Broad Bean Weevil

control of pest may restore the once important fava bean crop

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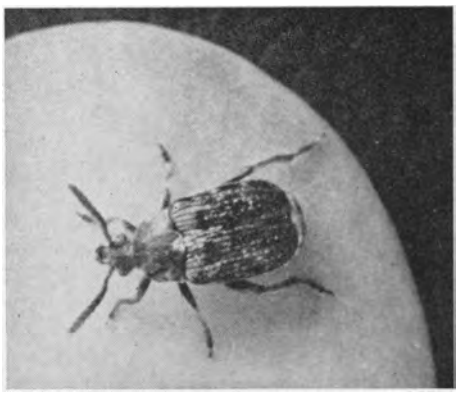

Adult broad bean weevil on broad bean. Magnified six times.

A drop in annual production from between 40,000 and 50,000 100-pound bags of broad—fava—beans in San Mateo County before 1920 to a total of 847 100-pound bags in 1949 was caused by the spread of the broad bean weevil, *Bruchus rufimanus* Boh. through the central coast area from San Francisco Bay south to San Luis Obispo.

Many people relish these beans either as a green or a dry vegetable but the presence of larvae in the green beans and the adult weevils in the dry beans render them unfit for human food.

Much of the present commercial crop goes into stock feed or is used for cover crop purposes.

The young larva hatching from the egg bores directly downward through the egg and pod into a developing bean. The entrance hole, or sting, can easily be seen on the green or dry bean as a small dark spot.

When full grown the larva cuts a circular window in the bean, for the subsequent emergence of the adult and then pupates within the bean. The adult can easily push off this circular cap and emerge.

Some adults leave the seed as soon as they are developed but others may remain in the bean for a period of several months. Many of the adults emerge after the beans have been planted.

There is but one generation per year and broad bean is the only host for this weevil.

Chemical control of this insect has not been practiced by the growers for several important reasons. Prior to the advent of the chlorinated hydrocarbon insecticides, such as DDT, there existed no insecticide that would give effective control and still be economically feasible. After these new materials were made available for agricultural use the growers did not know what insecticide to use or when to apply it.

Observations and experiments were begun—in co-operation with interested growers in San Mateo County—early in 1950 to determine if this pest could be controlled by chemical means.

Control Tests

These dust materials were used in control studies: 5% DDT plus 50% sulfur; 5% DDT combined with 1% crude benzene hexachloride—BHC—plus 50% sulfur; 1% lindane; 5% DDD and 2.5% dieldrin. The BHC was added for aphid control.

The materials were applied to small replicated plots by rotary hand dusters and to large fields by a specially equipped helicopter. The small plots were .05 acre in size; and were replicated four times. The materials used in the small plot tests were lindane, DDT, DDD and dieldrin.

In the helicopter studies, materials were applied to entire fields ranging in size from seven to 20 acres.

Adult bean weevils were found hibernating beneath the bark of Eucalyptus trees—in company with pea weevil adults—on March 31 when several adjacent bean fields were in blossom. One hundred bush tops were shaken over an insect net and 13 weevils were collected. Small pods were present at this time but no eggs could be found. On April 3 an examination of 300 pods revealed the presence of two glistening, milky white eggs glued to the surface of the pod. The largest pod at this time was about two inches in length.

On May 24 an examination of 100 pods from an untreated field revealed a total of 1803 eggs or slightly over 18 per pod. One pod had 57 eggs glued to its surface. At harvest time the beans from this field averaged 1.6 weevils per bean, indicating a larval mortality of about 64%. Another untreated field gave a larval mortality of about 50%.

The first adults emerged from sample beans on August 16 approximately four and one half months after the first eggs were observed.

On September 20 adults of the broad bean weevil were found again in company with the pea weevil beneath the bark of Eucalyptus, and cypress trees. They were found also behind large splinters on wooden fence posts adjacent to an untreated field and as far as 100 yards away from the field.

Results of Insecticide Tests

Eight fields of untreated broad beans were sampled at harvest time to determine the rate of infestation. These represent all of the fields that were readily available in San Mateo County. The re-

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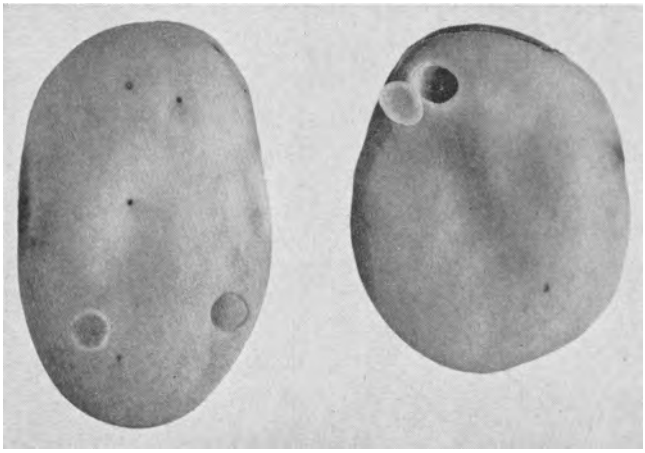
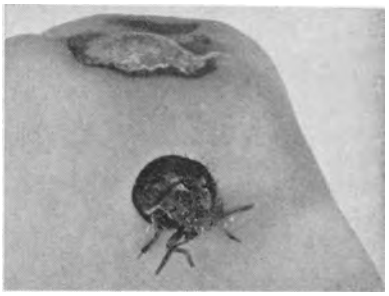
Below. Semi-lateral view of broad bean weevil egg showing typical method of adherence to surface of green pod. Magnified 12 times.
Center. Infested broad beans showing entrance holes made by first instar larvae, windows cut by mature larvae and cap pushed aside by emerged adult. Magnified two times.
Below. Broad bean weevils emerging from bean. Magnified four times.





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sults show that the rate of infestation varied from a low of 16.5% to a high of 92.7% and averaging 60.1%. Several of the infested fields averaged more than two weevils per bean. One bean was found from which nine weevils had emerged.

Five fields varying in size from 3.5 acres to 20 acres were treated by a helicopter under favorable conditions. Treated field No. 1 was separated from untreated field No. 5 by a wire fence. As a result of this proximity a single treatment of 5% DDT plus 1% BHC was not sufficient to give good control. The other four treated fields were remarkably clean at harvest time with average infestation rates of 0.25% to 1.8%.

Some of the beans from the BHC treated fields were tested by several cooperators for off flavor and none was detected. Additional studies will be made with other aphicides next season.

Result of Dust Treatments for the Control of the Broad Bean Weevil. Small Replicated Plots, San Mateo County, April 20, 1950.

Material	Number beans examined	Per cent infested	Per cent reduced under check
Check	1,600	12.9	0
DDT	1,600	6.1	53
DDD	1,600	7.6	41
Dieldrin	1,600	7.9	39
Lindane	1,600	9.3	28

The data obtained from the tests on the small replicated plots show that DDT gave the best control with one application reducing the infestation 53% under the check.

DDD and dieldrin also gave promising results but did not seem to be quite as good as DDT.

With the broad bean weevil controlled, a demand might be recreated for the broad bean as a human food, and a valuable crop could be freely grown once more in the central coastal area of California.

The aphid found on broad beans are vectors of several virus diseases peculiar to legumes, field observation and unpublished data support the contention that aphid honeydew in combination with high humidity provide a favorable substrate for the growth of *Botrytis cinerea* Pers. This fungus is reported as the cause of the common and destructive chocolate spot disease of broad beans.

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Dr. William Snyder, Professor of Plant Pathology, University of California College of Agriculture contributed the observation on the growth of Botrytis cinerea *Pers.*

Rate of Infestation of Untreated Broad Beans by *Bruchus rufimanus* Boh. in San Mateo County, California during 1950.

Field	Acreage	Number of beans examined	Per cent infested				Total average per cent infested	Average number weevils per bean
1	1	400	91	82	93	87	88.3	2.5
2	.5	300	35	36	35		35.3	0.48
3	1.5	300	83	81	76		80.0	1.7
4	.5	200	8	25			16.5	0.2
5	2	400	75	80	81	84	80.0	1.6
6	.5	300	96	93	89		92.7	2.1
7	3	400	61	57	49	58	56.3	0.9
8	3	400	37	32	27	31	31.8	0.45

Rate of Infestation of Treated Broad Beans by *Bruchus rufimanus* Boh. in San Mateo County, California during 1950.

Field	Acreage	Treatment	Rate in pounds/acre	Date applied	Number beans examined	Per cent infested				Total average per cent infested	Average number weevils per bean
1	8	5% DDT 1% BHC 50% sulfur	50	23 April 1950	400	33	36	36	27	33%*	0.5
2	20	5% DDT 50% sulfur	25–30	10 June 1950	400	1	1	2	2	1.5%	0.015
3	10	5% DDT 1% BHC 50% sulfur	45–50	11 April 1950	400	0	1	4	2	1.8%	0.02
4	3.5	5% DDT 1% BHC 50% sulfur	45–50	11 April 1950	400	1	1	0	0	0.5%	0.005
5	3.5	5% DDT 10% BHC 50% sulfur	45–50	11 April 1950	400	0	1	0	0	0.25%	0.0025

* Immediately adjacent to untreated field number 5 which averaged 80 per cent infested beans.

A thriving colony of bean aphids on a broad bean plant.