaporizing azobenzene powder. In houses without steam, fumigation can be done with lamps or hot plates as described later. Azobenzene pressure fumigators and other devices not requiring lamps are being developed and look very promising.

DIRECTIONS FOR USE OF 70% AZOBENZENE POWDER

1. Calculate carefully the cubic capacity and amount of fumigant required for each house, and record this for future use. A satisfactory dosage of 70% azobenzene powder for most houses is 1 pound per 40,000 cubic feet of space.

To calculate the cubic capacity multiply the length of the house by width by the average height, in feet. (To get the average height, measure the height from floor to ridge and floor to eave, add and divide by 2). For example: A house 250 feet by 50 feet has $250 \times 50 = 12,500$ square feet area. If the height at the ridge is 20 feet, and the height at the eaves 7 feet, then $20 + 7 = 27$, and 27 divided by $2 = 13 \frac{1}{2}$ feet average height. Then $12,500 \times 13 \frac{1}{2} = 168,750$ cubic feet.

To calculate the number of pounds of 70% azobenzene powder required, divide the number of thousand cubic feet (the nearest whole number) by 40. For example: If a house is 168,750 cubic feet, then 169 divided by $40 = 4.2$ pounds, or 4 pounds, 3 ounces.

2. **IMPORTANT** - Pick a time to fumigate when you can maintain the proper temperature. The best temperature is around 75 degrees F., with a range of 70 to 85 degrees. Lower temperatures are more dangerous than higher ones. A drop in temperature below 70 degrees during fumigation is very likely to cause injury, while temperatures have often gone to 90 or even 95 degrees without causing any important injury. Fumigation may be done either in the daytime or at night depending on the outside temperature. In cold weather it is best to fumigate in the daytime on a cloudy day, with

moderate temperature, and little or no wind, starting at 9 to 10 A.M.

3. Weigh out the required amount of the fumigant into one or more pails. Add water either by measure or a little at a time, and stir to a smooth thin paste the consistency of paint. One to one and one-half pints of water per pound of powder is about right.

4. By means of a 3- or 4-inch paint brush (a No. 1 oval varnish brush is excellent), apply a thin coat of the paste to the upper surface of four cold steam pipes the length of the house. Treat two pipes near the sides and two near the middle of the house. In extra wide houses treat one pipe per ten feet of width. To insure even distribution, treat 4 or 5 feet of pipe, skip 2 feet, and repeat, then go back and apply any material left to the blank spaces.

5. Close the vents and get the temperature up to 75 degrees before starting the fumigation. This can be done while applying the material. Then turn on one pair of vaporizing pipes, or half of those treated. The heat melts the azobenzene, which then fumes off as a visible orange colored vapor. An hour and a half later turn on the rest of the treated pipes. The first set may then be turned off or left on, depending on the temperature.

6. Keep the vents closed for six hours from the time you turned on the first vaporizing pipes. Keep the temperature around 75 degrees or above for the entire fumigation period. Then ventilate.

7. Ventilate for at least 3 hours with plenty of steam on and vents adjusted to drop the temperature slowly (3 or 4 degrees an hour). This is important.

DIRECTIONS FOR USE OF AZOBENZENE CRYSTALS WITH LAMPS OR HOT PLATES

For vaporizing with lamps or hot plates azobenzene crystals should be available from the same companies handling the powder form.

The dosage for azobenzene crystals is 1 pound to 57,000 cubic feet, or 1 ounce by weight to about 3,500 cubic feet. By using one lamp or hot plate for each 7,000 cubic feet, the total dosage will be 2 ounces by weight for each lamp. A 1 1/2 fluid ounce jigger holds approximately 1 ounce by weight of azobenzene crystals when level full. Thus 2 level jiggerfuls is the total amount for each lamp at this spacing. The crystals should be vaporized over a period of 2 to 3 hours. To be safe, it is best to put in one-half the amount (1 level jiggerful) at the start, and the rest at the end of an hour to an hour and a half. Adjust the heat so that

each half-dose will vaporize in about an hour's time. Experiment with one or two lamps or hot plates to find the proper adjustment before fumigating a house.

PRECAUTIONS IN FUMIGATING WITH AZOBENZENE

Since there is little experimental information on possible ill-effects of azobenzene vapor to man or animals, it is well to observe reasonable precautions.

We recommend wearing a felt-pad respirator when in the houses during the fumigation, and avoiding unnecessary long exposure. A good felt-pad respirator is the Dustfoe respirator, sold by the Mine Safety Appliance Co., Braddock, Thomas and Mead St., Pittsburgh, Pa., and by Sears Roebuck & Company.

AZOBENZENE FOR PLANTS OTHER THAN ROSES

Although developed and recommended especially for roses, experiments indicate that azobenzene fumigation is safe and effective for control of red spider mite on carnations and many other florist crops. A considerable number of large-scale tests have been made on carnations in various commercial ranges, with no injury other than a slight bleaching of open buds of some pink and red varieties. A number of trials in small to moderate sized houses indicate that azobenzene fumigation is also safe on chrysanthemums, gardenias, camellias, hydrangeas, geraniums, ivies, cy-

clamen, kalanchoe, ageratum, cinerarias, primulas, coleus, and a number of other crops, but we want to have more and larger scale tests on some of these before making unqualified recommendations. Azobenzene fumigation is not recommended for sweet peas, as these usually develop rather serious leaf burn.