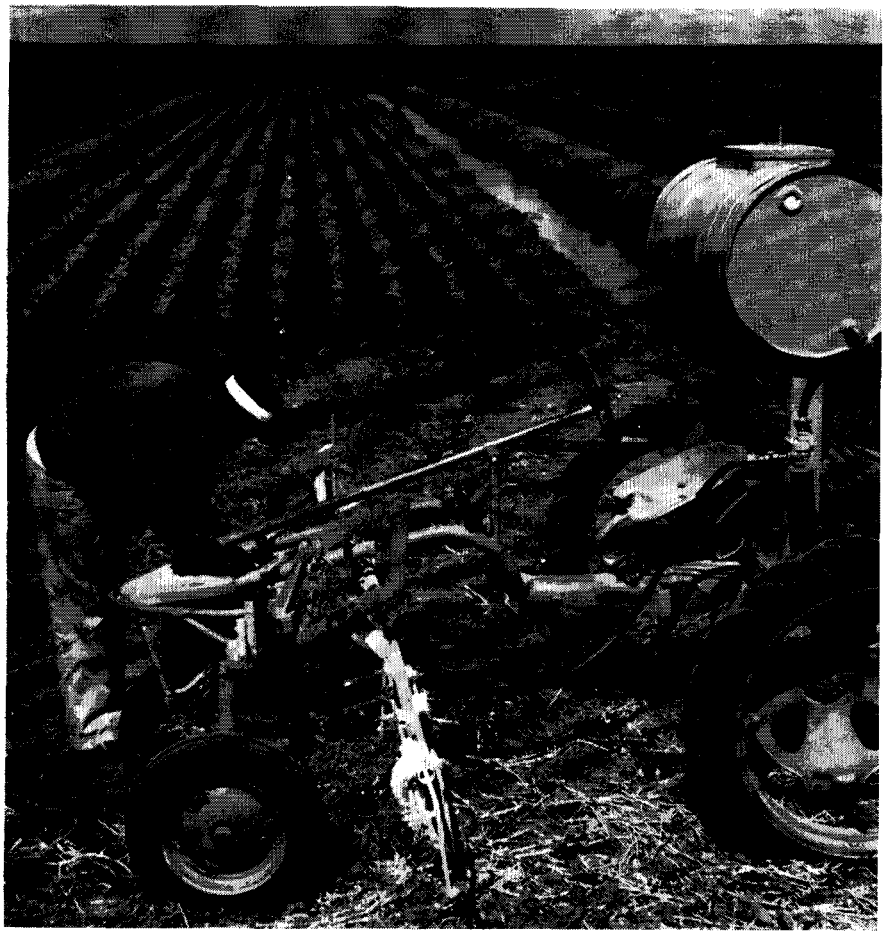


Equipment is readied for another application of Vegadex herbicide to celery field on Florida truck farm. Hand weeding in celery fields costs $50 or more per acre. Chemical weeding costs less than half that amount

Moderately increased sales, stable to higher profits marked the season nationwide. Education is still the cry of the industry

PESTICIDES—1959

South

A normal year—with few big insect outbreaks and slightly increased sales

NORMALCY seemed to rule in the South this pesticide season. Few really unusual pest outbreaks occurred—in fact boll weevils and bollworms were less prevalent than usual in the Mid-South Delta cotton region. Weather, too, averaged about normal by combining early rains to delay planting with good weather—sunny days, brief showers, and high humidity—to speed growth later. Perhaps the main added attraction was soil bank changes which allowed more planted acres, with added pesticide demands.

Business-wise, normalcy also prevailed. With a few exceptions, sales volumes increased. But as in past years, profits declined slightly for most manufacturers and formulators. Price cuts, the most notable one that on Monsanto's parathions, were common.

Changes in pesticide demands continue. Weather conditions in the Southeast brought some added demand for dust formulations for cotton. In some areas such as northern Georgia where soil bank changes increased cotton acreages, demand was up significantly for both liquids and dusts as compared to the past two years. A large increase in mite populations in Arkansas and parts of Tennessee and Mississippi helped miticide sales.

While economics in the form of lower prices often brought shifts in demand, other changes in demand reportedly stem from real or imagined insect resistance to certain compounds and the desire to try something new and possibly better. Among the examples cited by one producer, BHC in dust formulations dropped while endrin and methyl parathion dusts gained considerably. In liquids, endrin and toxaphene formulations showed up well.

A state official notices in his Mid-South state an accelerating shift toward sprays, because of poor dust formulations and farmers' desire for more toxic materials for boll weevil control. Farmers have bought sprayers to take advantage of less expensive materials, and to assure safe application of the more dangerous phosphates.

Other minor changes in demand have come from fire ant control programs in Mississippi and Alabama, and further recovery of Florida's citrus crops from the freeze. Use of granular materials for the fire ant program increased. Citrus crops and vegetables took increased quantities of phosphates, but with a drawback—a trend to laxness in safety precautions.

Monsanto's price reductions of some 50 cents per pound on parathion turned up a novel situation. Early in the year, the company reduced prices to meet foreign competition. As far as the company can tell, foreign competition became minor, if still present at all, and sales volume increased to the point that it more than offset the lower prices. Yet, this is a very good

cotton year, and boll weevil infestations have been lower than usual. Monsanto says that apparently the parathions are so low in price now that farmers are using them for insurance.

Unsettled conditions in Latin America, with lower cotton acreages, cut sales for some manufacturers in the South. Exports also are said to provide an outlet for some materials where restrictions in this country tend to slow their development.

Field Testing

New insecticidal materials for cotton, citrus, other fruits, and vegetables got extensive field testing in many parts of the South. One agricultural worker suggests that this year and next will see a peak in new materials testing.

Good results were obtained with ethion and Trithion to control spider mites on cotton in large scale tests in Alabama and Arkansas. Testing of these two compounds in Alabama began late last year; this year's results are up to expectations based on the early successful trials.

Sevin enjoyed wide-scale use in the field on both cotton and fruit in the South. Arkansas test results showed it to be satisfactory for codling moth on apples, oriental fruit moth on peaches, and grape berry moth on grapes. Some failure to control boll weevils and bollworms appeared with Sevin dust formulations. One entomologist wonders if the dust mixture is too stable, since analysis shows the mixture is up to par in toxicant content.

Tedion and Trithion showed up well against citrus mites in Florida tests. Trithion was added to the list of recommended materials for citrus. Other Florida tests included Thiodan, which gave excellent control of aphids, budworms, hornworms, and loopers on shade tobacco, and parathion, which controlled wireworms on potatoes. On the basis of test results, parathion is expected to be the principal material used for wireworm control in the Hastings, Fla., area for the next potato crop —to be planted early in 1960.

In Arkansas, both diuron and monuron showed promise for control of vines and weeds that lower quality of machine-picked cotton. These materials seem to work especially well when midsummer rains or irrigations cause a new flush of weed growth after the crop has been laid by. Other Arkansas tests with DNBP reveal that specific conditions are required for use of this material. Under dry conditions, normal rates are ineffective in keeping down weeds for any length of time. Under wet conditions, first weeds are killed, but succeeding growth will escape, especially if moisture remains adequate.

Several state officials report tests with *Bacillus thuringiensis*. Tennessee workers definitely demonstrated control of the variegated cutworm with this material. In Texas, it is being tested for control of lepidopterous larvae. Other states have tested the material against many different pests, but commercial use of *B. thuringiensis* appears not to have developed yet.

One of the few studies on application of a pesticide with fertilizer was made in Arkansas. Diuron in a liquid fertilizer, Spencer 32, was applied at time of planting. Use of the combination is being compared with use of fertilizer alone in different application methods, with separate applications of the herbicide, and with herbicide performance. So far, the combinations have not damaged cotton, says a college official.

In Alabama, with American Cyanamid cooperating on farmer demonstrations, Thimet granules were applied with fertilizers to peanuts, as a separate operation at planting time. In other cases, the fertilizer was broadcast prior to planting; in still others, fertilizer, insecticide, and seed were put out separately but in a single operation.

Education

Education of pesticides users, be they large or small farmers or home gardeners, remains an important need in selling and in control of pesticides. Educational results and educational efforts vary across the South, and the exact nature of the education problems varies with individuals. One state official suggests that better education of dealers who sell pesticides to farmers is the key; dealers could do much to encourage farmers to read labels before using pesticides. Another state official, with a slightly different approach, points out that many users cannot keep the names of insecticides straight and are dependent almost entirely on what a local dealer may have available.

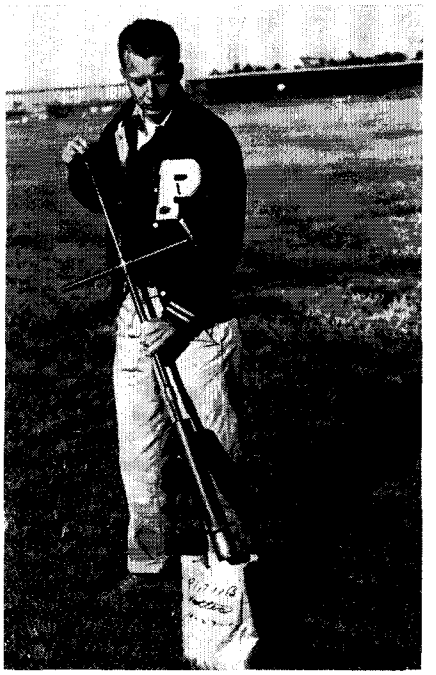
Other examples of educational needs are many. One big problem, suggests a state official, is a clearer understanding by the user that it is profitable to use an insecticide only when the alternative is a crop loss greater than the cost of the insecticide application. Losses are not always monetarily significant (as on ornamentals), but economics deserve more attention, he says.

Many users do not seem to understand that they may exceed insecticide tolerances if they use higher dosages than recommended. And haphazard use of insecticides on many crops may be based on farmers' whims, on weather conditions as judged by farmers, and on the shaky economics of hoped-for prices.

One of the major pesticide educational programs in the South took a body blow from this year's weather. Early-season control of cotton insects has been pushed by many large and small companies, with Hercules Powder possibly the major force in the South as a whole. This year, rains prevented many farmers from pursuing an early-season program, and a threatened late-season weevil infestation became a reality. The late infestation increased chemical sales, but may have damaged the early-season control education program built up over the past several years. Whether or not a single year can change a farmer's outlook on a planned control program may be known when next year's season ends.

Education, says one ag worker, takes on added complication each year with new and more specific pesticides coupled with specific use conditions, and with losses due to pests now meaning possible red ink for the grower after the year's work. The trend toward bigger and more scientifically run farms makes the education need even more important. But the size of the education problem might be considered decreasing as farms get bigger and fewer, and more competent farm managers grow in number and influence.

Insecticide residues in treated soil destroy fire ants. Here, a USDA worker collects sample of treated soil for chemical analysis



Midwest

Sales up 10 to 15%, thanks to weather's help. Profits up also

Nearly perfect weed control in soybean rows was achieved with Randox in Illinois

REASONABLY NORMAL WEATHER in the Midwest this year helped push pesticides sales up well over 1958's—some estimates run as high as 10 to 15%. There were deviations from the pattern—a drought in the Dakotas and dry weather in southern Illinois, for instance. But these were localized, and generally damp weather brought weeds and insects.

Other possible influences were largely inoperative, leaving pesticides sales to rise or fall with the weather. "Scare" articles in the press, such as accompanied the fire ant program, had no noticeable effect. And any significant boost that might come from new cultural practices such as minimum tillage and growing "continuous corn" is still largely in the future. However, at least one company attributes its increased sales in large part to increased selling effort. Monsanto doubled its field selling force between 1958 and 1959.

Profits rose, too. But mostly they rode the back of rising sales. Thompson-Hayward, for one, reports a lower profit percentage, although dollar profits increased. But slipping profit margins appear to be pretty much confined to the old standbys, such as 2,4-D, DDT, and the like, according to Dow Chemical. The company says newer materials—its Dowpon, Monsanto's Randox, and a few others—are going at a very good clip, and profits are about where they should be.

But the marketing picture is far from clear. Consignment selling is just about out in the Midwest; however, there can be no doubt that some price cutting is afoot. How severe is difficult to say, with comments ranging from "worst ever" to "noticeable" and "no more than ordinary." Dow puts the blame on oversupply, but most producers agree that pesticides—always subject to the vagaries of the season—have not been overproduced any more than usual.

Swing to Granulars

Herbicides appear to be leading the way in pesticides sales this year. A record corn crop in the Midwest has meant a marked growth in such pre-emergence herbicides as Simazin (Geigy), Randox (Monsanto), Eptam (Stauffer), Dowpon (Dow), and 2,4-D. Soybeans, too, are making more use of pre-emergence chemicals, mainly Alanap (Naugatuck). Also showing increased sales: Vegadex and chloro IPC, especially on vegetable crops.

Perhaps most significant is the region's sudden and very sharp shift to granular pre-emergence herbicides. Terming it an "almost abrupt change in farming practice," Monsanto predicts the shift will give such herbicides a 65 to 75% share of the market before long, maybe next year.

Cooler than normal weather slowed down fumigant sales during the first half of the year, according to Michigan Chemical. But consumption picked up in May, and now promises to go well over 1958 volume. There are, however, some indications of oversupply in methyl bromide. This year also brought a decided departure from old standard formulas in the fumigant field, as Frontier Chemical began marketing Chlorofume, a mixture of chloroform, carbon disulfide, and ethylene dibromide (AG AND FOOD, November 1958, page 796).

Stepped-up use of parathion presented Monsanto with a big boost in sales. The company had reduced the price of this insecticide drastically to compete with imported material; it now finds imports completely out of the picture. In addition, the bigger volume more than offset the effects of the reduced price. A sharp cut in price of the company's Vegadex also brought about a sharp increase in usage.

No Major Outbreaks

No general, outstanding outbreaks of insects hit the Midwest as a whole this year. But several areas were plagued with bug problems that were worse than usual.

In Kansas, for example, seed corn beetles were so severe that the grower who did not treat his seed got no stand. Aldrin, dieldrin, or heptachlor proved effective here, though. The harlequin bug—more abundant than in many years—succumbed to methoxychlor, while parathion and malathion hit greenbugs, pea aphids, and aphids in general. And while DDT was used on cankerworms, no successful control measures were adopted for black cutworm.

Cutworms also showed up in Iowa and Nebraska. Soil and weather conditions thwarted control in Iowa; Nebraska managed about 50% control. Iowa farmers treated some 20% more acreage this year than last for controlling rootworms, wireworms, white grubs, and other seed and root-attacking insects. Nebraska was hit also by rootworms and grasshoppers.

Ohio had a severe outbreak of corn leaf aphid over most of its northwestern area. Malathion was moderately successful. Ohio also played host to a new species of fly, *Musca autumnalis*, which appeared all over the state. It was extremely annoying to cattle in the field; no satisfactory control is yet known.

Other areas had their headaches, too. Guthion, chlorobenzilate, and Kelthane were pretty successful against European red mite in Michigan. Minnesota had to fight off green bug in many small-grain fields. North Dakota used toxaphene and endrin on sugarbeet webworms; DDT, endrin, and Thiodan on potato leafhoppers and potato flea beetles. Control was generally successful, reports the state, when materials were applied correctly. Grasshoppers, too, were a factor in North Dakota.

Illinois has been using aldrin or heptachlor for about 5 years as soil insecticide to control wireworms, seed corn

beetles, seed corn maggots, northern and southern corn rootworms, white grubs, grape colaspis, and cutworms. But this year saw an increase of 50 to 100% in acreage treated. Dieldrin and toxaphene also went out to thousands of acres for postplanting control of black cutworms.

Wild Oats a Target

Biggest news in pesticides under test is probably Spencer's Carbyne, a carbamate herbicide for use on wild oats in particular. In full swing on five test plots, each with about 1700 experiments, Spencer hopes to finish gathering data this fall; so far the company admits only that Carbyne looks promising. Such a herbicide, though, could strike a big blow for growers of wheat, barley, flax, sugar beets, and peas, in the northern states and Canada.

Many other pesticides also are under test this year throughout the area (see box).

Residues Probed

Midwestern pesticide (particularly insecticide) residue research, much of it centered at the University of Wisconsin, is increasing. Among major findings: a bioassay using fruit flies has been found an effective and sensitive tool to measure residues. Used along with chemical assays, the bioassay gives an important assist in determining the kind of residues present, and the extent, according to Wisconsin's E. P. Lichtenstein. Actually, he says, a good bioassay gives, in many cases, a more realistic assessment of insecticide residues.

As examples, Lichtenstein points to residue studies made on aldrin and heptachlor after soil application. Bioassays give higher residue estimates than do chemical assays. Apparently, he explains, some compounds form equally or even more toxic derivatives which do not show up in the specific chemical (colorimetric) tests used to measure the parent chemical. Aldrin and heptachlor, it turns out, undergo reactions which change them to dieldrin and heptachlorepoxide.

Conversely, though, bioassays of some compounds have shown lower residues than those indicated by chemical studies. Lindane is one such compound. Here, too, the original compound breaks down. But the residue is a nontoxic material, although it still reacts in the course of the chemical (Schechter-Hornstein) method, and might be mistakenly identified as lindane.

Generally, an insecticide's persistence depends on chemical properties of the material, concentration, type of soil, cultivation practices, microorganisms present, and temperature and moisture content. These factors, says Lichtenstein, also bear on insecticide absorption by crops from soils, a problem now being investigated at Wisconsin under field and laboratory conditions.

Future Influences

Although new cultivation practices such as minimum tillage and growing "continuous corn" had little effect on pesticides sales this past season, they will likely be something to reckon with in the future. Most agree that use of pre-emergence herbicides will increase as minimum tillage becomes more common. And the University of Nebraska expects continuous corn to become a stabilizing factor in future pesticide sales.

But Illinois feels the net changes are difficult to predict, and that minimum tillage may even have an adverse effect on soil insecticides. Broadcast treatments, it says, give the most effective and consistent insect control. Minimum tillage, on the other hand, likely means row treatment which will result in less effective control.

Irrigation is a factor to be considered in the corn growing area in northern and central Kansas. Kansas State University feels this will make a crop's value high enough or sure enough that growers will invest more in insecticides to protect their investment.

The biggest effect on the pesticides industry in the future could easily come from the growth of "business" farmers. In Iowa, for example, this group is growing so fast that the state feels it will make up the largest share of Iowa farmers in a few years.

Business farmers, integrated farms, and farm managers will also influence basic producers of pesticides. No longer, says Monsanto, will salesmen be able to get by with just a homely knowledge of farming practices. They will also have to be acquainted with farm management and the economics involved. Their problem will continue to grow as farms get larger and larger and farm competition gets heavier.

On the education front, the same problem keeps coming up—the dealers.

Pesticides Under Test in the Midwest this Year

This area . . .	is testing . . .	for use on . . .
Illinois	Sevin	Corn earworm
	Sevin, Thiodan	Spittlebug on legumes
	Trithion, ethion, and various formulations of Diazinon	Onion maggot
	Systemics, primarily Thimet and Disyston	Hessian fly in wheat
	Cyprex	
	Phaltan	
Iowa	Systemics ronnel and Co-Ral	Cattle grubs and lice
Michigan	Diazinon, ethion	Onion maggot
Minnesota	Sevin	Apple orchards
Missouri	(Applying pre-emergence herbicides combined with soil insecticides.)	
Nebraska	Heptachlor, toxaphene, endrin, DDT, and *B. thuringiensis*	Corn borer (granular materials applied by aircraft, with emphasis on smaller amounts of more concentrated insecticides)
North Dakota	Thimet, Disyston (granular)	Potato insect complex (will be recommended for use in 1960)
	Dylox	Sugar beet webworm
Ohio	Thimet (granular)	Potato leafhopper (soil treatment)
	Sevin	Codling moth and aphid on apple
	Guthion	Red mite
	Cyprex	Scab

Most dealers are not too interested in pesticides, since their biggest profits lie elsewhere. They stock the materials, but do not make much of an effort to sell them. These are the usual complaints, although there has been some improvement here. Also improved is the channeling of information to users. However, much remains to be done.

Most people in the field also feel the general public needs to be better informed about the benefits of using pesticides.

West

Miticides keep sales on even keel, with no improvement in profits

PESTICIDE SALES in the West generally are running along at last year's pace. Only one area, Arizona–New Mexico, is showing sharply reduced volume, this as a result of abnormally light insect infestation. Industry estimates there peg pesticide sales at 40 to 60% below last year's. In California's San Joaquin Valley, too, light insect infestation is keeping insecticide volume down somewhat, but miticides are helping to make up the deficit. Rohm & Haas, for example, reports that sales of its miticide, Kelthane, are "up sharply."

Even companies reporting higher sales, however, say there has been no improvement in profits, because of depressed selling prices and increased production costs.

The pinch of lower farm prices has resulted in curtailment of pesticide programs by farmers in some areas. In Arizona, the situation is especially bad in cotton and lettuce. In coastal areas, some fruit growers are doing only a minimum of control work.

Special discounts and consignment stocks are still the favorite sales tools of a few suppliers. Such practices have increased in some areas, decreased in others. The effects balance, according to one expert, leaving the over-all picture unchanged.

Exports have played a less significant role in the market this season, except in a few special situations, such as large government exports of DDT.

Education Problem

The problem of educating pesticide users still looms large in the West, although efforts by industry and public organizations should result in improvement by next year. Just last month, for example, the Western Agricultural Chemicals Association offered a review of new pesticides to farmers and salesmen at the Fresno Fairgrounds. But, according to one manufacturer, "Progress is painfully slow—many dealers refuse to be bothered. And many commercial applicators insist on doing the job the easiest and least expensive way, regardless of poor results."

There has been some interest in California in the possible licensing of pesticide salesmen in the state. The matter is under active discussion and may come before the legislature in the future, but no bill was introduced in the 1959 session.

Experts are unanimous in their opinion that pesticide supplies have been adequate. And most believe that inventory control by the major producing companies will prevent troublesome surpluses and dumping at off-schedule prices. There seems to be no indication of serious overproduction of any specific chemical.

Biology and Antibiotics

Some experts feel that biological control of agricultural pests is receiving less attention, and that this trend will continue unless resistance problems get much greater. In forest entomology, however, with the antagonism of animal lovers growing because of large scale insecticide applications, biological control is expected to receive its greatest emphasis. The Forest Service is introducing some parasites of the balsam woolly aphid, which is plaguing fir trees in western Washington. But it is too early yet to say how effective these beneficial insects will be.

Plant-systemic insecticides are faring worse during 1959 than during any other recent year, probably as a result of increased resistance. On the other hand, new systemics for treating livestock are gaining wider acceptance. Also, there has been some work toward combining systemics with biological control methods. Stauffer, for instance, is cooperating with Bioferm Corp. (developer of Thuricide) on this approach. The active agent in Thuricide is *Bacillus thuringiensis*, which causes quick-acting infection in susceptible insects.

The use of antibiotics as pesticides is still in a preliminary state, and a good deal of the interest in it seems to have lapsed. There is some continuing interest, however, in bacterial antibiotics for controlling alfalfa caterpillar. Some experts believe that more fundamental research must be done in this area.

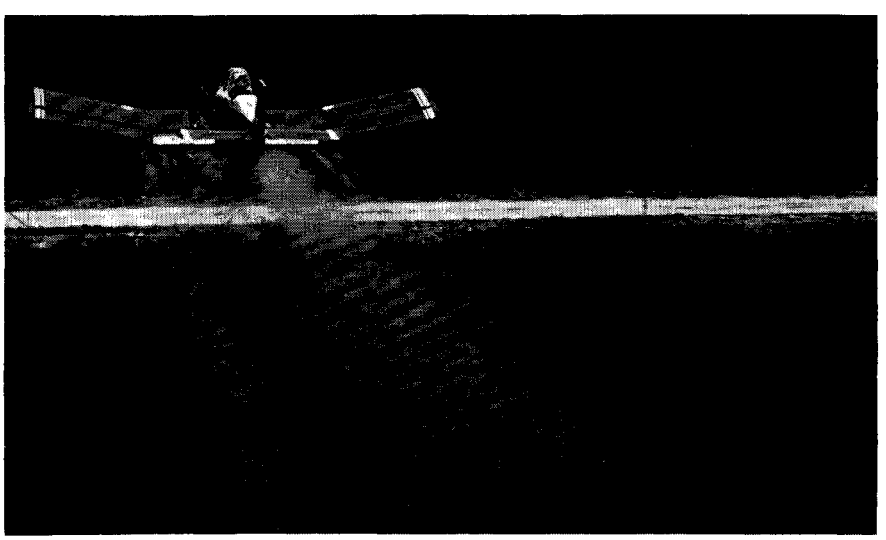
The use of ground sprayers in applying pesticides is expected to increase. The method generally affords closer and more economical pest control. But, says a western manufacturer: "Growers must learn to coordinate their other cultural practices with pest control if ground sprayers are to replace any percentage of air applications."

Small Gain in Granulars

There has been a small gain in use of granular herbicides and insecticides, too. Farmers have equipment more suitable for this type of application than for others. There seems to be more interest this year, also, in applying nematocides in irrigation water to citrus, peach, and grape. Nemagon, applied in furrow irrigation, has given good results on cotton in New Mexico.

There may be less talk in the West about insect resistance than formerly, but only because the topic is no longer new. Certainly the problem is no less important than it has been, and some entomologists feel that it is the most

Spraying seed alfalfa for mites and lygus with Transland Ag-2 aircraft



serious problem facing them today. In Washington, pear psylla was quite troublesome, rapidly developing resistance to insecticides in some areas.

In Arizona, a major campaign against pink bollworm was carried out with heavy DDT applications. Beet army worm was a major problem in the bollworm areas. Some observers attribute this to the widespread use of DDT, which kills off the bollworm's natural enemies. On the other side of the ledger, many apple growers in Washington are abandoning DDT in favor of Sevin or Guthion to control codling moth.

In Washington, 1959 has been an unusually bad year for aphids attacking stone and pome fruits, as well as alfalfa and other field crops. Corn earworm is again developing in sweet and fodder corn; last year, this type of infestation was the worst on record. In California, cotton pests were few and required less pesticide treatment. This was also true of vegetable pests in some parts of the state.

Drift a Problem

The California Department of Agriculture says its biggest problem at present is drift. In the state's extensive checkerboard agriculture, it is difficult, for example, to treat cotton with DDT without permitting some drift onto adjacent alfalfa; but any DDT residue renders the alfalfa unfit for dairy cattle. Says the department: "We do not know the answer yet, but the first step is to make certain that everyone concerned is fully aware of the problem."

There has been a tremendous increase in the use of pre-emergence herbicides. Something new in this regard is the marked increase in tax-supported control programs. In central California, for instance, programs jointly financed by county and landowner are aimed at controlling roadside weeds.

Not much attention is being given to baits this year. Under certain conditions, though, baits have been more successful than sprays for grasshopper control in range land. A promising repellent for honey bees is being investigated in Washington. There has been no change in the type of materials going into defoliants. Magnesium chlorate and sodium chlorate still are the principal materials being applied.

During the year, California Spray-Chemical's Dibrom insecticide entered the market and is finding good acceptance. The company is now testing another new phosphate insecticide, Phosphanidon, but cannot tell yet what its market potential will be.

East

Modest sales increase, renewed interest in effects of pesticides on wildlife mark the season

IN THE EAST, 1959 has been a good year for sales of pesticides. Comments from agricultural chemicals producers and experiment station workers range from "well above 1958" to a less optimistic "about the same as last year." Those who estimate 1959 sales to be up from 1958, itself a good year, are definitely in the majority.

For once the weather has been about normal, and has had little effect on pesticide sales. A possible exception is Massachusetts, which had abnormal rainfall in June and July. This led to increased use of fungicides on fruit crops and potatoes. Also, abundant rain combined with relatively cool weather in this area brought extra aphid infestations on several crops. Above-average amounts of pesticides were used to control them.

There were no shortages of major pesticide chemicals. Supplies, in the opinion of most, have been "adequate." However, some of the newer chemicals just emerging from the laboratory were in tight supply. Take Sevin for instance. One eastern state using Sevin in the gypsy moth eradication campaign planned to treat around 200,000 acres. But a shortage of material forced a cutback to 75,000 acres.

Marketing practices this year generally showed "no noticeable change." Prices have been stable, and profits about the same as in 1958. One producer notes that consignment selling was not as prevalent this year. Altogether, the 1959 pesticide season adds up to a good, stable year.

Among infestations that required special attention this year were those of alfalfa weevil and onion maggot in New York. The alfalfa weevil is not a new pest in New York; it came into the state four or five years ago. But it has spread rapidly, and growers this year found it a particular problem. The New York State College of Agriculture reports that heptachlor applied at rates of 4, 6, or 8 oz. per acre, and malathion at 8 oz., give excellent control of alfalfa weevil larvae. Endrin at 4 oz., and methoxychlor at 16 or 32 oz. per acre, also work well. For onion maggot control, Diazinon was used in various formulations.

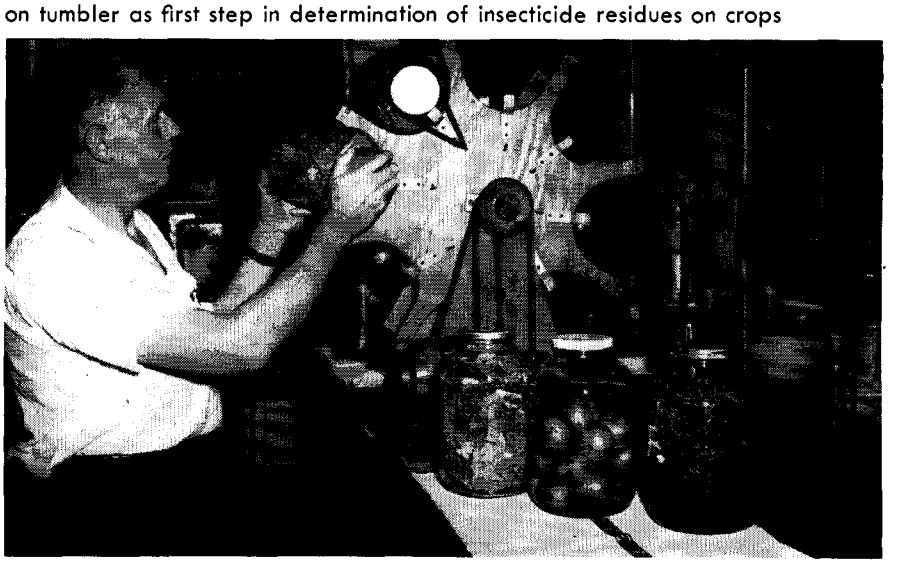
In Massachusetts apple orchards this year, the red-banded leafroller and the green apple aphid drew special attention. Against the green aphid, several phosphates, as well as Sevin, were used. Results were not ideal; reinfestations, in some cases, developed rapidly after treatment. To control the red-banded leafroller, phosphates were added to lead arsenate and DDD. Other pests that were unusually abundant in Massachusetts vegetable crops included the cabbage aphid, potato aphid, melon aphid, and green peach aphid.

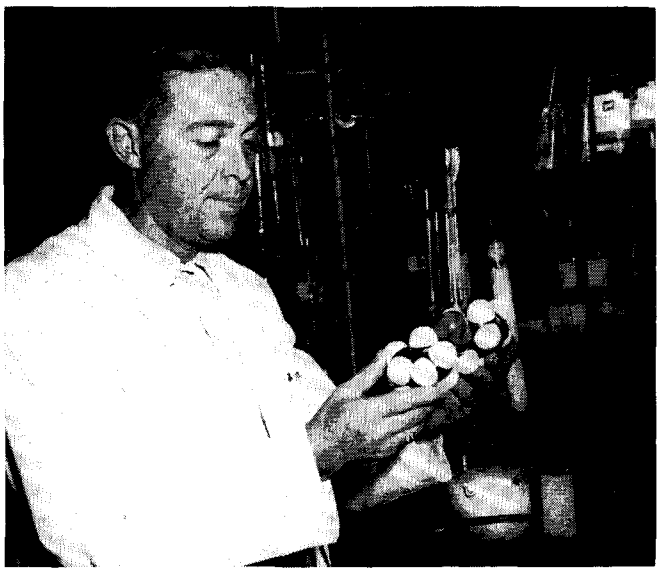
New Pesticides

The 1959 season was marked by field tests and full-scale use of several new pesticides. One producer, for instance, reports a strong switch to maneb for the control of vegetable foliar diseases. As a replacement for nabam plus zinc sulfate, maneb in some areas was used on more than 50% of potato acreage. According to several reports, nabam is on the verge of becoming obsolete. One man calls this a highly significant technological change.

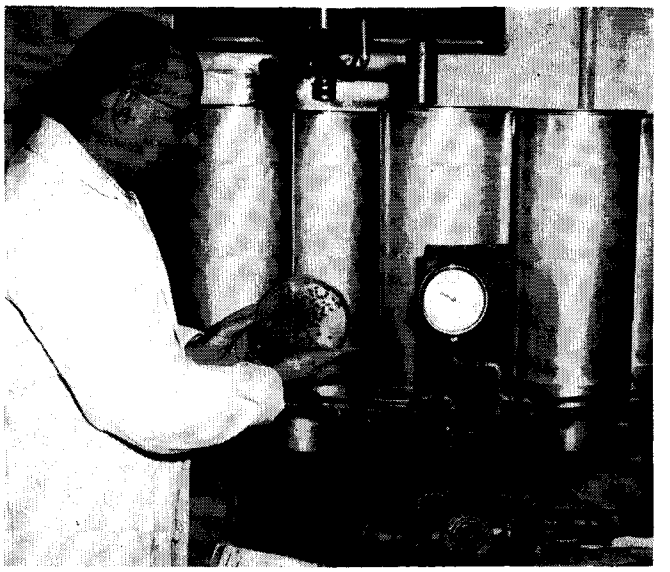
In New York State, the principal

W. E. Westlake of USDA, Beltsville, loads containers of treated food and solvent on tumbler as first step in determination of insecticide residues on crops





USDA chemist Milton Schechter uses structural model as tool in his studies of detecting residues of new insecticide



Entomologist Price G. Piquett, USDA, prepares petri dish of flies for cylinder which receives measured dose of insecticide

new material to get field tests is the systemic Co-Ral for cattle grubs and cattle lice. Trolene also was used for this purpose. Early results indicate that these materials are effective against grubs; Co-Ral also gives better than average control of cattle lice. Use of animal-systemic insecticides to control grubs and lice appears to be growing more popular.

This season has brought relatively little news of antibiotics as pesticides, although substantial basic research is being quietly carried on. The antibiotics presently available are expensive, and often operate effectively only under ideal conditions. Entomologists seem to feel that antibiotics have a definite place in pest control, but another five or 10 years of research and testing will be needed before they come into general use. Even then, antibiotics will probably be limited to a few special applications.

Interest in biological pest control continues, although there were no significant breakthroughs in 1959. In the New York area there was an upsurge of interest in the use of bacterial materials against cabbage and cauliflower insects. However, work is still in the experimental stage, and no official recommendations have been issued. As one company active in the field says, "The time for commercial utilization has not yet arrived."

Resistance Still a Problem

The subject of insect resistance to pest control compounds still evokes a variety of opinion. On one side are those who feel that reports are exaggerated, and that there never really was a major problem in resistance. Others, admitting the problem exists, think it has been largely overcome through use of alternative controls before serious resistance develops. Still others feel the fight is still in the early rounds.

In Delaware, the salt marsh mosquito is reported resistant to both DDT and BHC. And in some spots DDT is no longer effective against the Colorado potato beetle. In New York, serious house fly resistance to Diazinon has turned up over the past two years, and is felt to be on the increase. And Massachusetts reports resistance in red-banded leafroller to DDD. An entomologist in Connecticut says that on one or two pests the last available new material is now being used. He adds that while the resistance problem was eased a few years back by introduction of highly effective insecticides which apparently differed in mode of action from the ones then in use, growers have now used these materials sufficiently to produce resistance. The alternative: revert to older and less effective control measures.

Recently, new bioassay techniques have indicated that decomposed pesticide residues in soil, not detected by established chemical assays, may be as toxic as the original materials. Opinion in the East on just how this finding might affect sales of agricultural chemicals is divided. Much still needs to be learned about residues. But at least one entomologist views residue effects as a possible boon to soil insect control. In marginal cases where application to control a soil insect cannot be recommended because of economics, carry-over of a toxic residue for two or three seasons could make the application practical. On the other hand, if residues are found to harm crops grown in the soil, then it might be necessary to rule out some pesticides for control of soil insects.

The Public vs. Pesticides

During 1959, arguments about effects of pesticides on wildlife and vegetation flared up again. Articles in newspapers and magazines gave the public large amounts of fact, quasi fact, and opinion. Result, in the East: at least some antagonism toward nearly all general pest control programs.

In Connecticut, for example, individual home owners in several cases sought approval for large-scale, aerial application of DDT to control mosquitoes. In two of these instances, town officials refused the requests, and the home owners turned to the use of more expensive ground equipment. In two other Connecticut towns, administrators face petitions to stop all insect control activities until more is learned about the long-term effects of pesticides on wildlife.

Toward this end, the General Court of Massachusetts recently established a special commission to study the effects of aerial and ground spraying of insecticides. The commission will report to the General Court the results of its investigations along with recommendations. Also to be included: a draft of legislation necessary to put recommendations into effect.

Many in the industry feel that over the long pull the continually increasing need and demand for insect control will outweigh any unfounded appeals against use of pesticides. This year, despite the harsh spotlight focused on pesticides, companies in the East noticed little if any adverse effect on sales. However, the industry does recognize a need for more information on the problem, and better education of the public.

Significance of Pesticide Residues in Milk and Meat

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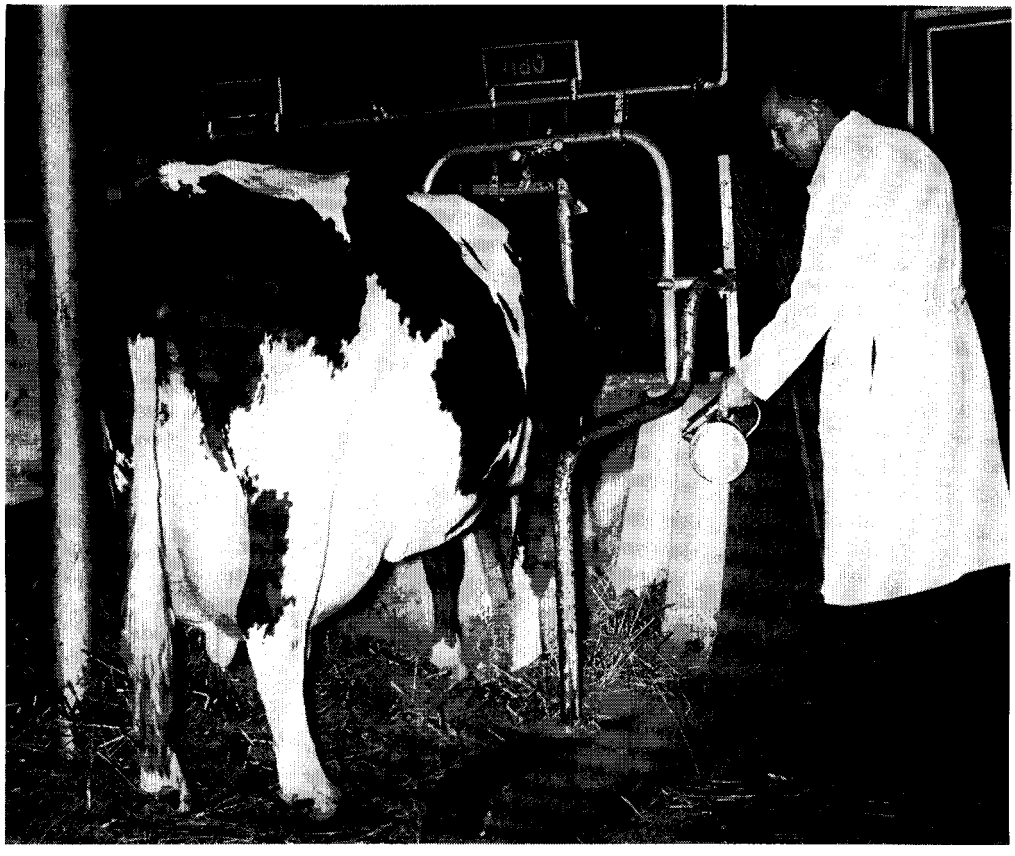
Is reluctance to tackle problems of pesticide residues in milk and meat a new, scientific version of taking the Fifth Amendment?



It seems to be no secret that under certain circumstances some pesticides may and do appear in milk and meat. Scientists with some breadth of training and experience in toxicology, pharmacology, and biochemistry anticipated such an eventuality. They readily accepted this discovery as a simple scientific fact which, without presenting cause for undue alarm, merely pinpointed a need for additional research data to evaluate the actual, potential, and imaginary hazards that may be involved.

On the other hand, to those individuals dedicated to a continuing campaign for the defamation and condemnation of pesticides, the appearance of pesticide residues in meat and milk represented one more ghost, which, when properly dressed with misinformation, suspicion, and apprehension, could be paraded before a perplexed and skeptical public as another horrible example of the hazards involved in pesticide usage.

The more rabid critics of pesticides demand that their use be discontinued and that they be replaced by other methods of pest control. The nature and availability of the methods they propose are left to your imagination or are presented as proposals about as fantastically absurd as the claims on which they base their condemnation of pesticides. They assume, or at least imply, that all scientists who in any way contribute to the development of pesticides and their use are engaged in a gigantic conspiracy designed to promote the welfare and the profits of the chemical industry. They seem totally unaware that traditionally entomologists, plant pathologists, and biologists in general have held to the fundamental concept that pest control is or should be largely biological in nature. They ignore the fact that most of these practical scientists regard the use of pesticidal chemicals as emergency or fire-fighting methods, to be used largely where appropriate ecological control measures have not been developed or have not been properly applied.

More enlightened individuals are, of course, aware that for many years entomologists devoted most of their research time to biological and ecological studies. As a matter of fact, for many years biological, ecological, cultural, and mechanical control measures dominated all pest control activity, and it was only after such methods proved wholly inadequate to give the degree of pest control expected and demanded by the public that entomologists and others cautiously and reluctantly turned to the use of chemicals.

The American people enjoy the most abundant and varied diet of any nation in history, thanks to modern technology. At the same time, the Food Protection Committee of the National Research Council warns that "Maintenance of the present nutritional status of the American public is contingent upon the continued production of an adequate food supply. Plant and animal pests rank among the foremost causes of food destruction, food deterioration, and food contamination. Hence, the necessity of protecting growing crops and produce from serious attack by insects, plant diseases, and other pests is quite obvious to all concerned."

The benefits to be derived from wise and expedient use of pesticides have been evident in the most spectacular way in controlling the insect vectors of malaria, typhus fever, bubonic plague, and many other devastating diseases of man and his domestic animals. It seems doubtful that there is a single state, national, or international public health agency that would now consider abandoning the use of pesticides. Rather, it is in this field we find the world's outstanding experts carefully weighing well-calculated risks to the extent that they are willing to endorse hazardous recommendations that may mean the almost certain illness of some, and perhaps even the death of a few individuals, when the only alternative is the illness of thousands and the death of many.

In the past few years pesticides have come to play a vital role in man's everyday life. As chemical tools, they have taken their rightful place along with electrical and mechanical tools as essential components of 20th cen-

tury technology. While it is possible, if not indeed probable, that in years to come biological and ecological control measures may play a greater role in pest control, for the present we must face the fact that pesticides are here to stay. And whether we like it or not, their use will undoubtedly increase before there is any evidence of significant decline.

Actually, the public health aspects of the pesticide residue problem have been thoroughly reviewed by several scientific bodies, notably the World Health Organization, the U. S. Public Health Service, the U. S. Food and Drug Administration, the food protection committee of the National Research Council, and the committee on toxicology of the American Medical Association. The general conclusions drawn in each instance were: (a) large-scale usage of pesticides in the manner recommended by manufacturers or competent authorities, and consistent with the rules and regulations promulgated under existing laws, is not inconsistent with sound public health programs; and (b) although careless or unauthorized use of pesticidal chemicals might pose potential hazards requiring further consideration and study, there is no cause for alarm.

Milk, Meat and the Miller Amendment

The Miller Amendment to the Food and Drug Act provided for the establishment of tolerances for pesticide residues on raw agricultural commodities. Meat and milk were not specifically mentioned, but it was generally assumed they would fall within the legislative intent of this act. Subsequently the Food and Drug Administration accepted a number of petitions proposing the establishment of tolerances for specified pesticides in the fat of various animals. After due study and deliberation, several such petitions were approved. For example, there is an officially established tolerance of 7 p.p.m. of DDT in the fat of cattle, hogs, and sheep.

At various times representatives of FDA have indicated their willingness to consider petitions for the establishment of tolerances in milk, and have at least implied that if the data presented in such a petition clearly established a sufficient degree of safety, a tolerance would be established. Several such petitions have been submitted, but apparently all but one were withdrawn before action was taken. Pesticide tolerance Petition 126, 1957, requesting the establishment of a tolerance of 0.25 p.p.m. of methoxychlor in milk, was referred to an advisory committee, and upon the recommendation of that committee, FDA established the tolerance of 0 p.p.m. As matters stand today, there is no established tolerance other than 0 for any pesticide in milk; thus, technically, at least, the movement of milk containing any amount whatsoever of any insecticide is illegal in interstate commerce. To date, Canada has not established a tolerance for any pesticide in either meat or milk.

The special problems posed by the appearance of pesticide residues in milk and meat, and the procedures required for their practical solution, are visualized and evaluated quite differently by individuals and groups representing various social and economic interests: (1) There is a small group definitely and sometimes radically opposed to any and all types of pesticide residues. (2) The public at large is primarily interested in maintaining or improving its present standard of living, including its nutritional and public health aspects, by the most economical procedures available, provided the safety and wholesomeness of its food supply are adequately protected. (3) Officials of governmental regulatory agencies are primarily interested in guarding the rights and welfare of the public, but more specifically in the practical and efficient administration of the various laws, rules, and regulations for which they are responsible. (4) Representatives of the chemical industry are interested in development of sound, safe insect control practices that will promote the orderly marketing of their products with a minimum of unwarranted or essentially arbitrary and dictatorial regulations. (5) Farmers in general are interested in safe, sound insect control practices that will permit them to produce and market their crops efficiently and profitably. (6) Farmers engaged in the production of milk and meat are of necessity particularly interested in the development of sound practices that will permit them efficiently and effectively to meet prescribed residue tolerances; they will be hopeful, of course, that tolerances, rules, and regulations that may be imposed will be fair and as liberal as a sound, scientific balancing of farmers' needs and public health requirements will permit.

With so many distinct points of view and diverse interests involved, some conflicts of opinion will be inevitable, and perhaps a few heated controversies must be expected.

The appearance of pesticide residues in mammalian tissues is not new. It has long been known that some of the component parts of commonly used inorganic insecticides such as arsenic, lead, mercury, and fluorine were, under certain conditions, assimilated and deposited in some of the soft and bony tissues of man and animals. However, the question of establishing tolerances for such substances in meat and milk was not raised until very recently. Even now the public's primary interest in pesticide residues in meat and milk seems to be essentially confined to the fat-soluble organic chlorinated hydrocarbon insecticides.

When preliminary research some 10 years ago indicated that animals might acquire some of the chlorinated hydrocarbon insecticides through one or more of three possible routes—inhalation, absorption, or ingestion—entomologists began an immediate review of current and proposed insect control recommendations.

While there was some doubt that inhalation was a factor, the very fact that barn spraying resulted in milk contamination led to the abandonment of chlorinated hydrocarbon insecticides as barn sprays. Livestock sprays containing such compounds were withdrawn from the market, including some where no incriminating evidence existed, and suspicion was hardly justified. Where the available data indicated milk contamination was probable, recommendations for the use of insecticides on forage crops were revoked. But it was in this field that differences of opinion were inevitable.

Since a pattern has been set by the establishment of tolerances for several compounds in animal fat, the problem of residues in meat is comparatively simple. For practical purposes, meat is just another raw agricultural commodity bearing a pesticide residue. In general, one can follow for meats the same types of procedures used for evaluation of residues on plants and other products, i.e., establish dosage-time-residue relationships, evaluate the toxicological hazards, and after comparing the two establish a sound, safe, and reasonable tolerance.

No Reason for Milk to Be the Sacred Cow

Milk presents quite a different problem. Because of its unique position as the principal item in the diet of infants, the infirm, and the aged, milk has been set apart as the one food which must be most diligently guarded. That is as it should be, and no one is more in favor of adequate safeguards for milk than the farmer, the entomologist, and the chemical manufacturer; for they, too, have loved ones to be protected. Furthermore, their reputations and the integrity of their products are at stake.

But while all seem to agree milk should receive special consideration, there seems to be no valid scientific or moral reason why it should be set apart