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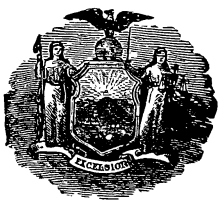
COMPARATIVE EFFICIENCY OF DUST AND SPRAY MIXTURES IN CONTROLLING THE CURRANT APHIS

P. J. PARROTT AND S. W. HARMAN



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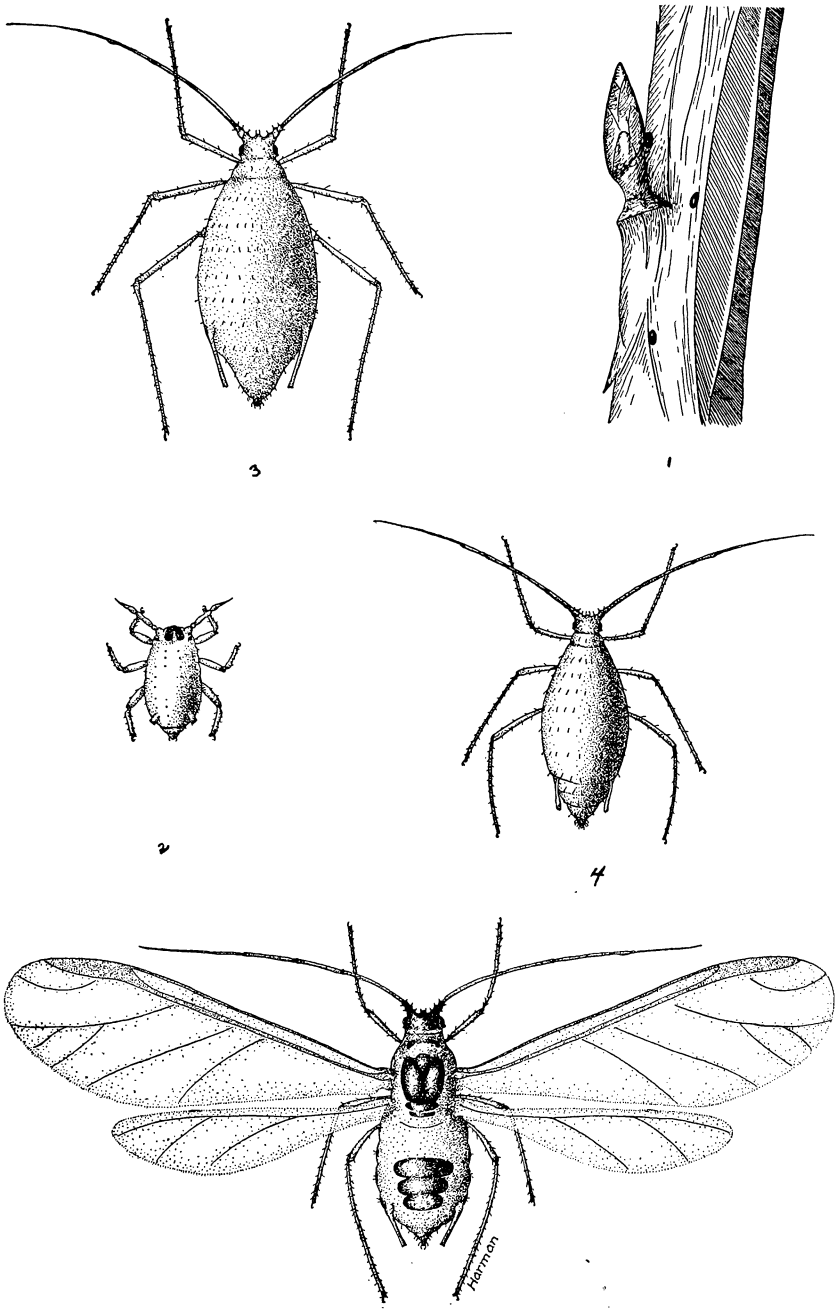

SOME LIFE STAGES OF THE CURRANT APHIS (*Myzus ribis* LINN.)

1, Egg x 4; 2, First-stage nymph x 21; 3, Stem mother x 14; 4, Oviparous female x 14; and 5, Winged viviparous female x 14.

BULLETIN NO. 517

COMPARATIVE EFFICIENCY OF DUST AND SPRAY MIXTURES IN CONTROLLING THE CURRANT APHIS

P. J. PARROTT AND S. W. HARMAN

SUMMARY

The experiments recorded in this test sought to determine the comparative efficiency of a number of preparations in liquid and dust form, containing nicotine as the principal insecticidal agent, in combating the currant aphis (*Myzus ribis* Linn.), a common pest of currants in this State.

Nicotine sulfate (40 per cent nicotine) was used in a spray mixture at the rate of 1 pint to 100 gallons of water, to which were added 5 pounds of dissolved soap. It was employed in several dust mixtures to give a nicotine content of approximately 0.5, 1.0, and 2 per cent, respectively, sulfur-lead-arsenate serving as the carrier. Tobacco dusts containing 1.0 and 3.5 per cent, respectively, of nicotine were also tested, the former being applied undiluted as well as in combination with lime hydrate.

The currant aphis displayed marked susceptibility to thoro applications of the different preparations. Counts of affected leaves showed that the average infestation of untreated bushes was 27.16 per cent for 1922 and 26.30 per cent for 1923. The foliage of the treated plats during the 2-year period showed an average infestation ranging from 0.06 per cent as a minimum to 4.4 per cent as a maximum. Altho certain preparations manifested a more rapid rate of toxicity or were somewhat more effective than others, the difference in insecticidal efficiency was in no instance very marked, pointing to the conclusion that as far as the currant aphis was concerned thoro and timely applications of the different materials tested had afforded noticeable protection.

Relative to the number of treatments required to secure effective results and most satisfactory conditions of applying the mixtures, it required two or three applications of either spray or dust mixtures to insure almost complete freedom of foliage injury during severe outbreaks of the aphis. The first treatment was made when the terminal

leaves that first appeared after the breaking of the buds had a diameter of about one-half inch to an inch in order to destroy the newly-hatched nymphs of the first generation. The destruction of these insects protected the blossom and fruit clusters, preventing the curling and other distortions of the leaves as well as reddish discoloration of the foliage. The control of the aphids of the first brood simplified the work of the later treatments, since the insects were forced to occupy relatively exposed positions on the new growth where they were quite accessible to treatment. The second application was given just after blossoming, while the third treatment was applied about one month before harvesting the crop.

Pruning the currants so as to remove the canes lying on or near the ground or to reduce the number of canes so that the bushes would not be too compact, contributed materially to the effectiveness and economy of both systems of treatment.

INTRODUCTION

This study dealing with the control of the currant aphis is a presentation of experimental data contributing towards the solution of a larger problem—the determination of the comparative merits of dust and spray mixtures in controlling common sucking insects.

On account of the habits of the insect and the nature of the growth of the host plant, the currant aphis lends itself readily to experiments of the character as planned and, as a consequence, this project has been one of the first to yield definite results. It should also be noted that the aphis is an important pest of currants, often causing the leaves to turn brown and shrivel up, and little data have been published bearing on its susceptibility to treatment and the relative merits of different control measures.

The experiments herein described, therefore, serve a two-fold purpose: 1, In demonstrating the comparative effectiveness of various dust and spray mixtures in combating an injurious sucking insect; and 2, in pointing out quite clearly the conditions under which currant plantings may be effectively protected from injuries by the currant aphis.

THE APHIS IN RELATION TO CURRANT CULTURE

The aphis (*Myzus ribis* Linn.*) has attracted attention as an important pest largely because of its injurious work on red currant, altho it infests also both the black currant and gooseberry.

The leaves attacked by the insects become badly curled and distorted, forming pocket-like recesses which are tenanted by the aphids. In these cavities the creatures live and breed, the damage to the plants increasing in extent with the prolongation of the period of infestation and the multiplication of the insects. During a severe and long-continued attack a large percentage of the foliage of the terminal growth may be involved, the curled and twisted leaves usually displaying brilliant colored mottling, red, orange and yellow being the prevailing tints. Those seriously affected frequently turn brown and fall prematurely, often causing the tips of the canes to be devoid largely of foliage. The loss of leaves causes the currant plantations to present a very unthrifty appearance and doubtless exerts an important influence on the vitality of the plants, but the actual effects of the defoliation on the fruit yields apparently have not been determined.

As the aphis is a sucking insect, spraying with the common contact insecticides, such as soap or a combination of soap and nicotine solution, has heretofore been regarded as the most practical method of protecting currant plantings. Until these experiments were undertaken, the susceptibility of the aphis to dust mixtures and the conditions under which the pest could be combated with such preparations seemed not to have been determined.

PLAN OF THE EXPERIMENTS

There was used in these experiments a planting of 250 currant bushes representing the four leading commercial sorts—Fay Prolific, Cherry, Perfection, and Wilder. The plats consisted of five bushes each which permitted frequent replication, the treated and check plats alternating as shown in Figure 1, which also shows the arrangement of the plats during 1922 and 1923.

The mixtures used for the treatment of the plants depended chiefly on nicotine as the killing agent. The nicotine was derived from superfine tobacco dusts containing 1 and 3.5 per cent nicotine, re-

*Identification of species by Dr. Edith M. Patch, Maine Agricultural Experiment Station, Orono, Me.

spectively, or nicotine sulfate (40 per cent nicotine). The formulas for the different preparations were as follows:

1. Dust, 0.5 per cent nicotine, composed of 1.25 pounds of nicotine sulfate (40 per cent nicotine) to 98.75 pounds of sulfur-lead arsenate mixture (90 pounds superfine dusting sulfur and 10 pounds of powdered lead arsenate).
2. Dust, 1.0 per cent nicotine, composed of 2.5 pounds nicotine sulfate to 97.5 pounds sulfur-lead arsenate dust mixture.
3. Dust, 2.0 per cent nicotine, composed of 5 pounds nicotine sulfate and 95 pounds of sulfur-lead arsenate dust mixture.
4. Superfine tobacco dust, 1.0 per cent nicotine, undiluted.
5. Superfine tobacco dust with lime hydrate in the proportions of 90 pounds of finely ground tobacco dust containing 1 per cent nicotine to 10 pounds of hydrated lime.
6. Superfine tobacco dust, 3.5 per cent nicotine, undiluted.
7. Soap-nicotine spray, composed of fish oil soap 5 pounds, nicotine sulfate 1 pint, and water 100 gallons.

The dust mixtures were applied with a power dusting machine at the rate of approximately 1 pound per bush, applications being made from both sides of each row. A power spraying outfit was used to apply the soap-nicotine spray, the dosage averaging about 2 gallons per plant. Both types of machines were of too large a capacity for the most economical treatment of plants with the character of growth of currants and with the disposition of plats as arranged in this series of tests. Then, again, to insure thoro applications, considerable waste of materials could hardly be avoided, since each plat was treated from both sides and it was not practical to check the discharge of materials after the treatment of each bush in passing to the next plant. As thoro treatment was the chief consideration, it was considered desirable to use enough material to insure satisfactory coating of the surfaces of all the leaves and the foregoing figures represent the amount required on an average to treat each plant.

A study of the literature suggests that no definite schedule has so far been determined indicating the probable number of treatments required to afford adequate protection to currants. In launching these experiments, it was clearly shown from the beginning that it was desirable to make one application after the aphids had hatched from the winter eggs to prevent multiplication of the insects and

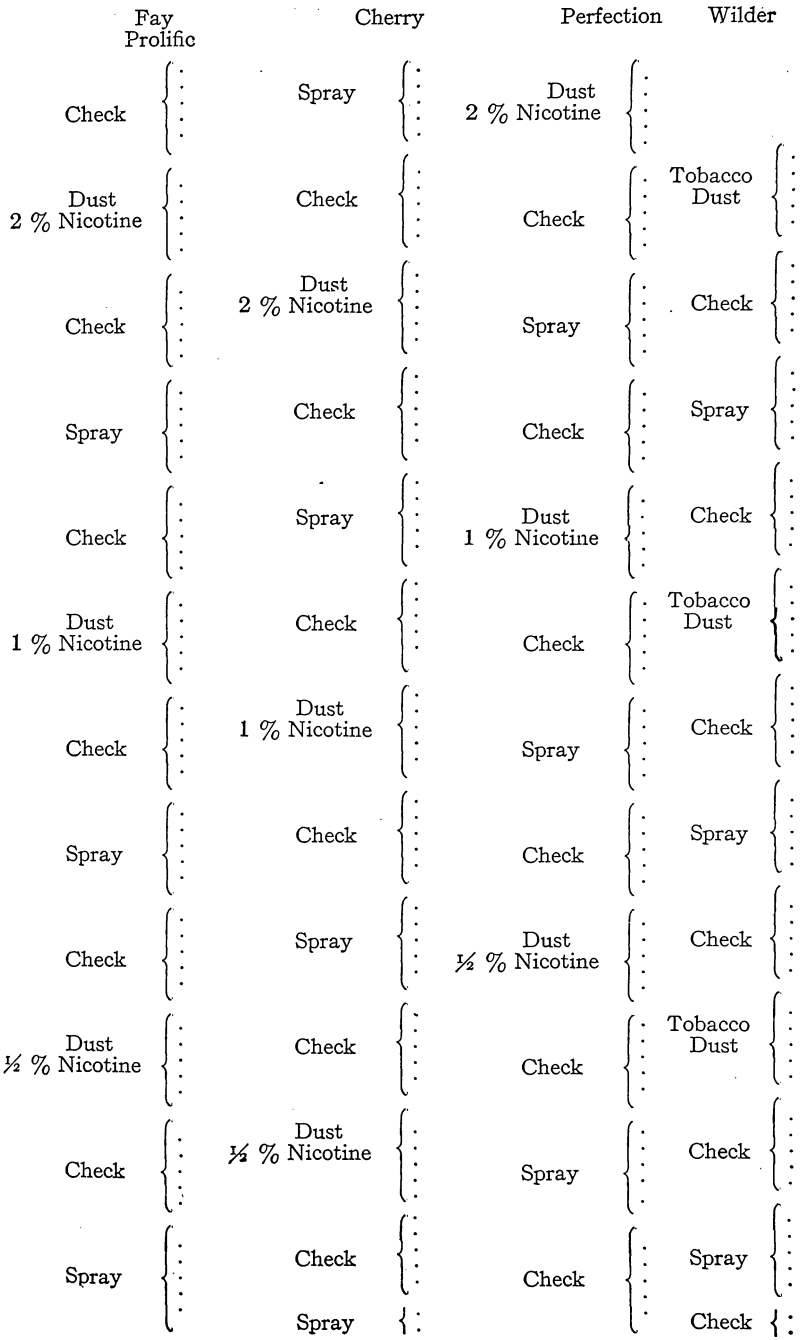

FIG. 1.—DIAGRAM OF CURRANT PLANTING, SHOWING DISTRIBUTION OF PLATS

curling of the leaves, since the distorted foliage makes it a more difficult problem to reach the creatures with insecticidal materials. The first treatment has usually been made when the more advanced leaves had a diameter of one-half inch to an inch. Subsequent applications were determined by the activities of the insects, treatments being made whenever the aphids appeared to be developing in de-

TABLE 1.—EFFECTIVENESS OF NICOTINE-SOAP SPRAY IN COMBATING THE CURRANT APHIS IN 1920.

SPRAYED					CHECK			
Row No.	Plat No.	Plant No.	Number of applications	Number of infested leaf-clusters	Row No.	Plat No.	Plant No.	Number of Infested leaf-clusters
1	1	2	2	2	1	2	2	60
1	3	2	2	1	1	4	2	28
1	5	2	2	2	1	6	2	40
1	7	2	2	9	1	8	2	56
1	9	2	2	1	1	10	2	14
1	11	2	2	20	1	12	2	49
2	1	2	2	1	2	2	2	45
2	3	2	2	3	2	4	2	11
2	5	2	2	4	2	6	2	55
2	7	2	2	3	2	8	2	41
2	9	2	2	3	2	10	2	24
2	11	2	2	4	2	12	2	46
Total				53	Total			469
Average number of affected leaf-clusters per sprayed plant				4.4	Average number of affected leaf-clusters per unsprayed plant			39
3	2	2	3	3	3	1	2	48
3	4	2	3	0	3	3	2	2
3	6	2	3	5	3	5	2	32
3	8	2	3	1	3	7	2	32
3	10	2	3	3	3	9	2	13
3	12	2	3	0	3	11	2	69
4	2	2	3	2	4	1	2	66
4	4	2	3	9	4	3	2	92
4	6	2	3	16	4	5	2	75
4	8	2	3	2	4	7	2	54
4	10	2	3	0	4	9	2	74
4	12	2	3	0	4	11	2	42
Total				41	Total			599
Average number of affected leaf clusters per sprayed plant				3.4	Average number of affected leaf-clusters per unsprayed plant			49.9

structive numbers. In these tests it has generally been necessary to make a second application after blossoming and in some instances a third treatment was made when the berries turned red to insure complete protection.

EXPERIMENTS WITH SPRAY AND DUST MIXTURES

TESTS WITH SOAP AND NICOTINE SPRAY DURING 1920

All plants were sprayed with nicotine and soap, one-half of the planting receiving two applications, once on May 18 with the temperature ranging from 49° to 69° F., and again on June 8 with temperatures from 59° to 64° F., respectively; while the remainder of the bushes were sprayed three times, May 18, June 8, and June 26, respectively, with the temperature for the latter date ranging from 66° to 82° F. After the harvesting of the crop, counts were made of the infested and healthy leaf-clusters of 24 checks and of 12 plants in each of the sprayed plats. The data are presented in Table 1.

TESTS WITH SPRAY AND DUST MIXTURES DURING 1922

The first application was made on April 21 with the temperature at 37° to 38° F., and when the newly expanding leaves were about three-fourths of an inch in diameter. The second treatment was given on May 15 with the temperature ranging from 55° to 75° F. and when the leaves were nearly full grown and the fruits had set. The bushes were treated for the third time on June 13 with the temperature from 52° to 60° F., when the fruits were beginning to show color. The effectiveness of the different preparations in protecting currant foliage from injuries by the currant aphis is shown in Table 2.

TESTS WITH SPRAY AND DUST MIXTURES DURING 1923

The first application was made May 2 with the temperature ranging from 55° to 64° F., and when the first leaves of the more advanced buds were approximately three-fourths of an inch in diameter. On June 11, with the temperature from 52° to 72° F., the bushes were given the second treatment and no further applications were required up to the time of picking the crop of currants, which commenced on July 11. During this season, two applications of the different preparations used in this series of tests afforded excellent control. The data are presented in Table 3.

TABLE 2—COMPARATIVE EFFECTIVENESS OF SPRAYING AND DUSTING AGAINST THE CURRANT APHIS IN 1922.

ROW NO.	PLAT NO.	TREATMENT	NUMBER OF HEALTHY LEAVES	NUMBER OF AFFECTED LEAVES	PERCENTAGE OF INJURED LEAVES
1	1	Spray	1,879	15	0.79
1	2	Check	2,372	589	19.89
1	3	Dust, 0.5 per cent nicotine	2,659	9	0.34
1	4	Check	1,998	1,038	34.19
1	5	Spray	2,614	14	0.53
1	6	Check	740	203	21.53
1	7	Dust, 1 per cent nicotine	3,551	6	0.17
1	8	Check	1,713	545	24.14
1	9	Spray	1,407	4	0.28
1	10	Check	4,449	939	17.43
1	11	Dust, 2 per cent nicotine	5,605	8	0.14
1	12	Check	3,710	1,185	24.21
2	3	Dust, 0.5 per cent nicotine	3,874	11	0.28
2	7	Dust, 1 per cent nicotine	5,821	9	0.15
2	11	Dust, 2 per cent nicotine	7,365	18	0.24
3	1	Check	1,266	591	31.83
3	2	Spray	2,193	49	2.19
3	3	Check	2,495	869	25.83
3	4	Dust, 0.5 per cent nicotine	2,068	176	7.84
3	5	Check	1,724	910	34.55
3	6	Spray	1,829	23	1.24
3	7	Check	2,183	1,027	31.99
3	8	Dust, 1 per cent nicotine	2,748	25	0.90
3	9	Check	1,755	930	34.66
3	10	Spray	1,122	11	0.97
3	11	Check	4,841	1,000	17.12
3	12	Dust, 2 per cent nicotine	3,913	0	0.00
4	1	Check	2,592	817	23.97
4	2	Spray	3,030	61	1.97
4	3	Check	1,390	745	34.89
4	4	Dust, superfine tobacco 1 per cent nicotine	2,255	3	0.13
4	5	Check	2,052	858	29.48
4	6	Spray	1,981	14	0.70
4	7	Check	3,838	1,182	23.55
4	8	Dust, superfine tobacco, 1 per cent nicotine, 90 pounds and lime hydrate 10 pounds	3,018	6	0.20
4	9	Check	1,940	821	29.74
4	10	Spray	1,836	7	0.38
4	11	Check	2,427	1,034	29.88
4	12	Dust, superfine tobacco, 3.5 per cent nicotine	5,331	15	0.28

PLATE I.—THE EFFECT OF APHIS INJURY ON CURRANT FOLIAGE.
Left, A normal leaf-cluster. Right, An injured leaf-cluster.

PLATE II.—TYPICAL CONDITIONS OF TREATED AND UNTREATED CURRANT BUSHES.
Left, An unsprayed plant. Right, A sprayed plant.

PLATE III.—DIFFERENT STAGES OF GROWTH OF BLOSSOM- AND FRUIT-CLUSTERS WHEN THE TREATMENTS WERE MADE IN THE STATION TESTS.

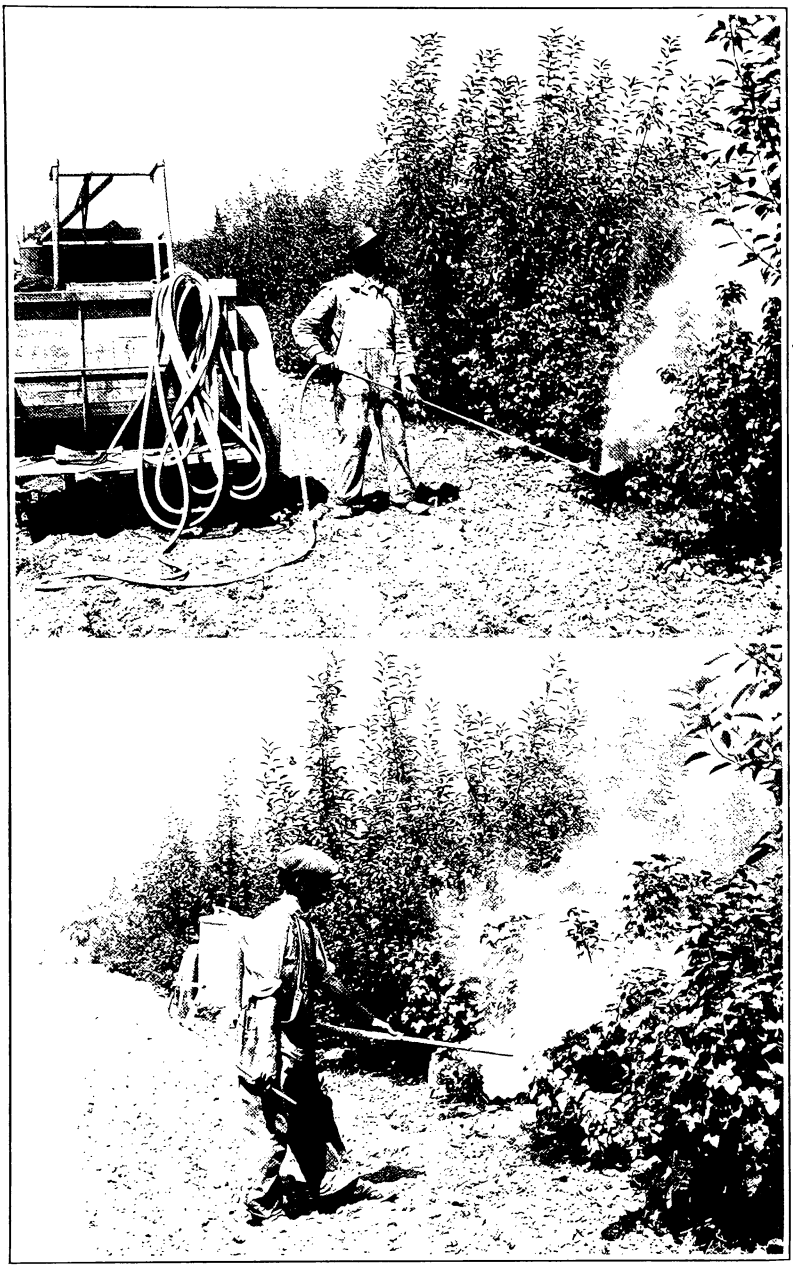

PLATE IV.—METHOD OF CONTROLLING APHIDS BY SPRAY AND DUST MIXTURES APPLIED TO LOWER SURFACES OF THE LEAVES.

Upper, with spray mixture. Lower, with dust mixture.

TABLE 2—SUMMARY.

Treatment	Percentage of affected leaves per bush
Spray, 1 pint nicotine sulfate with 5 pounds soap per 100 gallons of water	1.01
Dust, 0.5 per cent nicotine with sulfur-lead arsenate (90–10 formula)	2.82
Dust, 1.0 per cent nicotine with sulfur-lead arsenate (90–10 formula)	0.41
Dust, 2.0 per cent nicotine with sulfur-lead arsenate (90–10 formula)	0.13
Dust, superfine tobacco dust, 1 per cent nicotine	0.13
Dust, superfine tobacco dust, 1 per cent nicotine, 90 pounds and lime hydrate 10 pounds	0.20
Dust, superfine tobacco dust, 3.5 per cent nicotine	0.28
Check, no treatment	27.16

CONCLUSIONS AND RECOMMENDATIONS

The data derived from the experiments reported on the foregoing pages show that the currant aphis is susceptible to spraying with soap and nicotine at standard strength and dusting with sulfur-lead arsenate mixtures containing 1 and 2 per cent nicotine, respectively. Superfine tobacco dusts containing 1.0 and 3.5 per cent nicotine, respectively, also proved efficient aphiscides, altho straight tobacco dust, as well as the sulfur-lead arsenate dust containing 0.5 per cent nicotine, did not display as high a rate of toxicity on an average as the sulfur-lead arsenate dusts containing 1 and 2 per cent nicotine.

The plants that were systematically treated with any of the foregoing materials displayed on an average very few discolored or curled leaves and retained the bulk of their foliage until the end of the summer. During the three years that the experiments were conducted, the check vines exhibited conspicuous infestation annually which resulted in marked damage to the leaves and premature defoliation.

For the grower who desires to spray, a very satisfactory mixture, considering both safeness and efficiency, may be prepared from the following formula: Nicotine sulfate (40 per cent nicotine) 1 pint, soap 5 pounds, and water 100 gallons. Completely dissolve the soap, which should then be poured into the water containing the required amount of tobacco extract. Agitate the mixture thoroly and apply with high pressure, endeavoring to wet all surfaces of the foliage.

Efficient dust mixtures containing 1 and 2 per cent nicotine, as

TABLE 3.—COMPARATIVE EFFECTIVENESS OF SPRAYING AND DUSTING AGAINST THE CURRANT APHIS IN 1923.

ROW NO.	PLAT NO.	TREATMENT	NUMBER OF HEALTHY LEAVES	NUMBER OF AFFECTED LEAVES	PERCENTAGE OF INJURED LEAVES
1	1	Spray	2,867	0	0.00
1	1	Spray	2,631	0	0.00
1	1	Spray	2,382	7	0.29
1	1	Spray	1,426	0	0.00
1	1	Spray	2,238	5	0.22
1	2	Check	1,565	1,417	47.51
1	2	Check	2,165	976	31.07
1	2	Check	2,656	653	19.73
1	2	Check	1,573	1,011	39.12
1	2	Check	2,050	413	16.76
1	3	Dust, 0.5 per cent nicotine	1,100	13	1.16
1	3	Dust, 0.5 per cent nicotine	3,649	8	0.22
1	3	Dust, 0.5 per cent nicotine	3,062	7	0.23
1	3	Dust, 0.5 per cent nicotine	2,879	15	0.52
1	3	Dust, 0.5 per cent nicotine	3,198	21	0.65
1	4	Check	1,876	561	23.02
1	4	Check	1,763	613	25.79
1	4	Check	873	346	28.38
1	4	Check	1,421	421	22.85
1	4	Check	527	493	48.33
1	5	Spray	3,067	7	0.22
1	5	Spray	2,915	2	0.06
1	5	Spray	3,329	0	0.00
1	5	Spray	1,515	2	0.13
1	5	Spray	3,192	4	0.12
1	6	Check	1,932	1,272	39.70
1	6	Check	777	37	4.54
1	6	Check	2,658	371	12.24
1	6	Check	1,504	1,323	46.79
1	6	Check	2,134	211	8.99
1	7	Dust, 1 per cent nicotine	562	5	0.88
1	7	Dust, 1 per cent nicotine	3,756	0	0.00
1	7	Dust, 1 per cent nicotine	3,824	0	0.00
1	7	Dust, 1 per cent nicotine	4,071	0	0.00
1	7	Dust, 1 per cent nicotine	3,926	4	0.10
1	8	Check	1,781	1,473	45.26
1	8	Check	1,042	827	44.24
1	8	Check	784	319	28.92
1	8	Check	624	373	37.41
1	8	Check	1,497	1,107	42.51
1	9	Spray	1,816	6	0.33
1	9	Spray	864	0	0.00

TABLE 3.—COMPARATIVE EFFECTIVENESS OF SPRAYING AND DUSTING AGAINST THE CURRANT APHIS IN 1923.—*Continued.*

ROW NO.	PLAT NO.	TREATMENT	NUMBER OF HEALTHY LEAVES	NUMBER OF AFFECTED LEAVES	PERCENTAGE OF INJURED LEAVES
1	9	Spray	1,230	0	0.00
1	9	Spray	2,890	1	0.03
1	10	Check	2,333	986	29.70
1	10	Check	3,725	1,126	23.21
1	10	Check	5,717	491	7.90
1	10	Check	5,210	103	1.93
1	11	Dust, 2 per cent nicotine	7,217	2	0.03
1	11	Dust, 2 per cent nicotine	5,443	0	0.00
1	11	Dust, 2 per cent nicotine	6,210	0	0.00
1	11	Dust, 2 per cent nicotine	4,981	0	0.00
1	11	Dust, 2 per cent nicotine	4,016	12	0.29
1	12	Check	5,608	571	9.24
1	12	Check	5,357	1,151	17.68
1	12	Check	3,913	1,069	21.45
1	12	Check	3,719	989	21.00
1	12	Check	4,479	703	13.56
2	1	Spray	2,918	0	0.00
2	1	Spray	3,012	12	0.39
2	2	Check	1,835	917	33.32
2	2	Check	2,269	567	19.99
2	2	Check	1,992	681	25.47
2	2	Check	2,071	1,036	33.34
2	2	Check	2,347	612	20.68
2	3	Dust, 0.5 per cent nicotine	2,911	16	0.55
2	3	Dust, 0.5 per cent nicotine	103	0	0.00
2	3	Dust, 0.5 per cent nicotine	2,747	34	1.22
2	3	Dust, 0.5 per cent nicotine	2,894	22	0.75
2	3	Dust, 0.5 per cent nicotine	3,389	89	2.55
2	4	Check	2,941	1,470	33.32
2	4	Check	937	234	19.98
2	4	Check	905	302	25.02
2	4	Check	2,658	421	13.67
2	4	Check	2,641	511	16.21
2	5	Spray	1,968	8	0.41
2	5	Spray	2,006	0	0.00
2	5	Spray	3,835	5	0.13
2	5	Spray	3,367	0	0.00
2	5	Spray	1,961	2	0.10
2	6	Check	2,639	297	10.11
2	6	Check	1,565	256	14.05
2	6	Check	2,131	532	19.97
2	6	Check	1,784	293	14.10

TABLE 3.—COMPARATIVE EFFECTIVENESS OF SPRAYING AND DUSTING AGAINST THE CURRANT APHIS IN 1923.—*Continued.*

ROW NO.	PLAT NO.	TREATMENT	NUMBER OF HEALTHY LEAVES	NUMBER OF AFFECTED LEAVES	PERCENTAGE OF INJURED LEAVES
2	6	Check	2,508	626	19.94
2	7	Dust, 1 per cent nicotine	2,090	17	0.80
2	7	Dust, 1 per cent nicotine	2,077	2	0.09
2	7	Dust, 1 per cent nicotine	2,850	0	0.00
2	7	Dust, 1 per cent nicotine	2,117	0	0.00
2	7	Dust, 1 per cent nicotine	901	2	0.22
2	8	Check	2,529	254	9.12
2	8	Check	1,595	531	24.97
2	8	Check	2,205	268	10.83
2	8	Check	2,006	207	9.35
2	8	Check	2,863	317	9.96
2	9	Spray	2,637	12	0.45
2	9	Spray	2,061	0	0.00
2	9	Spray	3,163	0	0.00
2	9	Spray	2,784	0	0,00
	9	Spray	1,181	5	0.42
2	10	Check	1,058	4	0.37
2	10	Check	90	3	3.22
2	10	Check	1,625	542	25.01
2	10	Check	601	581	49.15
2	10	Check	132	146	52.51
2	11	Dust, 2 per cent nicotine	3,935	11	0.03
2	11	Dust, 2 per cent nicotine	4,103	0	0.00
2	11	Dust, 2 per cent nicotine	3,620	0	0.00
2	11	Dust, 2 per cent nicotine	2,941	0	0.00
2	11	Dust, 2 per cent nicotine	3,881	6	0.13
2	12	Check	2,606	872	25.07
2	12	Check	3,099	775	20.00
2	12	Check	2,288	1,874	45.02
2	12	Check	1,596	1,583	49.79
2	12	Check	2,448	933	27.59
5	13	Spray	5,199	11	0.21
2	13	Spray	5,965	2	0.03
2	13	Spray	6,209	0	0.00
2	13	Spray	7,113	0	0.00
2	13	Spray	6,118	16	0.26
3	1	Check	1,099	22	1.96
3	1	Check	765	713	48.24
3	1	Check	1,449	824	36.25
3	1	Check	869	678	43.82
3	1	Check	1,907	556	22.57

TABLE 3.—COMPARATIVE EFFECTIVENESS OF SPRAYING AND DUSTING AGAINST THE CURRANT APHIS IN 1923.—*Continued.*

ROW NO.	PLAT NO.	TREATMENT	NUMBER OF HEALTHY LEAVES	NUMBER OF AFFECTED LEAVES	PERCENTAGE OF INJURED LEAVES
3	2	Spray	2,607	31	1.17
3	2	Spray	2,215	3	0.13
3	2	Spray	472	0	0.00
3	2	Spray	2,882	2	0.06
3	2	Spray	979	3	0.31
3	3	Check	837	59	6.58
3	3	Check	1,990	497	19.98
3	3	Check	1,166	964	45.25
3	3	Check	1,760	1,421	44.67
3	3	Check	2,028	621	23.44
3	4	Dust, 0.5 per cent nicotine	3,107	23	0.73
3	4	Dust, 0.5 per cent nicotine	2,678	0	0.00
3	4	Dust, 0.5 per cent nicotine	3,063	9	0.29
3	4	Dust, 0.5 per cent nicotine	4,747	14	0.29
3	4	Dust, 0.5 per cent nicotine	2,740	24	0.87
3	5	Check	1,356	1,126	45.36
3	5	Check	1,119	823	42.37
3	5	Check	1,495	968	39.30
3	5	Check	1,144	872	43.25
3	5	Check	1,903	38	1.95
3	6	Spray	2,207	32	1.42
3	6	Spray	2,317	0	0.00
3	6	Spray	506	0	0.00
3	6	Spray	3,025	2	0.06
3	6	Spray	3,156	4	0.13
3	7	Check	1,965	906	31.55
3	7	Check	1,241	741	37.38
3	7	Check	1,035	312	23.16
3	7	Check	697	506	42.06
3	8	Dust, 1 per cent nicotine	2,741	41	1.47
3	8	Dust, 1 per cent nicotine	1,997	0	0.00
3	8	Dust, 1 per cent nicotine	3,026	0	0.00
3	8	Dust, 1 per cent nicotine	2,898	0	0.00
3	8	Dust, 1 per cent nicotine	2,055	6	0.29
3	9	Check	1,658	612	26.96
3	9	Check	901	225	19.98
	9	Check	1,274	89	6.53
3	9	Check	1,108	123	9.99
3	10	Spray	1,545	1	0.06
3	10	Spray	4,460	2	0.04
3	10	Spray	4,105	27	0.65
3	11	Check	3,901	975	19.99

TABLE 3.—COMPARATIVE EFFECTIVENESS OF SPRAYING AND DUSTING AGAINST THE CURRANT APHIS IN 1923.—*Continued.*

ROW NO.	PLAT NO.	TREATMENT	NUMBER OF HEALTHY LEAVES	NUMBER OF AFFECTED LEAVES	PERCENTAGE OF INJURED LEAVES
3	11	Check	4,231	1,058	20.00
3	11	Check	4,508	901	16.65
3	11	Check	5,458	607	10.09
3	11	Check	3,183	1,860	36.88
3	12	Dust, 2 per cent nicotine	3,056	8	0.26
3	12	Dust, 2 per cent nicotine	2,891	0	0.00
3	12	Dust, 2 per cent nicotine	2,763	0	0.00
3	12	Dust, 2 per cent nicotine	4,139	7	0.16
3	12	Dust, 2 per cent nicotine	2,689	0	0.00
4	1	Check	2,248	764	25.36
4	1	Check	2,329	526	18.42
4	2	Spray	2,706	12	0.44
4	2	Spray	3,063	6	0.19
4	2	Spray	3,471	0	0.00
4	2	Spray	3,166	0	0.00
4	2	Spray	2,964	6	0.20
4	3	Check	1,661	1,488	47.25
4	3	Check	1,887	1,120	37.24
4	3	Check	1,417	719	33.66
4	3	Check	2,311	568	19.72
4	3	Check	1,156	967	45.54
4	4	Dust, Tobacco, 1 per cent nicotine	2,939	22	0.74
4	4	Dust, Tobacco, 1 per cent nicotine	3,032	64	2.06
4	4	Dust, Tobacco, 1 per cent nicotine	3,296	47	1.40
4	4	Dust, Tobacco, 1 per cent nicotine	3,445	73	2.07
4	4	Dust, Tobacco, 1 per cent nicotine	1,958	17	0.80
4	5	Check	3,231	416	11.40
4	5	Check	1,004	819	44.92
4	5	Check	1,737	437	20.01
4	5	Check	2,123	711	25.08
4	5	Check	2,124	1,028	32.61
4	6	Spray	2,727	16	0.58
4	6	Spray	3,233	3	0.09
4	6	Spray	3,147	0	0.00
4	6	Spray	1,926	0	0.00
4	6	Spray	3,590	2	0.05
4	7	Check	2,015	761	27.41
4	7	Check	2,017	914	31.18
4	7	Check	2,285	821	26.43
4	7	Check	1,804	715	28.38
4	7	Check	1,875	507	21.28
4	8	Dust, Tobacco, 1 per nicotine	2,645	3	0.11

TABLE 3.—COMPARATIVE EFFECTIVENESS OF SPRAYING AND DUSTING AGAINST THE CURRANT APHIS IN 1923.—*Concluded.*

ROW NO.	PLAT NO.	TREATMENT	NUMBER OF HEALTHY LEAVES	NUMBER OF AFFECTED LEAVES	PERCENTAGE OF INJURED LEAVES
4	8	Dust, Tobacco, 1 per cent nicotine	3,170	2	0.06
4	8	Dust, Tobacco, 1 per cent nicotine	3,055	0	0.00
4	8	Dust, Tobacco, 1 per cent nicotine	1,467	0	0.00
4	8	Dust, Tobacco, 1 per cent nicotine	2,747	26	0.93
4	9	Check	2,014	1,123	35.79
4	9	Check	1,758	76	4.14
4	9	Check	1,339	724	35.09
4	9	Check	1,779	460	20.54
4	9	Check	2,057	624	23.27
4	10	Spray	2,470	3	0.12
4	10	Spray	1,922	0	0.00
4	10	Spray	1,716	0	0.00
4	10	Spray	2,136	0	0.00
4	10	Spray	2,906	42	1.42
4	11	Check	1,899	1,237	39.44
4	11	Check	1,465	1,326	47.50
4	11	Check	2,489	821	24.80
4	11	Check	2,751	967	26.00
4	11	Check	1,210	604	33.29
4	12	Dust, Tobacco, 1 per cent nicotine	3,476	0	0.00
4	12	Dust, Tobacco, 1 per cent nicotine	5,021	18	0.35
4	12	Dust, Tobacco, 1 per cent nicotine	6,244	21	0.33
4	12	Dust, Tobacco, 1 per cent nicotine	3,836	36	0.92
4	12	Dust, Tobacco, 1 per cent nicotine	3,890	12	0.30

SUMMARY

TREATMENT	PERCENTAGE OF AFFECTED LEAVES PER BUSH
Spray, 1 pint nicotine sulfate with 5 pounds soap per 100 gallons of water	0.19
Dust, 0.5 per cent nicotine with sulfur-lead arsenate (90–10 formula)	0.67
Dust, 1.0 per cent nicotine with sulfur-lead arsenate (90–10 formula)	0.26
Dust, 2.0 per cent nicotine with sulfur-lead arsenate (90–10 formula)	0.06
Dust, commercial ground tobacco dust, 1.0 percent nicotine	0.67
Check, no treatment	26.30

well as superfine tobacco dust, can be purchased from dealers handling spraying supplies, dusting machinery, and dust preparations. In the preparation of nicotine dusts containing nicotine sulfate growers who desire to make their own mixtures should use either hydrated lime or superfine dusting sulfur as the carrier of the nicotine sulfate. If control of leaf spot is also desired, sulfur should be selected as the carrier of the nicotine since our tests have shown that two or three applications of this combination of materials have afforded a large degree of protection from this disease as well as from the aphis. In this connection mention should be made of the fact that while sulfur applied as a dust has, generally speaking, proved safe to foliage, it has in some instances caused injury. If the use of sulfur is regarded as unsafe, then the grower had better not attempt to apply a dust containing both fungicidal and insecticidal properties, but instead use the lime-nicotine dust to combat the aphis alone, relying on the dehydrated copper dust, applied in separate treatments, to control the leaf spot. In dusting for the control of the aphis the treatment should be made as far as possible during quiet days when temperatures are high and the foliage is free or largely free from moisture.

Currant bushes with dense, matted growth, possessing canes which sprawl over the ground, are difficult to treat satisfactorily without expending an excessive amount of time or material. To simplify the work of both spraying and dusting, as well as to facilitate picking, it is a good practice to prune the bushes carefully during early spring to remove straggling and excess canes, since vines with upright and not too dense growth can be thoroly treated with the minimum amount of material.

During seasons when the aphis was superabundant, two or three applications of either the spray or dust mixtures afforded almost complete immunity from foliage injury. Of these treatments, chief in importance was the application made when the first unfolding leaves had a diameter of one-half inch to one inch, since the destruction of the first brood of nymphs protected the leaves of the blossom- and fruit-clusters which are the first to be attacked, as was plainly revealed in our tests by the freedom of the foliage from curling and discoloration. If further treatments are deemed desirable, subsequent applications should be made when the insect threatens to develop to destructive numbers.

In our experiments a second treatment was given just after blossom-

ing, and in some instances a third application was made about one month before harvesting the crop. Currant growers who treat their plantings systematically for such pests as anthracnose, leaf spot, and currant worms could doubtless, with only slight modifications in existing practices, adapt their system of treatment to secure adequate control of the aphis. In this event the chief item of expense would be the cost of the nicotine, supplied presumably in most cases in the form of nicotine sulfate. The addition of this constituent to the customary spray or dust mixture would increase materially the cost of the treatment, which prompts a word of caution—that provision for its employment should only be made when there is evidence of severe infestation of the unfolding leaves or the history of the planting indicates that it is annually subject to destructive attacks of the pest. Light infestations of aphids, particularly if restricted to the foliage at the tips of the canes, probably do not cause damage of great economic importance and, in attempting to combat the insect under such conditions, it is not likely that the benefits derived from treatment would compensate for the cost of the application.