

Mites, Soil Pests Dominant Fields for New Chemicals in West; Sales Rise Continues

TALK AG CHEMICALS in the West this summer, and conversation almost invariably centers on two topics—soil pests and mites. Reasons: "Everybody, but everybody" has a soil pest chemical in some stage of development; seldom before have mites loomed as such a serious threat throughout the area or been so hard to kill.

The soil pest complex and attacks thereon are not exactly new; first glimmerings of concerted efforts were noted last year (AG AND FOOD, September 1955, page 745). But 1955 development programs are moving forward on a broader front this year, while several additional companies are entering the lists with new developments.

Shell's Nemagon, now in its second commercial year in California-Arizona for citrus, cotton, and grapes, adds more crops to its list, including peaches, figs, walnuts, and beans. Advantage for Nemagon, as seen by Shell, is that it is a heavy gas, works in the same manner as ethylene dibromide. However, unlike ethylene dibromide or Shell's other fumigant, D-D, it is not broken down in the soil. Instead, it kills up to 30 days, possibly longer. Perhaps its greatest claim, in Shell's view, however, is that it can be applied at seeding time and around most living plants and trees.

Among future prospects for nematode control in crops tolerant to Nemagon is an indication (and, incidentally, one of the very few indications pesticide-fertilizer combinations might be more than a sales promotion effort in the West in the future) that Nemagon can be combined with dry fertilizer and applied in a one-shot side dressing. Whether this proves to be true remains for future research to determine.

Dow, meanwhile, has Fumazone available commercially in California and Arizona for the first time this year, following 1955 field experiments. Fumazone's active ingredient is identical to that in Nemagon—1,2-dibromo-3-chloropropane. Dow at this juncture believes the material is "promising" but not likely to be a general replacement for other materials such as D-D and ethylene dibromide, even though it may have an advantage on a price-per-acre basis. To date, Dow recommendations are limited to cotton and Ventura lima beans.

One additional Dow attack on soil pests this year is an old chemical,

chloropicrin, with Dow's first commercial release in the West coming in June. And expected to join the Dow soil chemicals commercially in the West next year is Telone, related to Shell's D-D (1,2-dichloropropene, 1,2-dichloropropane, and other chlorinated hydrocarbons) and stemming from a similar source—a synthetic glycerol plant.

Another soil treatment comes from California Spray-Chemical Corp. and Stauffer which promote a captan-pentachloronitrobenzene combination for various soil fungi that collectively cause "damping off." The material is dusted in seed furrows at planting time, giving the soil volume through which embryo plants germinate a protection against fungi. Spray applications also have been tested, but Calspray, which has done most of the marketing so far, feels dusting is the better approach.

Experimental on several thousand cotton acres last year, captan-PCNB was tried commercially on probably some 80,000 acres this year at about 10 to 12 pounds per acre. Calspray notes it doesn't work in all instances, but that some 80 to 85% of reseeded is eliminated. Calspray also says the method permits earlier planting with increased safety. Outlook for the future is extension to other row crops.

Of the two other soil treatments noted last year—Stauffer's Vapam and Rohm & Haas' zineb—the latter's use increased four-fold this year to about 40,000 acres on cotton. However, 1956 has turned out to be a tougher

year to get a good cotton stand—more late rain—and R&H has had to double recommended treatment. As for Stauffer's Vapam, a high percentage of its sales this year have been for weed and soil disease control, with the balance for nematodes and other soil organisms. Vapam cannot be used for food crops yet, but feeling is that it is just a matter of time to put data together and apply for approval; with no residue, there should be no problem.

Among promising new Vapam outlets is one as a preplant application in old orchards and vineyards when declining trees and vines are removed. Soil organisms built up through the years, together with tangled root systems, make it practically impossible to establish new stock. Vapam kills the organisms and burns out old roots, however.

Another 1956 development for Vapam in the West is a new injection method which should open up new markets for it in shallow placement. Key is a newly developed, very thin injection shank which does not disturb previously prepared seed beds. Vapam is injected at a depth of four inches to give growers a five-inch-wide band of weed-and-microorganism free soil for seeding.

Mite Resistance Spreads; New Chemicals Come to Attack

Here's a sampling of western feeling on mites:

► **New Mexico:** "The problem is complicated by assorted species we face, plus diversity of crops on which they occur. Control difficulties appear to be more a matter of residues than chemical toxicity."

Dust rig for Calspray's captan formulation eliminates time-consuming measuring and mixing with water for liquid application, as well as need for nurse tank to bring water to field during planting. Bags of dust are deposited at five-acre intervals before planting begins and bag has merely to be emptied into duster





Close-up of duster for Calspray's soil fungicide shows how dust tubes are rigged to direct dust into seed bed

► **Pacific Northwest:** "We need a satisfactory acaricide for a wide range of tree fruits to kill most or all species, yet not cause fruit or foliage injury. The area is suffering one of its worst mite infestations in years."

► **California:** "The problem is to know what to use, where to use it, and when. There's evidence of mite resistance to every compound used commercially. Latest item is that even Systox has failed to give mite control on some cotton fields and citrus orchards as of early August. This could be the first evidence of resistance to Systox under field conditions, or it could be anything from formulation errors to incorrect application—no one knows yet." (But one source notes it is traditional to blame every conceivable factor before finally agreeing resistance has developed.)

Here are approaches being taken:

► **Kelthane:** Rohm & Haas now has both California and Federal registration for post-harvest application, hopes for 1957 registration for growing crops at 0 p.p.m. residue for early season as well as post-harvest application. Tolerances should then come in 1958. Uses to date include apples, pears, peaches, and almonds. Points in Kelthane's favor are that it is broad spectrum, not specific for particular species as are present materials; it kills eggs as well as moving forms.

First western field tests were made in 1954, and this year somewhere between 25,000 and 50,000 pounds is on test in California alone. Treatment now runs \$10 to \$15 an acre, but even so, some growers are showing a preference over other chemicals at \$6 to \$8 an acre. Present price, incidentally, is "semiartificial" in that it is based on pilot plant production; it will undoubtedly drop as production increases.

► **Trithion:** Formerly R-1303, this new Stauffer chemical is a general insecticide for such bothersome pests as mites, aphids, scale insects, leafhoppers, and various worms, including codling moths and leaf perforators. Trithion is now being marketed under Federal experimental registration for use on seed crops and ornamentals and for post-harvest treatment of deciduous orchards. No residue tolerances have yet been established under the Miller Bill. Insofar as mites are concerned, Trithion is apparently not quite so general as Kelthane, but it is very effective for controlling the most important species, Stauffer says.

► **Mitox:** Calspray is promoting this material under license from Boots Pure Drug Co. (England). With an experimental permit, Calspray now has quantities in experimental stations for tests, and sales this year will be in the 5000-to-10,000-pound range. Already widely used in European and Commonwealth nations, Mitox will be made by Calspray at its main Richmond, Calif., plant if U. S. tests pan out.

Sales Continue Climb in West; Profit Predictions Vary

Research chemicals aside, how are older established products doing? Almost uniformly well. 1955 proved to have been a better year than 1954, and agreement is unanimous that 1956 will be even better. Whether profits will keep pace, however, is another matter. Comments range from "exceeding those of 1955 by a clear margin" to "at least equal" to "down substantially." Among reasons cited by "down" predictors: generally declining prices and increased cost of manufacture.

This year, as usual, weather has played its part in western insecticide sales. The November 1955 freeze in the Pacific Northwest and winter floods in northern California all but stopped dormant spraying until growers could definitely see a crop potential. Those hardest hit have only a minimum summer control program under way, while others have increased their insecticide purchases to make up for the missed winter spray-

ings. Generally cool weather during early summer delayed spread of the spotted alfalfa aphid into northern California, but by August 1 increased temperatures pointed to epidemic infestations up through the center of the state. Populations were also increasing in Colorado and Utah.

Here are views expressed by westerners on individual chemicals:

► **Malathion:** Due for "phenomenal" growth in the months ahead (substantiated by general industry opinion, not just the manufacturer's). Among big outlets is spotted alfalfa aphid control in a large U-shaped belt from Utah-Colorado down through New Mexico and Arizona and up into Northern California. And indicative of malathion's wide adaptability are such specialty programs as mosquito abatement (granular formulations) and Mexican fruit fly abatement along the California-Mexico border.

► **Dieldrin, aldrin:** Moving with what might be termed "normal" growth. Dieldrin, especially, is swinging into public health fields, mostly for overseas use. It has somewhere between a 5-to-1 and 10-to-1 dose advantage over DDT, an obvious shipping advantage.

► **Parathion, DDT:** Sales down, probably because of Miller Bill residue requirements (prior practice permitted sales for application closer to harvest).

► **2,4-D:** Very little sales effort being made, with dealers restricting themselves largely to taking "over-the-transome" orders because of demoralized prices.

Western Briefs on Other Chemicals . . .

Thimet is on an experimental program for cotton seed this year in New Mexico, Arizona, and California. Yield results are not in at press time, but growth is generally good. . . .

Amino triazole is up for limited commercial sales this year for nonfood cropland, with registration for food cropland expected. Suppliers have had difficulty keeping adequate stocks in the Pacific Northwest, where main uses are for Canada thistle and quackgrass. . . . U. S. Borax & Chemical has two new herbicides available commercially in the West this year—**DB Granular** (a complex of sodium borates and 2,4-D acid) and **Ureabor** (a complex of sodium borates and 3-p-chlorophenyl-1,1-dimethyl urea). US-BC says low application volume means rapid and economical control, with DB Granular for deep-rooted perennials, Ureabor for general vegetation. . . . Shell Chemical has launched its new phosphate systemic, **OS 2046**, under the trade name of Phosdrin—chemically 2-carbomethoxy-1-methylvinyl

dimethylphosphate. Advantages Shell sees include broad spectrum activity, three-way action (systemic, contact, fumigant), and rapid drop in residue (to 1 p.p.m. in 24 hours).

... And on Specific Pests ...

Sugar beets, flax, tomatoes, and some melons suffered heavily this season from curly top, a disease vectored by **beet leafhoppers**. Increase in leafhoppers started earlier this year, partly because of a shorter beet-free period last year. While a long beet-free period is the best control measure, control via seed treatment holds some promise, as a relatively short protec-

tion period at seedling time holds leafhopper infestation down until weather helps take over control. Thimet, Systox, and Bayer 19639 are out for field trial in California. . . Success for **spotted alfalfa aphid** control depends on application frequency, since present chemicals give good although temporary control. Still needed: an insecticide active at 45° to 55° F. to prevent build-up in the spring before temperatures are high enough for parathion and malathion to give satisfactory control. . . **Symphylid** control in the Pacific Northwest looks promising with a preplant application of parathion. Still lacking, however, is

a satisfactory method for getting parathion into soil in established plantings. Probable answer: some other chemical soluble in water which can then be applied directly or perhaps an effective fumigant which will not damage plants. . . Control of **yellow striped armyworm** in alfalfa presents serious problems throughout much of California. Even parathion does not appear to be too satisfactory, but reports indicate good control is possible with malathion. . . **Grasshoppers** are serious in Montana. Grain growth is good, and at summer's end a big spray program got under way to protect the investment.

Pesticide Sales Up, Profits Down in South; Newer Insecticides Getting the Nod

THROUGHOUT the South, total pesticide sales volume increased slightly in the first half of 1956 compared with 1955 or 1954. But generally, profit margins decreased in both dollar amount and percentage. Reports from several different areas in the South show weather, increased boll weevil infestation, and the Medfly outbreak (AG AND FOOD, June, page 481) caused variation in the pattern of slightly better sales volume. Sales estimates for specific insecticides indicate endrin, parathion, malathion, and toxaphene sold significantly better this year while DDT and BHC sales dropped in the South compared with 1955 and 1954. Newer pesticides cut further into DDT's popularity this year, lowering again its percentage of the total pesticides market.

Dry weather in Oklahoma caused some insects to appear later than usual. State officials report the fly season 60 days late with fly killer sales only about half of 1955 volume to date. In the high plains area of West Texas, winter and spring moisture brought a record buildup of thrips in May and June. Then June hot weather drove these pests to crops in search of succulent food.

From throughout the cotton growing areas came reports indicating boll weevil infestation was heavy this year. In the Texas Rio Grande Valley, a definite shift occurred toward methyl parathion and calcium arsenate for weevil control. In that area, however, where rigid control schedules had been followed, all materials including most chlorinated hydrocarbons gave adequate weevil control, indicating no resistance problem.

Except in a few isolated cases, pesti-

cide supplies have proved adequate throughout the South so far this year. Nor have any significant surpluses of materials appeared in the area. Cotton may have suffered, as Alabama extension workers report shortages of dust formulation insecticides for cotton. In Southeast Arkansas, resistant weevils may cause a shortage of methyl parathion or other pesticides more effective than chlorinated hydrocarbons, according to late July estimates.

Rising Farm Income

Rising farm income during recent months affected pesticide demand or supply only slightly. Some say it is too early for a reversal of the downward income trend to have a significant influence. Consensus currently seems to be that most manufacturers and formulators can easily anticipate a rise in demand and provide adequate supplies wherever needed.

Besides the Mediterranean fruit fly, which has received wide publicity throughout the country and brought a special demand for malathion, other pests got extensive chemical control. The spotted alfalfa aphid proved serious in Oklahoma where migration and rapid build-up required six or seven sprayings in some sections. Malathion or parathion gave satisfactory control after temperatures reached the 50° to 60° F. range.

Increasing resistance to chlorinated hydrocarbon insecticides received more attention in many places than did outbreaks of pests new to the area. Degree of seriousness varied widely. Measures to counter increasing resistance ranged from use of higher

strength formulations later in the season to shifting to insecticides containing phosphate derivatives. Extension workers point out that many cases of resistance can actually be traced back to improper application. Still, widely recognized resistant insect species in the South include roaches resistant to chlordane, cotton aphids to the gamma isomer of BHC, vegetable loopers to DDT, and house flies and boll weevils to many chlorinated hydrocarbons.

With the exception of a trend toward greater use of sprays for cotton insect control in South Carolina, no important changes in methods of pesticides use took place this year. Experiments to evaluate granular insecticides for cotton were started in Mississippi, but as yet results are incomplete.

Selling Ag Chemicals

Price slashing remained in the selling picture during 1956. In some areas, it became so intense that a few major companies abandoned consignment selling on pesticides for 1957. Trade sources in the South speculate that this practice will be discontinued entirely next year; the change may be the year's big news in the pesticide sales picture.

State officials point to a lack of noticeable improvement in "education" of pesticides consumers. But efforts aimed at safety education continue to be made by manufacturers and distributors. Over-all, results seem disappointing. Manufacturers work at giving farmers information on use of pesticides in the least technical fashion. They hope to make interpretation and adoption of their suggestions ever simpler.

Most complaints to state officials stem from ignoring application directions. Failure to follow caution statements on herbicide labels continues

to cause problems with contaminated spray equipment.

One pesticides manufacturer in the Southwest says few growers seem to be aware of the Miller Bill's potential to their business. Legal action against some may be required to bring full realization of the Bill's effects to all growers, he says. However, the Miller Bill hasn't caused any reduction in use, promotion, or development work on new pesticide chemicals anywhere in the South.

Rumors that large food processors determine pest control practices of growers in the South seem generally unfounded. About the only crops for which a trend toward food processors' influence exists are vegetables grown for canning, say state extension workers. And total use of pesticides on vegetables amounts to only a small part of over-all demand.

The soil bank program will not immediately affect pesticide sales in the South, although some distributors say demand may drop slightly in the future. Brightest note in the soil bank picture, according to one manufacturer, is that it may bring more complete compliance with extension station recommendations for pesticide application. Explained simply by a college extension worker and concurred in by others: "The soil bank will not affect total agricultural chemicals usage in proportion to the acreage taken out of cultivation. Less than half our crop is routinely treated with insecticides and most of the retired land will come from normally untreated areas."

Newer Control Methods Largely Experimental

Interest in systemic insecticides continues at a high level among extension workers and farmers who are most

receptive to new pest control methods. But most significantly, interest in systemics has increased rapidly among farmers generally.

Throughout the South, American Cyanamid's Thimet received large scale field trials on cotton for early season control. Planters used it extensively on a commercial scale in Mississippi and on a lesser scale in Texas this year.

Systemics are beyond the early experimental stage in Florida, where they are applied on vegetables and to control certain pasture insects. Wider use brought natural concern over systemic residues in vegetables, and as a result test work has accelerated. In other parts of the Southeast, nurserymen use systemics on shrubs with considerable success.

Antibiotics consumption is smaller than expected in the South to date. Early test results disappointed researchers in some cases, although in Alabama and Tennessee antibiotics are expected to become important in disease control on a wide scale. Research continues in such varied applications as leaf diseases of ornamental foliage plants, cotton blights, and in seed beds.

Tobacco farmers in Tennessee use antibiotics on a commercial scale for control of bacterial diseases. Antibiotics introduced in Georgia for use in tobacco seed beds this year met with fair success, says one distributor, but two or three more years will be needed for wider acceptance. In Texas, experiment station workers point to a great potential use of antibiotics for control of cotton bacterial blight. However, experiments showed none to be effective—a serious disappointment in view of reported effectiveness against similar bacterial diseases of other crops, says one researcher. High price and limited

availability in some areas holds down the use of antibiotics.

Development of biological pest control methods seems essentially unchanged in the South over the past year. Biological control itself finds little use generally throughout the South. And research is limited to specific pests. The European corn borer moved into northern Alabama this year and entomologists tested biological control methods on this pest. Research continues at the Citrus Experiment Station in Florida, but no significant changes have appeared recently in use of biological control methods for citrus crops.

Mixtures and Defoliants Up

Texas law prohibits use of pesticide-fertilizer mixtures, but in most other southern states sales of mixtures increased. However, distributors point out that mixtures still represent a very small part of insecticide sales volume and an even smaller part of fertilizer volume. The Southeast, headed by South Carolina which pioneered use of mixtures, continues as one of two regions in the country where mixtures sell best.

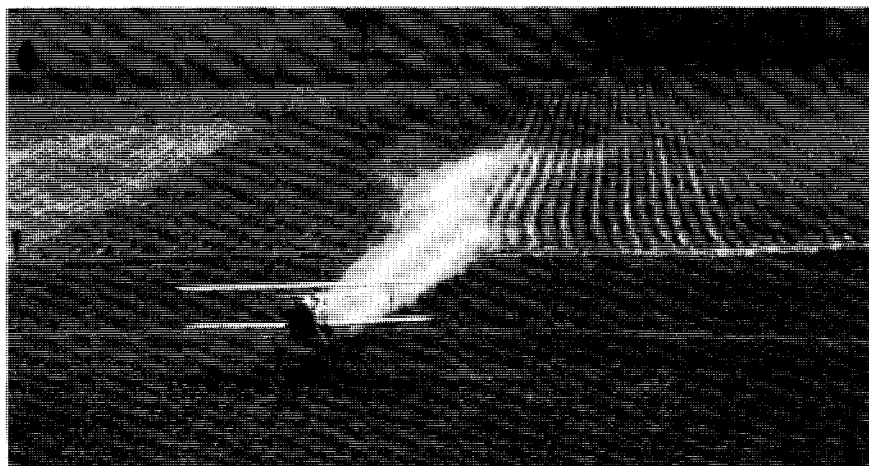
Among non-insecticidal agricultural chemicals, defoliants received most attention in the South this year because of increased mechanization of cotton picking; mechanical picking requires a uniform crop. Weather plays an important part in defoliant sales. For example, in west Texas, if abundant rainfall occurs in late August and early September, producing an excessive amount of late foliage on cotton plants, then high defoliant demand results. Otherwise, early frosts usually do a satisfactory job of defoliation.

Weed control chemical sales generally increased this year. Pasture development programs progressed on a large scale. In Oklahoma aerial spraying covered approximately 30,000 acres, chiefly with 2,4,5-T, to kill oak and other hardwood brush. Tests under way with 2,4-D in South Carolina aim at bitterweed control in pastures.

Specialized pest control chemicals—fungicides and nematocides—remain relatively small in the over-all picture. Interest in fungicides has increased in high value crops only. Nematocide testing grows more extensive in the South, but practically all experiments remain incomplete. Determination of crop sensitivity seems to have slowed release of nematocides for wide commercial sale.

Compared with farm income, however, pesticide sales had a relatively good year.

Cotton defoliation by aerial spraying continues to gain importance in South





Illinois seed corn field treated with Monsanto's Radox, selective pre-emergence herbicide. Band treatment was made at planting time with spray rig mounted at rear of planter. Grasses in untreated strips between rows indicate infestation that would have occurred without 1.5 pounds Radox applied per acre

In the Midwest: A Peculiar Year, but Sales Have Been Normal

It has been a peculiar year in the Midwest—mostly because of the weather. But volume of insecticide sales has been about the same as last year. Soil insecticides were hit hard by early season drought conditions in the area where most of them are sold: Nebraska, southern Iowa, northern Missouri, and Kansas. However, insecticide sales for the Midwest generally picked up later in the season.

Crop development is running later than normal. Herbicide sales have been excellent, especially in the more eastern midwest states. Rains, coupled with what is now a high acceptance of weed killers, rescued what looked like a poor year to make it better than normal. About the only bad spot for weed killers has been in the Kansas drought area, where the compounds are ordinarily used extensively on wheat.

The midwest farmer, generally speaking, is financially no better off than he has been, although in some areas like the specialized fruit and vegetable areas in Michigan there has been some improvement since last

year. Cherries, onions, and potatoes, for example, have been doing well.

In the corn belt, the corn borer—a big factor in DDT sales—is present, as always. This year infestation has been relatively steady over-all. In Iowa this pest was rather spotty. DDT sales for corn pests have been good over-all. Of course flies (about normal) and other insects account for substantial DDT sales too, but corn pests are still the biggest target for the largest-volume insecticide.

No serious, extensive insect outbreaks have occurred in the Midwest this year, although pea aphids and spotted alfalfa aphids caused an upsurge in sales of malathion and parathion. A producer of one of these says he has been in a sold-out position all year. The spotted alfalfa aphid was found for the first time in the Midwest last year, when it appeared in Missouri, Kansas, and Nebraska. Iowa, the Dakotas, and Minnesota have been expecting it this summer, and specimens have been discovered in Illinois.

Grasshoppers have been a major pest in the western half of the Mid-

west. They have helped make up for some of the loss in markets for soil insecticides (chiefly aldrin and heptachlor) as well as other members of the broad aldrin-dieldrin-heptachlor-toxaphene group used to control grasshoppers.

Grasshopper control is quite effective when recommendations are followed. "Amazing" is the word used by an Iowa entomologist. Early season spraying helped greatly in Iowa.

Army worms, which also are controlled by toxaphene, dieldrin, aldrin, or heptachlor, have not been much of a problem to farmers this year. Spittlebugs have been a small, but noticeable factor in sales of heptachlor and BHC in Illinois, Indiana, and Ohio. Chinch bugs have not been especially active.

Sales of grain fumigants have been very good. Comparatively, sales of chemicals for nematodes have remained small so far in the Midwest.

A slight outbreak of wheat stem sawfly, for which there is no economical chemical control, appeared in North Dakota. Proper cultural practices control this pest.

Insecticide-fertilizer mixture sales seem to be off this year—mainly because fertilizer use is down. The setback is believed to be temporary, and there is apparently no reversal in the trend toward their use; more fertilizer makers are expected to add insecticides to their products next year.

Granular materials have been catching on, but there has been no stampede toward their use, possibly because of price. Need for special application equipment is a problem, too, when DDT is used for corn borer control. Granular DDT has the advantage of rolling down the natural trough formed by the corn leaf to lodge in the whorl and leaf axils—the region in which the corn borer is most troublesome. Granular heptachlor and dieldrin were found to be quite effective in preliminary tests in Iowa, where they were tried with sweet clover. They were applied with a seeder, or were actually mixed in with the seed. Granular heptachlor has been found quite useful on some vegetable crops, also. More formulators are expected to have granular materials next year.

The Miller Bill has caused some shift in usage among the aldrin-dieldrin-heptachlor-toxaphene group. Heptachlor and aldrin can be used fairly close to the time a crop is harvested or used for pasture. With dieldrin and toxaphene, 30 days or more must be allowed between the last application and harvesting, to prevent exceeding residue tolerances aimed at exclusion of these

chemicals from foods. (Residues of pesticides found on forage may accumulate in fat or appear in milk of animals fed the forage.) The exact waiting period established has not been quite uniform among the various states, and in some cases there has been a little confusion about complying with Food and Drug policy. Most of the inconsistencies now appear to be on the verge of being cleared up.

Favorable toxicity properties have helped sales of heptachlor (and probably methoxychlor as well) for use on forage crops this season—especially in Wisconsin and Indiana.

Insect resistance has not been much

of a problem. Fly resistance to DDT has brought some shift to aldrin and dieldrin for this application. Often, however, a case of supposed "resistance" turns out to be the result of using insufficient dosage. In a very few instances such failure has been traced to low-analysis materials, but constant checking provides an adequate safeguard. Poor recommendations may be at fault in other cases. One entomologist says: "Many manufacturers do not keep up to date on the latest practices and most efficient use of their materials, so directions given with the product may lead to dosages that are too low."

Pesticide Volume in Northeast Up, Profits Slimmer Because of Competition

THE PESTICIDE INDUSTRY in the East reports that its sales in general have been on the increase, although with conditions becoming progressively more competitive, profit margins in many cases have declined. Sulfur compounds are a notable exception in sales. With the marked advances in the sales of the newer organic fungicides, the demand for sulfur appears to have dropped off sharply in the fruit-growing areas.

Recent months have witnessed some improvement in farm prices and farm income, but it cannot be said that this trend has had any marked effect on pesticide demand so far. On the other hand, as one company points out, it may exert a favorable effect on grower purchases at the time of harvest.

Another interest emphasizes that short-term economic fluctuations in agriculture have relatively little influence on the 40% of the farmers who produce about 90% of the output. These growers can be expected to continue their use of pest control measures along with other good management practices, rather than tighten their belts at the expense of production efficiency.

Steel Strike

The steel strike, which brought supply headaches to other segments of the chemical industry, appears to have made no sizable impact on the pesticide trade. Supplies of benzene used in the production of DDT, BHC, and other large-volume items were abruptly curtailed by the shutdown of coke ovens, but inventories of benzene were sufficient to maintain operations. Furthermore, the strike came rather late in the season when the heavy demand for pesticides had passed.

The vagaries of the weather continued to be an important factor in pesticide sales. The late spring and late freeze in the East were especially damaging to the fruit crop, and also caused the loss of many early vegetable plantings. The result was an appreciable reduction in spray requirements.

An important development in the East is the increasing influence that food processors have been exerting on the pest control practices of growers. The firmer hand taken by food processors has had a very healthy effect, pesticide producers believe. However, they also believe that processors should adopt such practices only after consultation with agricultural experiment stations and pesticide producers.

Miller Amendment

Industry observers at the same time have been closely watching the effects of the Miller Amendment governing the use of these materials. One company contends that the measure has definitely curtailed the use of some of the established pesticides and may also have reduced the number of new materials entering commercial use. The same factor believes, however, that this legislation has had no effect on research being conducted in the industry toward the development of new pesticides.

A top-ranking firm points out that the Miller Amendment has merely required it to supply for public record the kind of information it has always made available before marketing a new agricultural chemical. This company takes it for granted that one of the largest single costs in the development of agricultural chemicals is the research needed to assure their safety to health. The Miller Act require-

Although pesticide volume has been up in the central states, profits have been down, according to most of the formulators interviewed. Price cutting and related "malpractices" have been widespread. Some suppliers have been accused of appointing anyone with an empty barn a "distributor." These low-overhead operators can cut prices easily enough. Most basic manufacturers and formulators deplore price cutting. Speaking of the situation in herbicides, one of them puts it this way: "Just about everybody knows what weed killers will do now. Price cutting isn't really going to sell any *more* material. So why do it?"

ments tend to slow down commercialization of a new product since the evidence that satisfies the company's standards also has to be reviewed and accepted by Federal authorities. "However," the company adds, "in our contacts with responsible officials of the USDA and the Food and Drug Administration, we have found them at all times eminently reasonable and entirely fair."

Foreign Trade

Several producers report that pesticide export totals this year are running ahead of those of 1955. One company says that the only substantial change in its export pattern has been a lower volume of cotton insecticides caused by cutbacks and bad weather in Central and South America.

The export picture for the future appears good. As one observer points out: "The release of manpower from agriculture to industry, business, and services has been an important factor in over-all economic advancement. As other nations increase their industrial potential, they will demand more and more of the products that reduce manpower requirements in agriculture."

Field Testing

There have been a host of experimental insecticides under test during the past season, and many of the "semi-established" pesticides have been field-tested by experiment stations in the Northeast.

At Cornell, for example, field experimentation is being carried out with a great many chlorinated hydrocarbon and organic phosphorus insecticides. In some instances they are used with other chemicals in research on residues, in formulation studies, and for comparison in performance with candidate materials not yet cleared for full-scale use. Approximately 15 new compounds are undergoing field tests.

The Cornell people report that several new organic phosphorus compounds as well as other candidate insecticides, still largely under code numbers, are showing promise for a rather wide range of uses. In the herbicide field they have found Geigy's new Simazin (2-chloro-4,6-bis (ethyl-amino)-S-triazine), in comparison with other new and standard chemicals to be outstanding in controlling both broadleaved and grassy annual weeds. Sweet corn seems to have a high tolerance for this product.

The Connecticut Agricultural Experiment Station is continuing the fight against Dutch elm disease, and at the same station fungicides are being field tested on tomatoes and celery.

In the East, American Cyanamid has been extensively testing Thimet, its phosphate systemic, in seed treatments, direct-application sprays, root dips, and granular applications, to determine the extent to which its systemic qualities can be used on vegetables and ornamentals. Cyanamid also reports excellent results with a new herbicide, amino triazole, in control of persistent weeds such as Canada thistle, poison ivy, and quack grass.

General Chemical Division's miticide Genite 923 has been undergoing large scale tests for the control of the mite complex on elms in the Eastern States. Data obtained so far indicate the product is highly effective in preventing mite build-up which often follows use of DDT to control bark beetles on elms, says a company spokesman. Genite 923 contains 50% 2,4-dichlorophenyl ester of benzene sulfonic acid. It is a specific for certain mites.

At Maine's experiment station in Orono, a number of products were field tested against aphids during the summer. Diazinon gave excellent results against the pests. DDT is being reevaluated for aphid control. If late season infestations warranted, plans were made to use other products including Thiodan, Guthion, and Thimet.

A growing number of experiment stations are recommending systemics such as Systox for aphid and mite control. Thus far, mites and aphids are the principal pests for which eastern growers have used systemics, although leaf miners in the ornamental field have been controlled in this way, too.

In mid summer, late blight of potatoes was found on Long Island and in Pennsylvania. The unusually cool and wet summer was particularly favorable to spread of this fungus disease. Growers went into action at once to protect potatoes and tomatoes

(to which the blight spreads) with sprays such as zineb, nabam plus zinc sulfate, Bordeaux, and standard copper-containing mixtures.



These pine caterpillars were part of an isolated infestation on a stand of pitch pine at a children's camp in northern New Jersey. Camp director and 100 of his small charges went after the caterpillars with hand-pumped sprays. Director told AG AND FOOD he was getting excellent results with a mixture of turpentine and creosote

As insects seem to become more and more choosy about their food, baits and attractants frequently have to be used to coax them virtually to eat themselves to death. Sugar or molasses makes malathion, diazinon, and dipterex particularly palatable to houseflies. This has led to current tests conducted in the northeast with protein hydrolyzate in malathion and parathion formulations for the cherry fruit fly, apple maggot, and drosophila.

In other new tests codling moths seem to like brown sugar, yeast, and sassafras-oil essence with their poisons.

Various mixed baits are available for garden and field use, principally in cutworm control, while metaldehyde baits are notably effective on slugs. In bait tests for control of alfalfa snout-beetles, sodium silicofluoride has been replaced by heptachlor.

The other side of the picture shows repellants gaining attention in the control of biting flies on farm livestock, and for prevention of weevil damage in farm stored wheat.

Insect Resistance

One of the most troublesome phases of insect control is the growing toler-

ance to chlorinated hydrocarbons displayed by mosquitoes, and by various flies, moths, roaches, beetles, and worms. The Colorado potato beetle has shown signs of taking favorably to dieldrin as it has to DDT. More recently the red-banded leafroller has come to resist TDE.

This problem of resistance is generally met by the use of different insecticides or combinations. Often an additional stumbling block here is finding an effective substitute which has been approved, and for which necessary information—residue data, for example—is available. Phosphorus compounds like malathion seem to be proving successful in combatting this resistance, certainly so far as mosquitoes are concerned. However, in some orchards and greenhouses, mites are developing, in turn, resistance to phosphate insecticides where these have been in use steadily for several years.

Large-scale fundamental research into the mode of action of insecticides and the mechanics or physiology of insect resistance is being conducted to solve this puzzle. Evidence that acquired tolerance may be cyclical over the course of several generations indicates that insecticides now fast losing their efficacy may be very useful again within a few years.

Application Techniques

The principle of using high-content sprays is gaining wide favor in the East, but growers realize that careful application is vital. Water-spraying with emulsifiable concentrates is preferred, and mist-blower application for orchards and shade trees is being developed for fruits and vegetables as well.

While simultaneous application of soil insecticides and fertilizers—or mixtures of these—is generally being discouraged, specific custom mixes are occasionally used to advantage where supervision and control are adequate. Prior to planting, soil is usually treated by low-volume, low-pressure sprayers, but granular insecticides and herbicides are being tested intensively in the east. For many pest problems, granular formulations with clay, tobacco stem particles, or vermiculite offer a highly effective method of application and reduce residues on edible portions of such crops as corn.

Granular insecticides promise to become particularly practicable for forage crops. Herbicides used for soil sterilization—like General Chemical's Urox (22% p-chlorophenyl dimethyl urea trichloroacetate)—are especially effective, when granulated, for control of broad-leaved weeds and grasses on rights-of-way, along highways, and in industrial or storage yards.