which could be attributed directly to the use of the tractor is applying insecticides amounted to 44 pounds per acre.

The average yield from the entire treated area was 1,394 pounds of seed cotton per acre, which was 496 pounds more than from the untreated area. The actual increase in yield resulting from the use of the equipment and insecticides described herein amounted to 55%, whereas, if the tractor had not damaged the crop, the increase would have been 60%.

Effects of Physical Properties of Derris Dusts on Their Toxicity to the Mexican Bean Beetle[1]

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One of the problems in controlling the Mexican bean beetle (*Epilachna varivestis* Muls.) with derris dusts has been the variation in effectiveness of dusts from different sources. To obtain a better understanding of the reasons for this variation, tests were conducted at Columbus, Ohio in 1943 to determine the effects of different properties of derris dusts on their toxicity to the beetle. Earlier tests had shown that their toxicity to the pea aphid (*Macrosiphum pisi* (Harr.)) did not increase with the derris content but did increase with the greater fineness of grinding of the derris root and with the decrease in particle size of the diluent (Harries 1956).

Four samples of derris root of different rotenone content were each ground to three degrees of fineness and diluted to a strength of 1% of rotenone with pyrophyllite of four degrees of fineness. The 48 dusts were compared in a 4×3×4 factorial experiment to study the effects of differences in each of the major factors and their possible interaction effects. Eight replicates were made. Greenhouse plants in the large two-leaf stage were transplanted into No. 2 tin cans, treated with insecticides under a bell-jar duster (Harries 1943), infested with 10 third-instar larvae, and covered with cylindrical screen cages with cellulose acetate tops to admit as much light as possible. The cages were then placed on a table under fluorescent lights at 80° F. and 50% relative humidity. After 3 days the numbers of dead and moribund larvae were recorded and the leaf area eaten was estimated by placing a transparent grid over the leaves and counting the squares where more than half the area was consumed. The particle size of the derris samples and the pyrophyllite was determined as surface-mean diameter with an air permeation apparatus (Gooden & Smith 1940).

The data are summarized in table 1. Both the larval mortality and the leaf area eaten show highly significant effects of the percentage and particle size of the derris root and the particle size of the diluent. The dust with the highest percentage of derris root was significantly less toxic than dusts with less root. Also, the derris samples of 6 and 7 microns were significantly more toxic than the 9-micron sample. There was a decrease in toxicity with increase in particle size of the pyrophyllite, and the 3-micron diluent produced a significantly more toxic dust than any of the coarser ones.

Presumably, greater fineness of milling of the derris root could affect the toxicity by more thorough breaking down of the plant structure to expose the contained rotenone and/or by increasing the number of particles and surface area of the root encountered by the insects. If the latter effect were the more important, the toxicity could also be expected to increase with the derris content of the dust. Since there was no such indication in the data, the breakdown of the plant structure appears to be the more important effect. The highly significant interaction between fineness of grinding and the percentage of ground root shows that derris of low rotenone content was most improved by finer milling. Similar results were obtained in tests of the same dusts against the pea aphid (Harries 1956).

Table 1.—Effects of the derris content and the particle sizes of the derris and pyrophyllite on the toxicity of 1% rotenone dusts to the Mexican bean beetle.

Property	Per Cent Mortality of Larvae	Leaf Area Eaten (sq. cm.)
Derris content (per cent)		
8.6	74	36
11.1	79	29
15.4	79	30
25.6	68	46
L.S.D. at 5% level	7	9
Particle size of derris (microns)		
6	76	33
7	78	26
9	70	46
L.S.D. at 5% level	5	6
Particle size of pyrophyllite (microns)		
3	82	29
6	75	35
9	72	37
12	70	40
L.S.D. at 5% level	6	7

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Effectiveness of Three Organophosphorous Compounds against Larvae of the Painted Lady in Alfalfa[1]

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Migrations of the painted lady or thistle butterfly, *Vanessa cardui* (L.), occur at irregular intervals in southern California (Abbott 1941, 1946, 1950, Sudgen *et al.* 1947, Woodbury *et al.* 1942). A heavy migration of *V. cardui* took place during the winter of 1958.

Painted lady larvae feed on a variety of species in the genera *Malva* L., *Arctium* L., *Lupinus* L., *Urtica* L., and species in the Cynoreae (thistle) tribe. The larvae are frequently a pest on ornamentals, especially chrysanthemum and hollyhock, and they are sometimes found on oak trees where they rarely, if ever, cause damage. When populations occur in large numbers they may attack globe artichoke (=genus *Cynora*), beans, sunflower, prune trees, lettuce, cotton, and okra.

During February and March 1958, painted lady larvae were extremely abundant in alfalfa fields in the Imperial Valley, where they were feeding principally upon cheeseweed, a wild mallow (*Malva parviflora* L.). In many instances, the caterpillars com-

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