

DUSTING TO CONTROL FRUIT INSECTS

BY S. B. FRACKER.

This paper and the next consist of a report of the symposium on dusting held at Chicago in December. So much interest has been expressed in this method of applying insecticides that it seems best to discuss the subject briefly at this time and outline the results of experiments in other parts of the United States rather than wait until the Wisconsin experiment station tests have been completed.

A special study of the control of sucking insects was the subject of the first report by Prof. P. J. Parrott of the Geneva, New York, station. Dusts containing one-half, one and two per cent of nicotine, respectively, were used.

Apple aphids were found unequally susceptible to the dust. From 91 to 98 per cent of the common apple leaf species were killed during a rainy period when the check trees lost 27 to 60 per cent from natural causes. The results were also satisfactory against the currant aphid, apple leaf hoppers, and nymphs of the four-lined leaf bug, but less so against the woolly aphid and potato aphid.

Air currents, denseness of tree growth, cold and wet weather and the presence of honey dew or waxy secretions of insects were found unfavorable for effective work. The high cost of nicotine preparations at present, according to Professor Parrott, makes the expense of dusting against sucking insects "almost prohibitive for large operations."

The results outlined by Dr. T. J. Headlee of New Jersey included work on codling moth, curculio, apple scab, and plant lice. His first table, which is given herewith, indicates unsatisfactory results against curculio, but successful applications against scab.

Year	Location	Curculio Per Cent			Scab Per Cent		
		Check	Dust	Liquid	Check	Dust	Liquid
1913.....	Glassboro.....	29.1	4.4	5.5	22.2	0.0	0.0
1913.....	Vineland.....	70.3	43.3	31.6	51.9	14.8	6.4
1914.....	Vineland.....		3.68	3.88		3.86	19.69
1917.....	Haddonfield.....	no record			57.88	5.05	2.52
Average.....		49.7	17.12	13.66	43.97	7.90	9.53

Further study showed conflicting data in the codling moth work. A study of the weather records proved that the applications made for the second brood, in which the dust was only half as effective as the spray, were soon followed by heavy rains and that the latter were a limiting factor.

The New Jersey results against leaf hoppers show that "the 90-10 dust impregnated with one per cent nicotine is as effective as that charged with three per cent, and only a little more than one-half as effective as the liquid treatment." Against recently hatched aphids also, the liquid materials gave better results, though the dust of one per cent strength or higher was decidedly effective.

Dr. A. L. Quaintance presented a summary of the dusting and spraying results of the U. S. Bureau of Entomology from 1915-1920. At Benton Harbor, Michigan, liquid applications in 1915, 1916, and 1917 resulted in from 87 to 97 per cent freedom from codling moth, and dust applications in from 80 to 98 per cent of fruit free from worms. With *curculio* the liquid spraying yielded 83 to 94 per cent clean fruit and dusting practically the same figures except in the case of one experiment, where only 5 per cent of arsenate of lead was used, the results being unsatisfactory. Against apple scab the dusting efficiency was only 15 to 87 per cent as compared with spraying, which yielded 83 to 95 per cent. In all cases several different dust mixtures were tried, but the results did not conclusively favor any one formula.

In Virginia, Arkansas, and Connecticut, codling moth and plum *curculio* were controlled by dusting to the extent of at least 84 per cent, except when the insects were extraordinarily abundant. The per cent of *scab*-free fruit, however, went as low as 30 per cent among the dusted trees. In Grand Junction, Colorado, dusting is nearly a total failure against codling moth, as this insect is unusually severe in the semi-arid region.

While cost was not discussed at Chicago, Bulletin 171 of the Oregon station publishes an analysis of the expense in the Hood River valley. The average cost per acre in 1920 for the entire program, including labor and materials, was \$28.00 using spray guns, \$33.00 in the case of spraying rods and nozzles, and \$31.77 in the case of dust.

The conclusion reached by every speaker was that while dusting yielded some favorable results, it was less efficient, less suc-

cessful and more expensive than spraying, and could not be relied upon in the case of severe infestations.

REPORT ON THE EFFECTIVENESS OF DUSTING

By PROF. G. W. KEITT.

I have been requested to report to you on those discussions at the recent scientific meetings in Chicago which related to the effectiveness of dusting for the control of plant diseases. There was less work reported on this phase of the subject than on insect control by dusting, the chief paper being that of Dr. N. J. Giddings, of the West Virginia Agricultural Experiment Station on "Orchard Dusting versus Spraying."

The recent revival of interest in dusting has led to comparative spraying and dusting experiments at a number of state experiment stations. An effort has been made to correlate this work, and Doctor Giddings has acted as leader of the project. Accordingly, reports on the work in various states have been forwarded to him and were treated in his paper.

The dusting work that Doctor Giddings reports related to the apple, and was almost exclusively concerned with apple scab. He stated that in West Virginia the results thus far obtained have indicated that sulphur dust is not so effective as either lime-sulphur or Bordeaux spray for the control of apple scab in those orchards of that state where the disease is severe.

The evidence from Michigan and Virginia in 1920, he said, was much more favorable to dust. In Virginia, however, seven applications were made.

Pennsylvania reported good results from dust in two orchards in 1920 and just a fair control in a third. In these cases five applications were made.

In Connecticut in 1920 dust controlled scab well on Greening, which was but slightly attacked, but showed almost no beneficial effect on Fall Pippin, on which scab was more severe. Four treatments were made in each case. It was also pointed out that in Pennsylvania in 1919, when scab was severe, dust failed to control the disease, whereas it gave more satisfactory results in 1920, when scab was less severe.