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Bean Aphid Control Studies Made

The black bean aphid, Aphis fabae, is a pest in Willamette Valley green bean yards. It usually appears in greatest numbers during picking season. Insects on pods, as well as the devitalizing effect of large numbers sucking sap from vines and leaves, necessitate control measures in most seasons. The fact that pickers and other farm workers are in direct contact with bean foliage adds another hazard to insecticide use in addition to their application and the possibility of toxic residues remaining on pods at harvest. Observations and experiments were carried on during the 1957 season in an effort to evaluate several pesticides.

Malathion is probably the most generally used insecticide on beans, largely because of its relatively low mammalian toxicity. It has the high residue tolerance of 8 ppm on the raw product at harvest. Last year registration restrictions were lowered to allow its use on beans up to 24 hours of picking. This had considerable practical value because of the tight picking schedule and irrigation and insect control measures necessary during the harvest period. The only difficulty is that malathion has not always given satisfactory aphid control.

Two trials were conducted last summer in OSC bean yards in which a 5% malathion dust was compared with 4% Diazinon and 4% Dibrom. Materials were applied to both sides of the rows with a 4-nozzle Niagara power duster.

(Continued next page)

Field Day Features Bush Bean Picker

A mechanical bush bean picker used in experimental plots will be shown at a field day scheduled at Oregon State College the third or fourth week in July.

Bush bean plantings for mechanical harvest include a number of OSC breeding lines as well as commercial varieties from various seedsmen. Also included in the trials are spacing and fertilizer treatments. These plots are located at the vegetable crops farm east of Corvallis.

Symphylid control experiments conducted by Entomology personnel will be observed. Residual soil insecticide plots may also be seen.

(Continued page 4)

In This Issue

Aphid Control Study.... (Continued from page 1)

Weather conditions were ideal, with no wind at the application time and temperature rising above 70°F during the day. Leaves tagged at random through plots were examined before and after dusting. First trial results were as follows:

Material	Rate/A.	Number of leaves exam.	No. with live aphid (24 hrs)	Percent control
Diazinon 4%	30 lbs.	15	0	100
Malathion 5%	40 lbs.	15	2	96

Second trial conditions were again excellent for application, with temperature rising to 75°F. Ten tagged leaves were examined in each plot after 24 and 48 hours.

Material	Rate/A. (lbs.)	Number of aphids after 24 hours Dead	24 hours Alive	48 hours Dead	48 hours Alive	Percent dead 24 hr.	Percent dead 48 hr.
Malathion 5%	50-55	471	32	269	14	94	95
RE 4355 (Dibrom) 4%	55-58	120	908	57	1,783	0.12	0.03

Tests showed that (1) malathion would give satisfactory control if applied thoroughly to both sides of the rows; (2) malathion apparently requires actual contact with aphids to effect a kill; (3) a 4% Diazinon dust was very effective, as had been shown by previous tests; (4) the experimental material, Dibrom, was ineffective in the formulation used; and (5) aphid kill with malathion is essentially complete 24 hours after application.

Additional trials with insecticidal dusts were made on a bean yard near Independence. Rows were dusted from both sides with a 2-nozzle ground duster in the early morning of July 25. The weather was calm during application, but temperature did not rise much above 70° during the day. Ten leaves from each plot were examined 24 hours later with the following results:

Materials	Approx. rate/A.	No. of aphids Dead	Alive	Percent dead
Diazinon 2%	45 lbs.	305	61	83
Diazinon 4%	45 lbs.	430	0	100
Trithion 2%	45 lbs.	154	197	44
Malathion 5%	45 lbs.	219	37	85

(Continued next page)

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Aphid Control Study.... (Continued from page 2)

Under conditions of this test, Diazinon 4% was the only dust which gave satisfactory aphid control. Diazinon 2% and malathion 5% were comparable in effectiveness, but degree of control was only fair. Trithion at 2% strength was not promising.

Application of insecticides to pole beans by aircraft is popular because it saves time, especially during picking season. Aerial sprays are more economical than aerial dust applications, but have not been as effective, probably because of poor coverage on the under side of the leaves. Trials were conducted in 1957, in cooperation with a Corvallis Air Service, to test several insecticidal sprays applied by helicopter.

Insecticides were applied as emulsions or solutions at the rate of 10 gallons of prepared spray per acre. Single, half-acre plots on a heavily aphid-infested yard near Corvallis were treated after the picking season closed. Weather conditions were good, with only slight wind drift and temperature between 65 and 70°F. Twenty leaves in each plot were tagged and half of them examined for aphid kill at 24 and 48 hours after treatment with following results:

Materials and rate (actual) /A.	Hours after treatment	Est. orig. no. aphids	Actual counts No. of aphids Dead	Alive	Percent control*
Diazinon, 1.0 lbs.	24	820	260	21	97.6
	48	440	72	78**	82.3
RE 4355 (Dibrom) 2.0 lbs.	24	696	199	48	93.0
	48	438	115	29	93.4
Malathion, 2.5 lbs.	24	711	175	107	85.0
	48	659	145	72	89.1
C - 140, 1.4 lbs.	24	625	36	446	28.8
	48	795	61	222	72.0
Dylox, 1.5 lbs.	24	1400	44	745	46.4
	48	1161	66	772	66.6

* Percent control derived by comparing number of live aphids remaining after treatment with original estimated number of aphids on tagged leaves.

** 65 of the 78 live aphids found in this count were on one leaf.

In this trial with helicopter-applied sprays, Diazinon again performed well against bean aphid. Material is a phosphate insecticide and, although considerably safer than parathion or TEPP, it is not in the same class with malathion regarding safety to higher animals. It has not been registered for use on beans as yet.

Malathion gave fair aphid control as a spray at a rate comparable to dust applications (50 lbs. of 5% dust per acre = 2.5 lbs. of actual toxicant). This method of application might be satisfactory if dosage were increased to three or four pounds of actual material per acre.

Results with Dibrom (a new, unregistered experimental material of low mammalian toxicity and short residual life) were very promising. The manufacturer attributed to an unstable formulation in this material the failure for killing aphids when it was used as a dust.

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Aphid Control Study.... (Continued from page 3)

The other two insecticides tested (c-140 and Dylox) gave poor aphid control, and considerable reproduction by survivors was evident 48 hours after treatment.

Development of effective and economical aerial sprays for insect control on pole beans is desirable. Future studies will be directed not only to testing promising materials at various rates of application, but also to the possibility of reducing the amount of spray per acre and comparative efficiency of helicopters versus fixed-wing aircraft.

--H. H. Crowell
Entomology Dept.

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Field Day Features.... (Continued from page 1)

Although this will not be the best time for observation of a number of other crops such as pole beans, sweet corn, table beets, tomatoes, and peas, these will be available for inspection. Personnel will be on hand after the bush bean picker demonstration to explain the experimental work on these crops.

To get to the farm: Travel east on Van Buren Street, cross the Willamette River bridge on the "old" Albany highway. Take the first road (Smith Lane) to your left (about 1/2 mile) after crossing the bridge. Continue past the Plant Pathology farm.

Notices of exact date and time will be made through County Extension Agents, Northwest Canners and Freezers Association, and the press.

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Breeding Tomatoes for Localized Environment

The tomato is continually being improved for adaptation to various areas or localities of the country by USDA, most State Experiment Stations, and many seedsmen.

The tomato -- like most crops -- will perform best when bred for a specific, localized environment. Disease resistance and resistance to fruit cracking are major objectives of most tomato breeders today, but they must incorporate other desirable horticultural characters, such as size, smoothness, solidity of fruit, and ability to set fruit well under local conditions.

In Oregon, as in other northern states, earliness of maturity must also be a major objective. In many breeding programs, F_1 hybrid combinations are now being made, since such hybrids are often (not always) relatively vigorous and heavy yielding. A few such hybrids have been available from seedsmen in recent years. Some of them perform rather well in the north, although there is room for much improvement.

Hybridization and selection of self-pollinated breeding lines have been under way in Oregon since 1951. Parents involved have been the small, early, heavy-setting varieties, Puck, Stokesdale, Wasatch, Queens, and certain breeding lines from other areas -- especially lines reported to be resistant to fruit cracking. The various OSC selections being developed in this program have, within the past three years, been given rather wide trial in Oregon.

The state might be divided roughly into three areas, each of which needs a tomato with specific characteristics. In the coastal area extreme earliness is a necessity because of slow growth and maturity. Resistance to late blight would be desirable. In the Willamette Valley distinct, though not extreme, earliness is needed, along with resistance to fruit cracking. In the Milton-Freewater area, as well as other localities of eastern Oregon, only medium earliness is a necessity, but resistance to the virus causing curly top (yellows disease) would be highly desirable. In Southern Oregon, good vigor and medium to early maturity are required. Resistance to fusarium and verticillium wilts, as well as spotted wilt, would also be a safeguard. In all localities, better solidity and all-round fruit quality is needed. Because of the difficulty of combining extreme earliness with quality of fruit it is hardly expected that tomatoes can be developed for coastal areas which will possess the zenith of fruit size, earliness, and quality.

Cooperating in the tomato-testing program are Tom Davidson of the Umatilla Branch Experiment Station, Hermiston; Earl Brown, Milton-Freewater, and Harold White of the Southern Oregon Experiment Station, Medford. In the Willamette Valley and other areas, County Agricultural Agents have placed tests with market and home gardeners with the cooperation of Ralph Clark.

Resistance to the various diseases mentioned has not been given major attention, since the program has not permitted intense concentration on disease resistance. It is hoped, in the future, that work on resistance to the destructive curly top disease will be given more attention through cooperative effort of tomato breeders in several of the western states.

Several of the OSC tomato lines have appeared promising in the Willamette Valley, southern, and northeastern Oregon. They are under test again this year and, since several of them are approaching "trueness to type", one or more could be released in the near future. More promising lines, especially for resistance to cracking, can not be perfected until a few more years have elapsed. Such lines should be available for trial within two or three years.

(Continued next page)

Breeding Tomatoes.... (Continued from page 5)

This year, for the first time, a large number of OSC F_1 hybrid combinations are being observed, particularly at Milton-Freewater and Corvallis. If certain combinations -- either of our own breeding material, or of OSC lines hybridized with material from elsewhere -- appear highly promising, there remains the question of availability of seed. Hand pollination is necessary in order to secure such seed and this means relatively high cost of production. Even so, seed cost, in terms of total cost of growing a bumper crop may not be great, and F_1 seed is likely to be more widely used, especially by home and market gardeners, in the future. A discussion of the current variety situation will be published in the Vegetable Digest in the winter, but two F_1 hybrids which have performed rather well in Oregon will be mentioned -- Big Early Hybrid, and Moreton Hybrid. Ideally they should be earlier, more resistant to cracking, and more compact in growth habit, and are among the best of present-day tomatoes for this area.

Over 250 OSC breeding lines and varieties or breeding lines from seedsmen and breeders in public agencies have been planted at the OSC vegetable crops experimental farm at Corvallis this year. If you wish to size up their performance you should visit the farm about the first week in September.

--W. A. Frazier
Horticulture Department

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Vegetable Note

H. C. Mohr, of Texas A and M College, hybridized a bush type of watermelon found in a field of the Desert King variety in 1953, and feels that eventually the short-vined character may revolutionize watermelon production. Plants would require only 1/2 to 1/3 of the area of present varieties; dusting and spraying would be facilitated; dense foliage protects melons from the sun; and plants appear to be more resistant to wind injury. Desert King has a yellow rind and yellow flesh. Selection is under way within hybrid progeny for red-fleshed types with green rinds and for large, medium, and small fruit sizes.

Progress Report... Labor Saving in Onion Packing

Substantial savings in labor are possible in packing and handling Malheur County onions. This is shown in preliminary results of a study of labor and equipment efficiency in Malheur County onion-storage and packing-house operations made during the storage period of the 1957 crop. Operations selected for study represented all commonly used methods of packing and handling.

Total direct labor requirements for packing were quite similar among the plants included in the study (Table 1). Direct labor includes all work for the operations -- sorting through carloading or stockpiling. Time requirements apply to the onions packed and not field-run onions. Time of foremen, mechanics, or other workers is included only when working on the jobs shown.

Table 1. Summary of direct labor requirements for packing onions -- Malheur County, Oregon, 1957 crop year

Operation	Labor requirements		Crew size	
	Average of all packing sheds (Man-minutes per hundredweight packed)	Range - low to high	Average of all packing sheds (Number of workers)	Range - low to high
Sorting	1.87	1.53 - 2.30	4.5	3.2 - 5.6
Bagging	2.08	1.85 - 2.36	5.0	3.8 - 6.7
Hand trucking	.58	.44 - .67	1.4	1.0 - 1.7
TOTAL	4.53	4.04 - 4.88	10.9	8.3 -13.6

Distribution of workers in most of the packing sheds in which studies were made showed bagging and hand trucking crews were waiting for work over 30% of the time in addition to regular rest periods and equipment breakdowns. Packing cost per hundredweight could be reduced considerably by increasing the dumping rate to a level providing more work at these stations. In some packing sheds bagging crews on U. S. No. 1 Jumbos and Mediums are large enough that work at the two stations could be combined and crew reduced by one worker.

Average packout rate was 240 pounds per minute, of which 200 pounds were U. S. No. 1's and 40 pounds were U. S. No. 2's. The field-run onions averaged about 70% U. S. No. 1 and 10% U. S. No. 2. This grade composition applies to both Tables 1 and 2.

In moving onions from storage to packing shed, the method using bulk boxes and fork-lift equipment had lowest labor requirements (Table 2). Relative costs for different methods shown will be altered by inclusion of equipment and container costs. Preliminary investigation indicates that even with addition of these costs, the bulk box method is the most efficient.

(Continued next page)

Labor Saving in Onion Packing.... (Continued from page 7)

Table 2. Labor requirements for different methods of handling onions from storage to packing house Malheur County, 1957 crop year

Operation	Method of Handling: Crates (not on pallets)	Skeleton boxes	Bulk boxes	Field bags
	(Man-minutes per hundredweight packed[1])			
Load at storage	.60	.13	.13	.84[2]
Unload and dump at packing house	.70	.92	.23	.99
Load, unload, and store empties	.54	.28	.20	---
Miscellaneous work	.17	.06	.09	.12
TOTAL	2.01	1.39	.65	1.95

[1] Includes a 20% allowance for normal delay, and assumes
   a. Crates and field bags contain 60 pounds of field-run onions.
   b. Skeleton boxes contain 24 field bags -- 1440 pounds.
   c. Bulk boxes contain 1200 pounds of field-run onions.
   d. No time lost by storage or dumping crews in waiting for trucks.

[2] Estimate based on a limited number of studies.

Total labor for any of the above methods may be added to packing labor shown in Table 1. This will give labor requirements for handling from storage through packing.

During the 1958 crop year labor and equipment cost and efficiency studies will be continued with particular emphasis on costs of moving onions from field to storage in different containers. This work will be closely coordinated with current studies of handling and storage losses being conducted by the Departments of Botany and Plant Pathology and Agricultural Engineering of the Oregon Agricultural Experiment Station.

Results obtained in cost and efficiency studies will be summarized to show comparative costs of different methods of storing, handling, and packing onions. Different scales of operation will be considered. These results will form the basis for an analysis of the impact of improved methods and technology on the industry.

--G. B. Davis and
F. H. J. Dickmann
Agricultural Economics Department

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National Advisory Committee Reports

The Vegetable Research and Marketing Advisory Committee of the United States Department of Agriculture met in Washington, D. C., Feb. 3-6, 1958. The Committee consists of 14 members, representing various segments and regions of the vegetable industry. "Farmer" Smith of Stayton is a member of the Committee. Their recommendations for new and expanded work relating to production follow, in priority order: "In recommending new or expanded work on the problems listed in this section, the Committee recognizes that it is not its responsibility to delineate between research to be conducted within the Department and that to be conducted in cooperation with State Agricultural Experiment Stations and other research agencies. The recommendations made by the Committee are in terms of the importance of problems on which research is needed and in which the Department should participate.

PRODUCTION RESEARCH

General Note: Ten of the following 12 fields of work on problems recommended for initiation or expansion have been included previously in this category by this Committee. The Committee also discussed recommending the expansion or initiation of work on 3 other subjects but declined to do so since they were considered to be of less importance than the following items.

1. Vegetable Breeding. New high-yielding disease or insect-resistant varieties of vegetables adapted to mechanized production and with improved eating and market qualities have helped to solve production, processing, and marketing problems. To accelerate progress, vegetable breeding research should be strengthened by expanding genetic, cytogenetic, and applied breeding work designed to develop varieties of sweet potatoes, carrots, beans and peas (dry and green), lettuce, cabbage, spinach, tomatoes, and muskmelons that are variously resistant to diseases and insects, have better eating, nutritive and market qualities, better adaptability to specific processes and uses than varieties now available.

2. Nematodes. Nematodes are a limiting factor in the production of dry beans, dry peas, and vegetables. To achieve improved methods of control, expanded research is needed on nematodes as primary invaders in bacterial and fungus disease complexes, on efficient use of nematocides, and on nematode resistance of vegetable varieties.

3. Pesticide Residues. The public has become increasingly concerned over the hazards of pesticide residues, and producers have difficulty in meeting the rigid requirements of the Miller amendment. Lack of information on residues in or on vegetables following the use of pesticides is a serious obstacle to their maximum use in crop protection. Pesticide residue research should be strengthened by expanding research on the development of methods of analyses, search for safer insecticides, and the determination of residues on or in vegetable crops resulting from insecticide and fungicide applications needed for the control of insects and diseases.

4. Vegetable Disease Control. A wide variety of diseases limit both the quality and quantity of vegetable production. Disease control with antibiotics, fungicides, bactericides, crop, and soil management systems and other materials and methods developed by research have been invaluable. Unsolved disease

(Continued next page)

National Reports.... (Continued from page 9)

control problems call for strengthened research with emphasis on the nature and behavior of specific viruses, fungi, bacteria, and certain unidentified causes of diseases that variously attack carrots, beans, peas, spinach, tomatoes, peppers, melons, and related crops.

5. Insecticide Resistance. Many of the current methods of controlling insects have become ineffective because insects have developed genetic resistance to previously effective insecticides. Research to overcome insecticide resistance needs to be strengthened by expanding work on the cabbage looper, the imported cabbageworm, the green peach aphid, southern potato wireworm, Colorado potato beetle, the potato flea beetle, and other resistant insects.

6. Weed Control. Herbicides are revolutionizing weed control. Full realization of their potential should be accelerated by strengthening weed control research in the Lake States, South, and West by expanding work to develop effective weed control principles, methods, and practices for use in vegetable crops including asparagus, beans, beets, and cole crops, melon crops, carrots, celery, cucumbers, lettuce, onions, peas, spinach, and sweet corn in the major production areas.

7. Growth Regulators and Antibiotics. Exploratory tests of the nature of growth regulators and antibiotics to improve the quality and fruitfulness of vegetables and to control virus diseases have given encouraging results. Basic research should be strengthened by expanding work with antibiotics and related growth-regulating chemicals designed to discover and to develop systemically effective chemical agents and methods of using these translocatable compounds.

8. Insect Vectors of Vegetable Diseases. The solution of disease problems can be expedited by determining the insects responsible for carrying certain diseases to beans, melons, peas, tomatoes, carrots, and spinach, and by developing methods for their control. To accomplish this, research on the role of insects as vectors of diseases of virus, fungous, and bacterial origins should be strengthened by expanding both pathological and entomological studies.

9. Biological Control of Insects. Introduction of diseases and other natural enemies have proved to be an effective method of controlling some destructive insects. If effective biological methods of controlling vegetable insects can be developed, we can reduce the need for expensive insecticides, decrease hazards from handling and applying insecticides and avoid the possibility of accumulation of insecticide residues in the soil and on the crops. Research on biological control should be strengthened by intensified effort to find and develop methods of utilizing diseases, parasites, and predators for the control of aphids, leaf-feeding beetles, leafhoppers, caterpillars, and other pests of various vegetables.

10. Management of Soil and Water Resources. There is need for basic knowledge on different soils to determine the soil-water-plant relations that influence the consumptive use, irrigation and drainage requirements, soil fertility levels and the proper balance of plant nutrients for the efficient production of vegetables in both dryland and humid regions, for controlling wind and water

(Continued next page)

National Reports.... (Continued from page 10)

erosion, runoff, and sediment production. Soil and water conservation research should be strengthened by initiating a team approach to determine the most efficient use of water, timing, and amount of irrigation for vegetables, and to prevent soil losses, salinity and poor soil structure, by developing more effective soil management systems and moisture conserving practices.

11. Plant Disease Reporting. Plant diseases that fluctuate in importance from year to year because of environmental and other factors can be controlled more effectively if producers are warned of the likelihood of attacks. So that needed warning services can be established, expanded epidemiological research is needed on cereal rusts, corn bacterial wilt, and apple scab.

12. Pesticide Application Equipment and Methods. There is evidence that the failure of some commonly recommended pesticides to give satisfactory control in some areas in recent years may be due to short-comings in methods of application. Studies indicate that better equipment for the application of insecticides will reduce the cost of vegetable insect control and reduce damage. Research on the development, improvement, and testing of equipment and methods for air and ground application of pesticides on vegetables should be expanded."

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Staff Changes

Dr. Andrew A. Duncan joined the staff as Extension Vegetable Production Specialist effective July 1. He was formerly Extension Vegetable Specialist at Maryland.

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Dr. Richard M. Bullock has been appointed as the superintendent of the new Northern Willamette Valley Experiment Station. Research at this station will be conducted on vegetables, small fruits, and nursery crops.