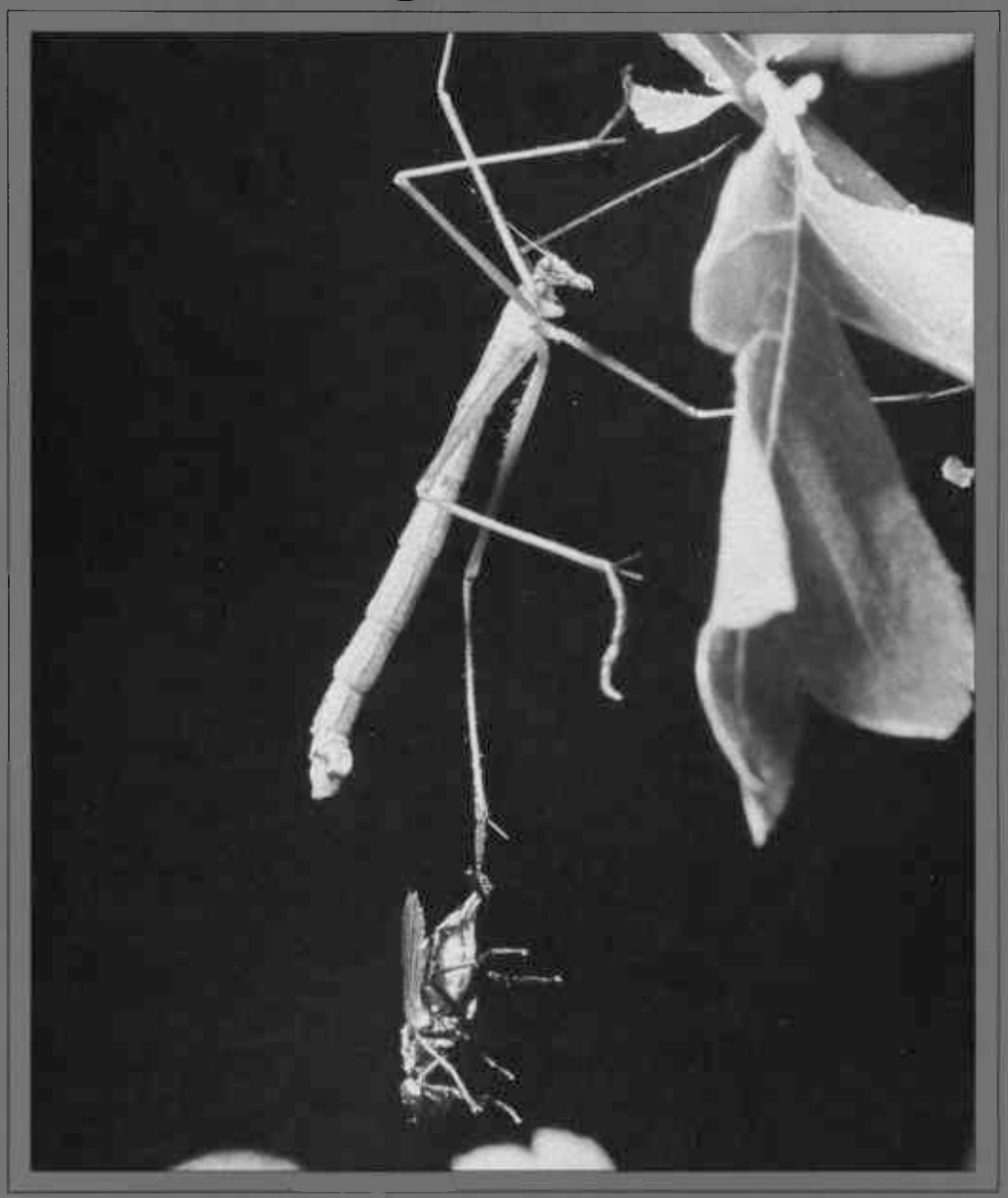
OREGON'S AGRICULTURAL
progress
WINTER 1981

Can 'Good Bugs' Protect Our Food?



Agricultural Experiment Station, Oregon State University

comment

The Economic Crunch: cake without frosting

The problems of tax revenues and unemployment affecting state government in Oregon have had an effect also on the Agricultural Experiment Station. Most (65 percent) of the operating budget of the Station is derived from the General Fund of the State of Oregon. During this 1980-81 fiscal year, the special session of the Oregon Legislature was forced to reduce General Fund support of the Station by about $1.6 million and, as a consequence, some research programs were discontinued.

In looking toward the 1981-83 biennium, the revenue situation doesn't appear to be much better. Sawmills are still closed, new construction and housing starts are down and there is still a high unemployment rate. As a result of these factors involving state revenues, the Governor's budget message to the Legislature included a reduction in general funds for the Agricultural Experiment Station amounting to about $1.8 million for the biennium (when you consider the funds needed to maintain the current level of research).

Obviously, the state's revenue dilemma demands a reduction in state expenditures. The economy may recover soon; but, for now, what are the impacts and the implications of the reductions on programs of the Agricultural Experiment Station? A number of people have asked whether programs might be continued or terminated and, although it is too early to be specific, there are some obvious consequences of the budget reduction.

Skipping special ingredients

Good research today requires accurate and precise instruments, up-to-date library facilities, access to computers, visiting scientists, faculty attendance at scientific society meetings and generally good support services. Many programs probably will forego these activities and services just to maintain a basic research activity to serve an area or commodity—but at a significant cost in the quality of the programs.

For example, travel to meetings is usually the first expense to be cut during tough times. This is most often a mistake, though, because scientists always freely exchange ideas and information, and often such contacts at a meeting help solve a problem without the need to conduct research on-site.

Generally, like the frosting on a cake, it is the little extra effort that inspires the success or that finds the solution to a problem. Without adequate funding, the frosting simply will not be put on the cake, and some of our best research will lack the touch necessary to serve Oregon effectively.

Scrimping on basics

Research is not simply a spray and pray operation—it is a determination of why things happen as well as what happened. In other words, with good science, research in agriculture can translate from one area to another, or can solve some fairly insolvable problems.

For example, recent research on nitrogen fixation indicates that proper selection of bacteria for certain plants and environments can increase nitrogen fixation tremendously. As another example of applying the basic science of plant genetics, a recent trial in the laboratory shows promise that filbert trees might be produced with tissue culture techniques, thus producing virus-free stock for planting or grafting.

The problem here is that basic research is not flashy, and people sometimes are too impatient to wait for research results. Pressures to maintain applied or field research at the expense of basic research tend to develop. If good basic research is reduced, we become today's problem solvers exclusively, rather than solving problems of both today and tomorrow.

Throwing out tools

Successful research in agriculture is usually interdisciplinary, because life is not simple. Insect problems involve entomologists, microbiologists, plant scientists, chemists, engineers and others. Nearly every research problem undertaken involves different sciences—working together to explore the complex interactions that occur in most biological systems.

If the Experiment Station is forced to

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terminate a program, even though that program by itself may have a lower priority, we could lose an important segment of a broad base of talent and possibly an important key to the solution of a critical problem. This will be true especially if the use and cost of energy in agriculture become a prime issue. Substitutes for energy require the careful integration of many operations.

Baking . . . after the cake 'falls'

One of the interesting things about biological research is that start-up is usually of long duration, whereas, shutdown can be done instantaneously. For example, if a plant breeding program is terminated and all the germ plasm is discarded, or if a field site is abandoned and weeds, insects, fungus or viruses then invade the site, revival of the research program can take years.

If funds are reduced for some areas of biological study involving plants and animals, the research cannot simply be deferred or put on the back burner. Instead, that research activity may be better terminated and given a decent burial. Such decisions will be difficult ones, however, because some of the research will never be started again, for the reasons mentioned above.

These are just a few of the issues that will be confronted by the research community and our public advisors during the next few months, in addition to some specific program issues. Decisions will be influenced by relative teaching and Extension efforts; by whatever happens in neighboring states; by economic, social, and environmental needs of Oregonians; and by the best information available for making important judgments.

Whatever happens, we'll make the best decisions possible, but the question is—will we ever be the same? Will we ever be able to serve all Oregonians with quality and distinction? Without the frosting, will there still be richness in the cake?

John K. Davis

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Cover: A scorpion fly claims its prey, a common housefly. Other such natural predators—along with space-age strategies and chemical pesticides—are helping Oregon farmers combat pests. See Page 6. (Photo: Dave King)

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Confusion about chemicals

In Oregon, public attitudes toward the use of chemicals on food crops are like a boulder on a narrow ledge: They could roll in either direction.

That's the impression you get from a statewide opinion survey conducted to help Agricultural Experiment Station leaders bring public input into their research planning.

In the November 1979 survey, whose results were published last summer in Experiment Station Special Report 588, a team directed by Robert Mason of OSU's Survey Research Center randomly selected 602 Oregon adults and questioned them face to face about the use of chemicals (fertilizers and weed and insect sprays) on food crops. A slim majority, 53 percent, favored the practice, 42 percent opposed it and 5 percent were undecided.

What intrigued Mason, as a sociologist, was that the beliefs about farming with chemicals expressed by many people were not consistent with their opinions.

"What it may mean," he said, "is that there are sizable numbers among both those who said they favored the use of chemicals and those who said they did not who really haven't given the issue a lot of thought and aren't quite sure which of their beliefs they consider most important."

Mason said a close look at the survey data revealed many "far from perfect" relationships between beliefs and opinions.

For example, more than a third of those who said they believed the use of agricultural chemicals increased food production opposed their use.

On the other side of the issue, nearly 30 percent of those who said they believed agricultural chemicals were harmful to human health favored their use.

Such contradictions, the sociologist speculated, suggest sizable percentages of both those who support the use of chemicals and those who oppose their use may shift as people receive more information or think more about the issue.

The survey results may tell public agencies, and the special interests working to retain, or ban, chemicals in agriculture that there are lots of residents who need more information, Mason said.

"It suggests to me that before solid opinions are formed, many people are going to need to know more clearly what the issues are and what the facts are," he said.

But the information sent to the public, through the media and other channels, may be a bit confusing, too, he acknowledged, because even scientific experts do not seem to agree yet on all the benefits and risks of agricultural chemicals.

"People are going to need to know more clearly what the issues are."

Delving deeper into the survey findings, Mason said favorable opinions about the use of farm chemicals were based most strongly on the belief they increased food production; opposition to chemicals was based most strongly on the belief they are harmful to human health.

The scientist speculated that factors such as food shortages in some parts of the world and rising food prices may rally more people in support of agricultural chemical use. But he said the public's concerns about the health effects of chemicals in the environment probably are here to stay, judging by a 1979 American Farm Bureau Federation national survey.

Many Oregonians who think chemicals improve food quality and production oppose their use and many who think chemicals are a hazard to human health favor their use, a statewide survey suggests.

The study showed 58 percent of the public is "strongly concerned" about environmental problems and nearly seven of every 10 persons want environmental laws and regulations made stronger.

Americans picked autos (29 percent), non-agricultural chemicals (22 percent) and pesticides/fertilizers (16 percent) as the worst polluters, in that order, Mason said. Less than 1 percent saw the farmer as one of the worst polluters, he added, but 77 percent did not want farmers exempted from regulations involving weed and pest killers.

"To farmers, that means there may be more confrontations—in the courts and even public referendums—coming," Mason said. "They are going to have to be ready to establish the safety and worth of chemicals they use." ●

Survey results

Here are some of the results of a statewide survey the Agricultural Experiment Station sponsored to gather public opinions about the use of chemicals on food crops:

- A slight majority of those interviewed, 53 percent, favored the use of chemicals (see accompanying article for more information).
- An overwhelming majority, 86 percent, believed chemicals increase food production.
- Fifty-six percent said chemicals are harmful to human health, 33 percent said they are not and 11 percent were undecided.
- Thirty-eight percent said chemicals impair food quality, 36 percent said they improve food quality, 16 percent said they have no effect and 10 percent were undecided.
- Forty-eight percent said chemicals help keep food prices from going higher than they would otherwise, 42 percent said they do not and 10 percent were undecided.

Robert Mason of OSU's Survey Research Center, who directed the study, said a greater percentage of residents of eastern and southern Oregon supported the use of chemicals. But a majority from all regions of the state favored their use.

More women than men and more people under 30 years of age opposed the use of chemicals on food crops, said the researcher.

For a complete review of the survey findings, contact Mason, Room 403, Agriculture Hall, OSU, and ask for a copy of Special Report 588, "Public Opinion in Oregon About the Use of Chemicals on Food Crops."

IPM

Agriculture's counterattack on the enemies in the field

An excited moth (can an insect pant?) zooms around a tree, up and down, following a familiar scent.

He is confused when the invisible trail, which promises to satisfy his urge to mate, leads to a tiny transparent stick instead of the voluptuous creature nature has taught him to expect. The fragrance of romance still is bombarding the bug from several directions, though, so he launches similar ill-fated search patrols until he is exhausted, then flies away to seek fulfillment another day.

But fulfillment will never come. The sticks are filaments containing a pheromone, a manmade version of the chemicals moths and other insects use to attract a mate. They were dropped from a helicopter and are part of a human attempt to reduce the ranks of the moth, an agricultural pest, by keeping male and female apart, blocking reproduction.

Such trickery is an example of Integrated Pest Management, or IPM for short, a program Agricultural Experiment Station researchers believe is gaining momentum in Oregon.

Precisely what is IPM?

Those vaguely familiar with the term often reckon it's a way of controlling the pests that damage farmers' crops using measures other than the application of chemical pesticides—such as using pheromones or encouraging "good" bugs to eat "bad" bugs.

Those *are* IPM strategies. But there are a lot more. The concept isn't based on one or two techniques. The idea is to combine a wide range of pest control methods, including chemical, biological and cultural techniques, in a program guided by common sense, and dollars and cents, considerations.

The need for such an all-out counterattack on agriculture's enemies in the field is easy to see. Despite an increasing quantity of synthetic chemical pesticides used as farmers' main defense in recent decades, the federal government estimates about a third of the crops planted in the United States do not reach harvest because of the damage insect, animal and plant pests inflict.

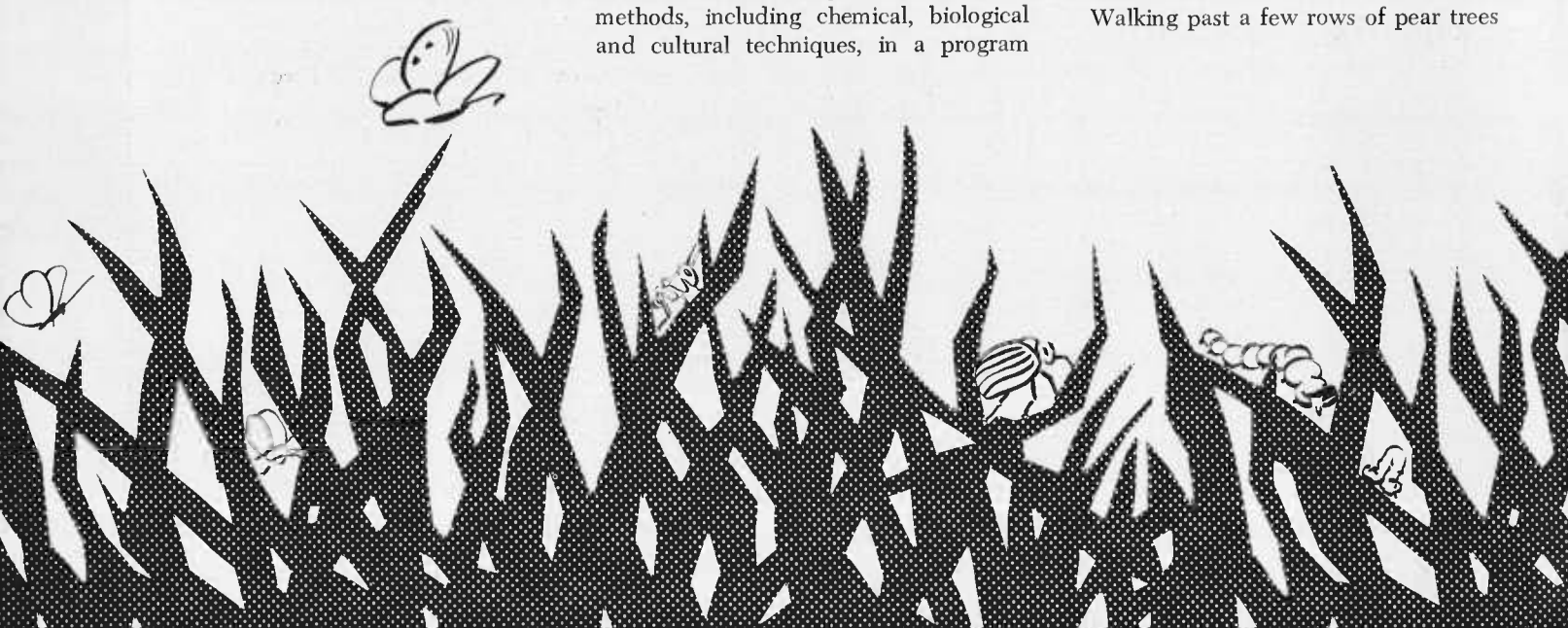
The estimate is an average for all crops, of course. But it brings to mind a farmer planting 12,000 carrots, only to have 4,000 eaten or destroyed by pests (while some people go hungry, carrot prices go up and the farmer's income goes down because of reduced yield and the need to buy increasingly expensive pesticides).

As if that doesn't justify IPM, there are other important reasons it is gaining popularity around the country. Examples: Insect pests have shown they can become resistant to pesticides quickly; public concern is growing over the environmental impacts of a chemicals-only approach to pest control. If ever an agricultural program bridged the needs of farmer and citizen-at-large, IPM does.

* * *

"See," said Pete Westigard as he sliced a pear and held out a section riddled with holes bored by a white caterpillar still present, munching, and apparently unremorseful. "This is the codling moth worm. Just about everyone has bitten into a piece of fruit with one of these inside."

Walking past a few rows of pear trees



in the orchard at OSU's Southern Oregon Agricultural Experiment Station at Medford, where he works, Westigard grabbed a limb and bent it to display a leaf spotted with bubbles of a clear, sticky substance like tree sap.

"This is honeydew," he said. "The immature nymphs of pear psylla, a little aphidlike insect, produce it when they feed on the leaves. When honeydew drops down on pears it causes russetting, the brown patches on most of the fruit in this tree."

Presto. In a couple of minutes the tall, bespeckled entomologist had introduced, directly and indirectly, two chief villains in a multilayered conflict that illustrates very well how IPM is giving, or promises to give, farmers from one end of Oregon to the other new weapons and tactics to use in their battles with pests.

Briefly, besides the codling moth worm (larval stage of the sex-crazed moth at the beginning of this article) and pear psylla, the conflict in Medford involves pear growers and other orchard pests such as San Jose scale, a flea-sized bug that builds a shell (scale) around itself and can damage tree limbs and blemish fruit, and several types of even tinier mites. The mites can cut fruit yields by feeding on leaves, disrupting photosynthesis and sapping a tree's energy.

When Westigard arrived at the Medford station in 1962, growers in the Rogue Valley were spraying chemical pesticides to control all the insects.

"The first thing we did was leave a block of pear trees unsprayed," he recalled. "That laid the framework. We began to see which were 'true pests' and

How IPM started

Explanations of what spawned the Integrated Pest Management, or IPM, approach to pest control often drop back to 1962 when writer-naturalist Rachael Carson warned of a symbolic *Silent Spring* with its animal and insect serenades stilled by the far-reaching destructive power of the pesticide DDT.

Apparently, those explanations aren't entirely accurate.

The popular book opened the public's eye. But biological scientists, some conducting agricultural research, have said they already were concerned about the environmental impact of the indescriminate use of synthetic chemical pesticides developed during and after World War II. They also have said they were disturbed by alarming evidence of pests' (especially insects') ability to alter their genetic makeup from generation to generation (mutate) and rapidly become resistant to pesticides.

The feeling among the scientists, generally, was that humankind had entered a contest—the frantic struggle to keep ahead of pest mutations by developing new chemical control agents—it might not be able to win.

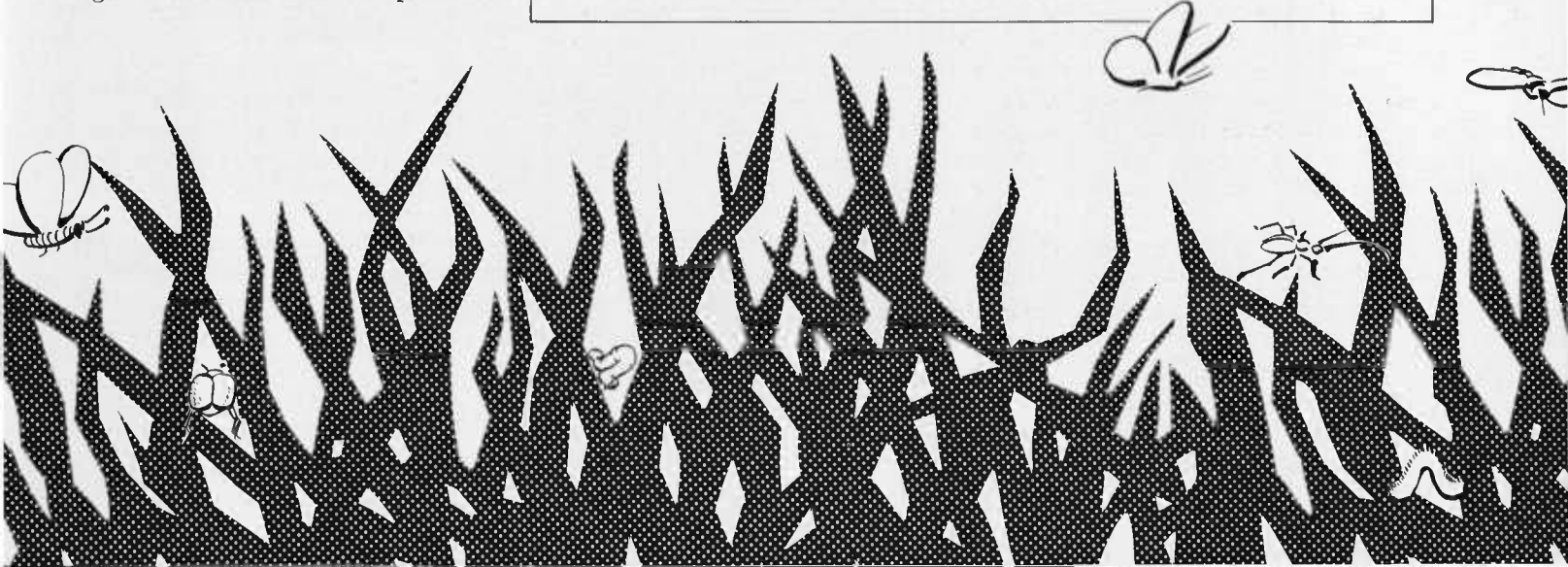
Here and there, scientists, including some Oregon Agricultural Experiment Station researchers, began exploring alternatives, and from that disjointed effort emerged the formal movement to integrate nature's control mechanisms with the selective use of chemicals.

By 1972, a nationwide IPM project had been organized with the support and participation of the National Science Foundation, the U.S. Environmental Protection Agency, the U.S. Department of Agriculture, state agricultural experiment stations and Extension units at 18 land grant universities (including OSU) and other federal, state and local agencies.

But that is IPM's formal history, and Pete Westigard, an entomologist at OSU's Southern Oregon Agricultural Experimental Station at Medford who was in on the start of the program, knows history has a way of packaging life in deceptively neat boxes.

"The words IPM aren't especially important," he said, "because a concept doesn't start with words. In Oregon, you have to go back to what a lot of good entomologists were doing long before I came to the state. They had a lot of ideas about how to control pests without chemicals in place in the 1920s and 1930s. But they didn't call it pest management."

Silent Spring, which Westigard recalls reading in 1962 as a doctoral student at the University of California at Berkeley just before he graduated and took a job with OSU, was a "super-exaggerated book in my mind and the minds of most scientists," he said. "But it did bring a view of a problem to the public and cause some changes."



which were 'induced pests' unleashed when natural predators were killed off by chemicals or host trees were altered in some way."

As you might suspect, the hedonistic codling moth worm turned out to be a glutton. It had no enemy it could not overcome and ruined 50 percent of the fruit a year, the researcher found. The pear rust mite and San Jose scale proved to be persistent pests, too. But pear psylla and the others were making a nuisance of themselves when sprays killed their natural predators.

Nature was out of balance.

Armed with his knowledge of the natural insect community, and with the help of Bill Liss of OSU's fisheries and wildlife department, a specialist in the study of such ecosystems, Westigard set out to reduce the cost and increase the effectiveness of pest control in Rogue Valley pear orchards.

He hasn't won all his battle. But he seems to be gaining ground. Just analyzing the "true" economics of spraying was a step forward, he explains:

Westigard said the spray used to kill codling moths costs about $30 per acre per year. But the spray also kills three bugs that prey on pear psylla. That creates the need to spray pear psylla, which costs from $120 to $150 an acre per year. What's more, the chemicals used on pear psylla destroy the enemies of spidermites, making spidermite spraying necessary—at a cost of $50 to $100 per acre per year.

"That means a $30 control (spraying codling moths) ends up costing a grower more than $200 an acre," he said.

Long before those prices were reached, Westigard realized tolerating a certain level of codling moth infestation would be cheaper than spraying and began using old-fashioned bug nets and traps containing pheromone "bait" to collect pests from test orchards so he and his assistants could calculate the pests' developmental stage and density, estimate the fruit and tree damage they might cause and decide if sprays were economically justified. Such work creates labor and management costs, of course. But Westigard demonstrated that it reduces the numbers of sprayings and allows natural predators to shoulder more of the pest control burden.

Some of his work is more basic. For years he has searched for a chemical that would kill codling moths without destroying pear psylla predators. While that search continues, he is eyeing other control means.

A type of "supermite" that preys on spidermites and is resistant to pear psylla spray has been identified by a California researcher.

The predator population may one day help tilt the . . . balance in the Rogue Valley pear growers' favor.

"We've gotten some of the predator mites and released them into trees here and they look very promising," said Westigard.

He is testing, with researchers from OSU, the U. S. Department of Agriculture research lab in Yakima, Washington, and elsewhere, the aerial spraying method of blocking codling moth reproduction with pheromones, and he is testing other experimental control techniques such as using viruses that attack pests (related story on new control methods, Page 12) and reducing pear psylla damage by injecting trees with chemicals to decrease new shoot growth. New shoots are the insect's main food source.

Bill Liss has helped Westigard realize many of the pests and predators in a pear orchard come from surrounding land. Circling orchards with vegetation that increases the predator population may one day help tilt the insect community's balance in the Rogue Valley pear growers' favor, he believes.

"An IPM program … reduce the number … That saves money a… insects longer to bec…

The list of undertakings goes on. The point is, Westigard is an example of researchers, Extension Service specialists and agents and others working with various crops around the state who are clawing their way toward any technique that promises to expand and improve the

ısually helps a grower
of (pesticide) applications.
nd means it will take
come resistant."

OSU researchers in Medford are deceiving orchard pests with sex. Helicopters spray pear trees with a pheromone—a manmade version of chemicals insects use to attract a mate—to confuse male codling moths so they can't find a female. Blocking reproduction with the tiny, transparent pheromone filaments (far left) reduces the ranks of the moth's larval stage, the codling moth worm (left), which bores into pears.

growers' pest control arsenals. His is the IPM approach, through and through.

Are Rogue Valley pear growers jumping on the bandwagon? Some have been trying IPM techniques, with the help of OSU Extension agents. Many are slower to accept new approaches.

"The growers are getting more and more interested all the time," said Westigard, "and the big reason is the rising cost of pesticides. They're still the cornerstone of control and I think even environmentalists are beginning to realize you couldn't eliminate pesticides and grow enough food for the world. But an IPM program usually helps a grower reduce the number of applications .That saves money and means it will take insects longer to become resistant to pesticides."

Reactions vary in other parts of Oregon.

In Hood River, where entomologist Bob Zwick of OSU's Mid-Columbia Agricultural Experiment Station has experimented since the mid-1960s with IPM techniques on that area's complex of pests in apple, pear and cherry orchards, grower attitudes have been similar to those in southern Oregon.

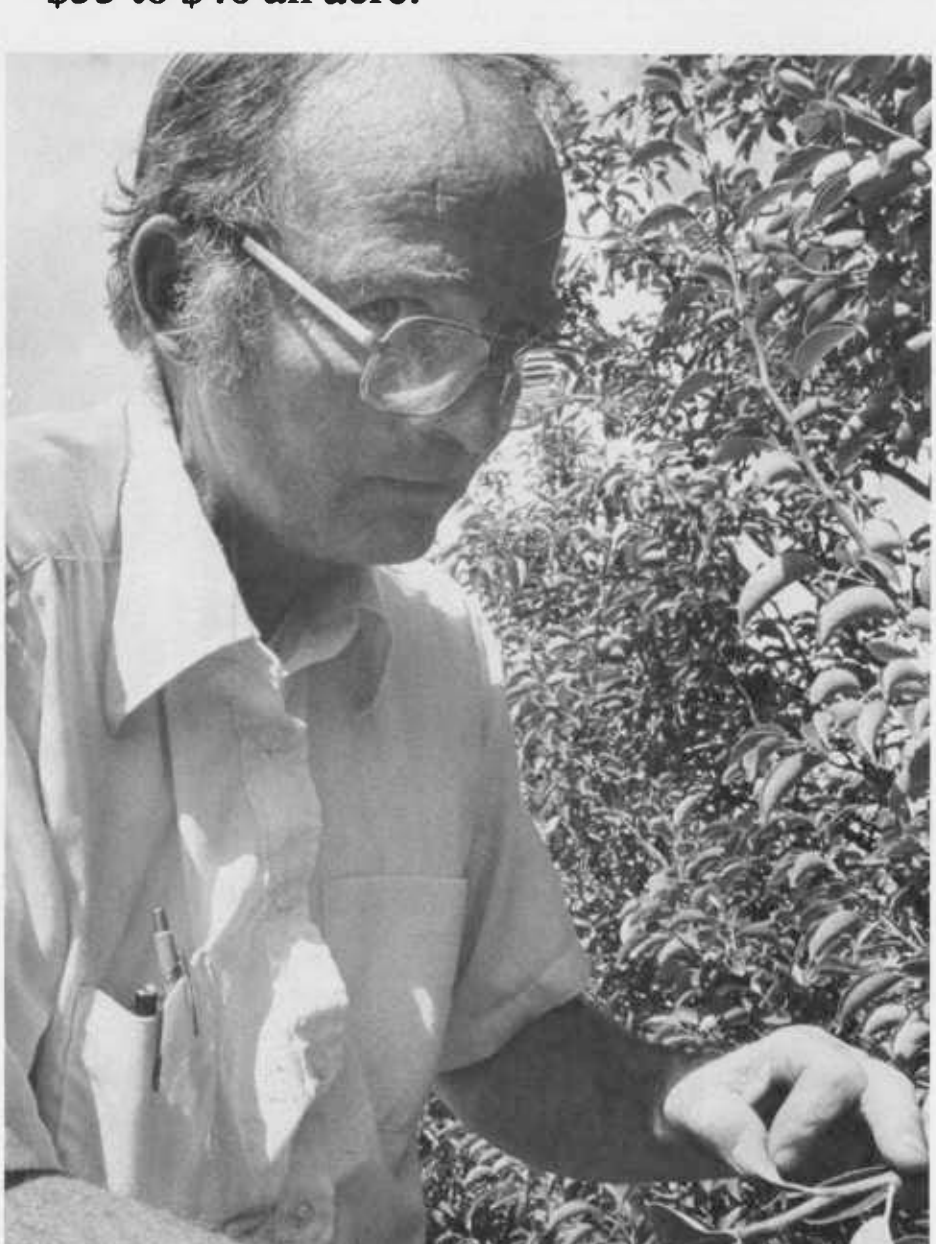
"Some growers work closely with us and as they learn more they get more enthusiastic," said Zwick. "But many just don't want to worry. They're making money on their fruit and they would rather put their sprays on without wondering whether it's the right day or if they are damaging predators.

"There's a lot of IPM that sounds nice," he continued. "But there are many loose ends, things we don't know about. Each orchard ecosystem is different. We have a pretty good idea of what's happening in one guy's pear orchard. We've been studying it for eight years. But I'm not ready to go out and say that applies to the whole area."

And if ecosystems differ from orchard to orchard, so do they from region to region.

"Pear psylla and mites are a bigger natural problem than the codling moth and 'scale' at Hood River because of our cool weather," Zwick said. "One of the main things we try to do is get growers to use pesticides carefully when predator populations are coming on. It can save

IPM is being used on 10 to 12 percent of Oregon's mint acreage and is saving growers $35 to $40 an acre.



OSU entomologist Pete Westigard checks a leaf for signs of pear psylla, a tiny aphidlike pest.

them a little money, of course. But the most important thing is that a month or so later they may have enough predators to control, oh, spidermites, for example."

In the Willamette Valley and central Oregon, a budding IPM effort in the mint industry is catching on.

"We've already made a lot of headway and the growers taking part are starting to get the word around," said Ralph Berry, an Experiment Station entomologist who helped organize the two-year-old program with Glen Fisher, OSU Extension entomology specialist. "Now we're hoping some private firms will take over the field work. That's the way this sort of thing should work."

"The growers taking part are starting to get the word around."

By "take over" Berry means take over the program's key task of keeping week-to-week track of "good" insects and pests so pesticides can be carefully selected to foster natural pest control and used only when the economic situation dictates it.

Monitoring insects includes such activities as taking regular soil samples, collecting bugs with sweep nets and gathering leaves and counting the number of certain types of insects per leaf. The field scouting, as the monitoring is called, is being done mostly by students hired by Berry and Fisher and paid an hourly wage by participating growers.

Berry estimates IPM is being used on 10 to 12 percent of Oregon's mint acreage and is saving growers $35 to $40 an acre per year. He expects IPM popularity to rise sharply now that the benefits have been demonstrated. That is why he hopes that, as in successful IPM programs with other crops in other states, private businesses will provide a field scouting service so researchers and Extension agents can return to the job of searching for new methods of cutting costs and pest damage . . . and introducing those to farmers.

Other IPM projects are pushing forward, in the lab and in the field.

A USDA entomologist stationed at OSU, Jim Kamm, is zeroing in on the sod webworm, or cranberry girder. Despite earning a nickname for its destructive binges in cranberry bogs, the webworm inflicts more dollar damage to grasses grown for seed in western and eastern Oregon and to Douglas-fir seedlings.

In the lab, Kamm and researchers from Oregon's state Department of Agriculture and the USDA lab in Yakima have discovered that the same chemical compound is a pheromone component of the moth stages of webworms and a cutworm pest of grasses in eastern Oregon.

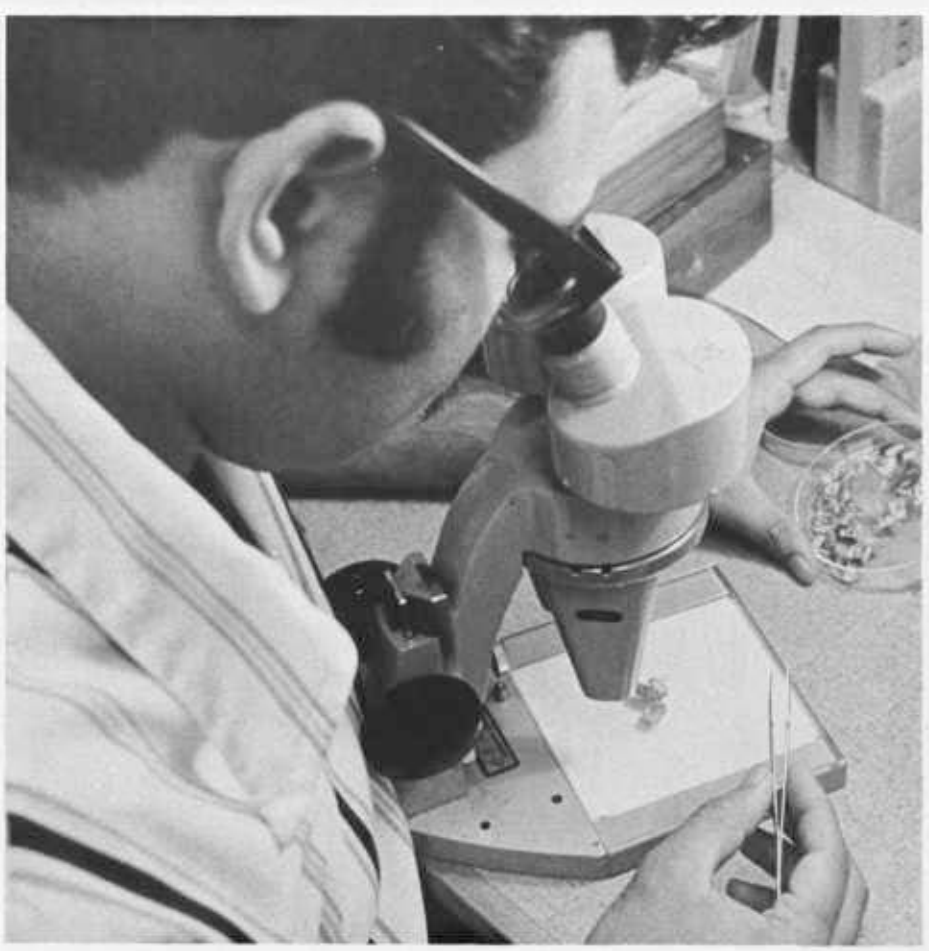
The researchers have used the pheromone in field traps to monitor the pests' population, and last spring near La Grande they applied pheromone sticks by hand in a small section of an orchardgrass field. Because most moths could not find each other to mate, almost no progeny were produced to damage the grass.

"Next spring we plan to spread the pheromone from a helicopter on about 120 acres of orchardgrass in the Corvallis area and 120 acres of orchardgrass in the La Grande area," said Kamm, who also is working with Weyerhaeuser Company researchers to determine if the pheromone can protect Douglas-fir seedlings. "In La Grande, we're hoping we can kill two birds—the webworm and cutworm—with one stone, so to speak."

"A jar of (pheromone) fibers the size of a can of soup will cover an entire acre," Kamm said, explaining that the pheromone is relatively inexpensive and does not appear to be toxic to plants or animals.

Another OSU entomologist, M. T. AliNiazee, has applied IPM to the pests of

OSU entomologist M. T. AliNiazee is applying IPM to pests of filberts, cherries and apples.



three crops—filberts, cherries and apples—and expects the effort to have major impact on each.

"We have already made substantial advances with filberts," he said. "We've developed a bacteria that attacks and can control the filbert leaf roller. Farmers started spraying the bacteria on their trees in 1974."

Explaining the full benefits of that leads into the same old story: that of ecological balance. The spray previously used to control the leaf roller killed a natural predator of aphids that also plague filbert growers. The new bacterial control gives lady beetles, which like to eat aphids, a chance to grow.

AliNiazee is introducing filbert growers to the payoffs of using pheromone trapping to monitor the filbert moth, whose larval stage is the third chief filbert pest. He also is testing the pheromone to find out if it can disrupt the moth's reproduction.

The scientist is showing Oregon cherry growers how to use a sticky trap, like a fly trap, to monitor development of the cherry fruit fly, a pest. And he has developed a model, or chart, Extension agents and growers can use to predict when cherry fruit flies will come out in late spring to lay their eggs. That is the time sprays should be applied. The model is based on thermal units, or how much heat there has been in the orchards.

AliNiazee expects his apple research to give new pest control tools to growers, too.

The discussion above is not a total inventory of IPM in Oregon. IPM has been applied to snap bean and vegetable crop production in the Willamette Valley, to alfalfa seed production in eastern Oregon's Treasure Valley, to gopher and mole control in the Columbia Basin and other areas, even to the control of tansy ragwort, the innocent-looking, yellow-flowered weed that poisons livestock through much of western Oregon. Those, too, are merely examples. The list of projects and less formal efforts is longer.

IPM certainly seems like an all-out counterattack. Wonder what the pests are planning next? •

Some new weapons for pest control

A radio advertisement 10 years from now:

"Afraid a swarm of gluttonous grasshoppers is going to ravage your crop, Mr. and Mrs. Wheat Farmer? Don't be. Buy your own army of laboratory-grown parasites. They latch right onto grasshoppers. Why, they'll drive those pesky critters into the next state."

The sales pitch is whimsical, of course. But the imaginary product (an army of grasshopper parasites) hints at the promise of Integrated Pest Management (IPM) research. In experimental plots, and flights of fancy, scientists are considering a host of potential control techniques. Many are new and some are revivals of techniques discarded in recent decades.

They can be loosely categorized.

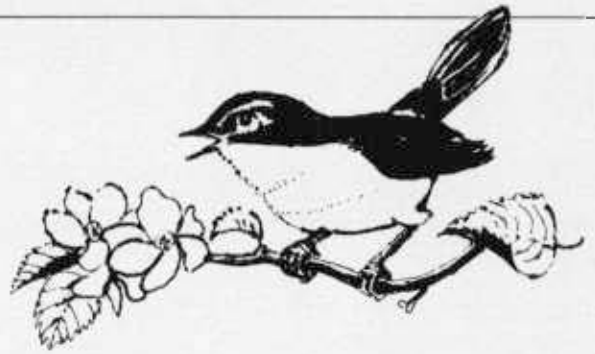
Examples of potential biological control techniques include developing—and perhaps even "ranching"—parasites and predators that attack pests or developing disease-causing organisms, such as bacteria and viruses, that attack only a specific animal, insect or plant pest.

Examples of techniques researchers call "cultural controls" include rotating crops and removing field residue to disrupt the buildup of various pests, timing crop plantings and harvests (where possible) to avoid periods when pests are most dangerous and planting "trap crops"—planting expendable crops attractive to pests near crops being protected.

Chemistry promises many pest control alternatives. Besides the development of more effective pesticides, examples include using chemical pheromones (sex attractants) to trap pests and monitor their numbers and development, or block their reproduction, and the spraying of manmade growth hormones which can throw a pest's growth out of kilter and destroy it.

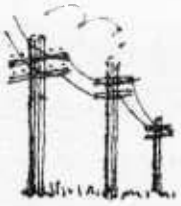
IPM has lots of promise, and farmers scattered around Oregon are enthusiastic about the approach. What would it take to win over the rest?

"If we lost one really effective pesticide in my area, for environmental reasons or because of pest resistance or whatever, it might drive the growers to more reliance on IPM," said Bob Zwick, an entomologist at OSU's Mid-Columbia Agricultural Experiment Station in the fruit-producing Hood River Valley.



research notes

Pill popping power poles?



Douglas-fir and other wooden power poles which distribute electrical energy throughout the nation are getting a new lease on life.

Their rejuvenation comes from the work of Malcolm E. Corden, OSU plant pathologist, and Robert D. Graham, OSU wood preservation scientist, in cooperation with a number of electrical utility companies. They recently completed a six-year study on controlling interior decay of power poles.

"We found that pouring agricultural fumigants into holes bored into Douglas-fir poles in the groundline area controlled internal decay," said Corden. "The fumigants also are being tested on cedar and southern pine poles."

Once inside the poles, the fungicides diffuse as vapors for about eight feet above and below the groundline to control decay for 10 years or more.

"The fumigants did not have any adverse effects on vegetation around the poles nor on the strength properties of wood," said Corden.

Internal decay of the poles has been a persistent problem, especially in large Douglas-fir poles that cannot be seasoned economically to lower the moisture content below 14 percent.

Chemical treatments protect the pole's relatively thin sapwood shell. But once in service, the poles dry and crack, exposing untreated wood inside the shell to attack by wood-destroying organisms.

The culprits are decay fungi, plants which feed on wood because they are unable to manufacture their own food. The fungi require water, air, a favorable temperature and a food source for growth. Sound wood can be infected by fungal spores or strands from decayed wood or from the soil.

During the study, 15,638 cores were taken from 9,257 pressure-treated Douglas-fir poles and were cultured. Eight decay fungi and the most frequently occurring non-decay fungi were identified.

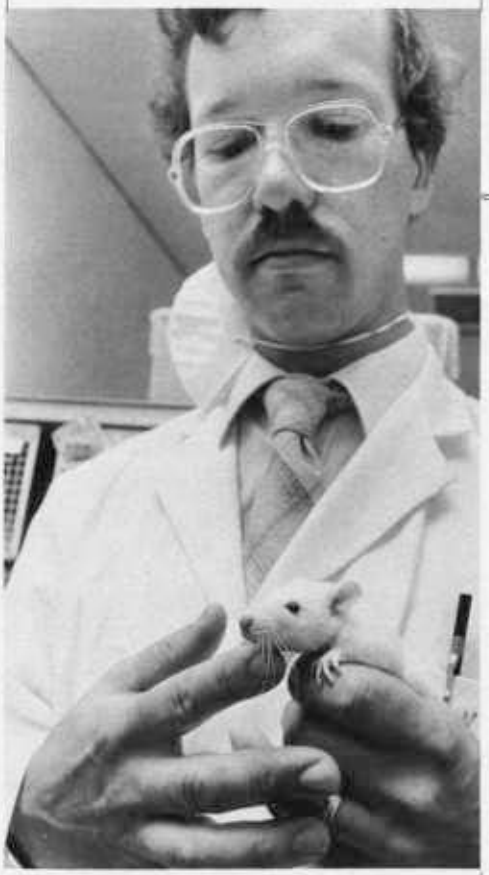
Two fumigants are used nationwide: chloropicrin (tricholoronitromethane) and Vapam (sodium N-methyldithbiocarbamate). Both are used in agriculture as soil fumigants.

The Bonneville Power Administration, the first utility to use the fumigant treatment, has inspected and treated 15,000 power poles with Vapam and estimates the treatment extended the life of Douglas-fir and red cedar poles by 10 to 15 years. Estimated annual savings: $2.25 million. New York State Electrical and Gas Corporation reports savings of $1.5 million annually.

Corden and Graham are working on a "pill" that will be safer, easier and more versatile to use than the liquid fumigants now injected into the poles.

Pill popping power poles?

Could be.



Florian Cerklewski

Of pregnant rats and tooth decay

You may not realize it, but there's zinc in your mouth.

Selenium and magnesium, too.

The metals are in your teeth, and Florian Cerklewski, OSU foods and nutrition researcher, is trying to find out if they affect cavities.

"What I'm hoping to learn is the effects of those metals on developing teeth," said the Experiment Station scientist. "For example, a preliminary animal study done elsewhere suggests a severe zinc deficiency during development results in a much higher rate of dental caries (cavities). I'm using my experiments to look closely at that."

Cerklewski explained that when a tooth is developing, small amounts of the metals collect in the enamel layer which surrounds it. The element fluoride, proven to resist decay, collects there in the same way.

His research includes feeding differing levels of the metals to pregnant rats, then feeding the rats' offspring a cavity-promoting diet high in sugar (after they are weaned) to determine which have the most cavity-resistant teeth.

Cerklewski said he also plans to study lead, a metal which some think may promote cavities.

The studies may help guide dental researchers in studies with humans, he said.

research notes

Test for tansy may cut losses

Tansy ragwort, the deceptively harmless-looking, yellow-bloomed weed spread across much of the state, killed enough horses and cattle last year to rob Oregon ranchers of more than $2 million, says A. Morrie Craig.

But the Experiment Station veterinary researcher and his colleagues at OSU's Veterinary Diagnostic Laboratory hope a new blood test they have developed will reduce future losses.

Craig explained that symptoms caused by the poisonous substances in tansy ragwort, called alkaloids, often show up only after a horse's or cow's liver is severely damaged and the animal is doomed. With the new test, if a rancher suspects his animals have eaten tansy, a blood sample can be analyzed to assess any damage . . . perhaps before fatal injury is inflicted.

"We began work on this project 2½ years ago by looking at two proteins—or enzymes—called gamma glutamyltranspeptidase and alkaline phosphatase," said Craig. "It seems the higher the concentration of these enzymes, the greater the liver damage of the animals."

Craig said if a test shows an animal has eaten tansy, the owner may want to move the herd from the tansy-infested area or, if blood levels of the proteins are high enough, prepare for the animal losses which probably will follow.

When animals are being sold, the test can be used to determine if they suffer from tansy poisoning, which can take six months to a year to erode the liver and kill, he added.

Craig said several OSU researchers are trying to determine if any tansy residue is in the meat of animals that have eaten the weed, and if the meat of animals poisoned by tansy is a potential human health hazard.

The new animal blood test is being done at the Diagnostic Laboratory for a small fee. Craig said ranchers can collect blood samples themselves and send them to the lab for analysis, or they can arrange for their veterinarians to do so.

The Experiment Station scientist is searching for a method of arresting, or reducing, the ill effects of tansy on cows and horses. The weed apparently has little effect on sheep, except at extremely high dose levels, he said.

Quackgrass showdown

Quackgrass, a weed that dominates swampy pastureland in Oregon's Klamath Basin, seems headed for a showdown with an unexpected rival from the Willamette Valley.

"It's still early, but it looks like ryegrass is the more competitive of the two," said Mark Buettner, agronomist at OSU's Klamath Agricultural Experiment Station at Klamath Falls.

Buettner was testing several pasture grasses and legumes on organic, former lakebed soils in the area when he discovered ryegrass's apparent heartiness.

He said many cattle ranchers and others in the Klamath Basin assume there is no reasonable way to get rid of quackgrass (chemicals are too expensive), which is classified by the federal government as a noxious weed but has many of the nutritional qualities of popular forages.

"I think if this study works out the way it's started, we may be able to suggest planting ryegrass for a couple of years to clear out the quackgrass," said Buettner. "Then we can plant something else if we want."

A prime reason for eliminating quackgrass, he explained, would be so legumes could be planted in pastures to "fix" nitrogen—making the nutrient more available to plants, which increases forage production and the number of cattle a pasture can support.

Fertilizing with nitrogen, one alternative to planting legumes to increase forage, is very expensive, Buettner noted.

Boosting weight gains in cattle

Agricultural Experiment Station researchers evaluating the combined use of Rumensin, a commercial feed additive, with Ralgro, a growth stimulant, to boost cattle's weight gains say the technique looks

A new lily

A new lily will bloom come Easter.

Al Roberts, a horticulturist who retired recently from full-time duty after 40 years at OSU, developed the plant, called "Harbor," during 15 years' research on the campus and at the Pacific Bulb Growers Association research station at Harbor on the Oregon coast near Brookings.

"It is the first seedling we considered as being equal or superior to commercial cultivars," said Roberts, adding that it may take years to find out if the variety can carve a place for itself in the commercial Easter lily market.

Roberts explained that greenhouse "forcing" turns regular lilies into Easter lilies. The procedure uses a series of cold treatments to make the flowers bloom early instead of during the usual mid-summer blooming season. The practice increases the value of the $3 million worth of lily bulbs grown each year in southern Oregon and northern California to about $40 million, he said.

It is difficult to produce plants that satisfy the needs of field growers and greenhouse operators, the scientist said, pointing out that only two commercial Easter lily cultivars are on the market in the United States.

Harbor, still being commercially tested, has gone to the Pacific Bulb Growers' Variety Evaluation Committee for propagation and release, he added.

promising.

Harley Turner, an animal scientist at the Eastern Oregon Agricultural Research Center at Burns who supervised the work of graduate student Grif Wooten in the study, said experiments using Rumensin in combination with Ralgro on spring- and fall-born heifers and spring- and fall-born steers produced weight gains of up to 30 percent a day more than the gains of test cattle not given Rumensin and Ralgro.

Daily weight gains in experiments with cattle given Rumensin alone averaged 16 percent more than the gains of cattle not given Rumensin and the gains of cattle given Ralgro alone averaged 12 percent more than those of cattle not given Ralgro, Turner said.

He explained that Rumensin can be added to grain to help cattle utilize food more efficiently in the rumen, and that Ralgro can be implanted in the animals' ears every 100 days or so to encourage weight gains by stimulating growth.

The researchers identified one problem.

"It looks like Ralgro may disturb a heifer's heat cycle—at least some of ours were messed up last winter," said Turner. "We plan to look at that more closely."

After more evaluation, the researchers plan to publish information about their findings through the Agricultural Experiment Station.

Artichoke fuelishness

John Yungen grows Jerusalem artichokes for the road, not the dinner table.

The agronomist at OSU's Southern Oregon Agricultural Experiment Station at Medford is testing how the vegetable grows because of its potential as a source of alcohol fuel.

"People kept coming back from these seminars on how to make ethanol saying, 'I hear Jerusalem artichokes are one of the best things to make it from,' " said Yungen, explaining why he pulled a few tubers from his home garden and planted them last spring on an Experiment Station research plot.

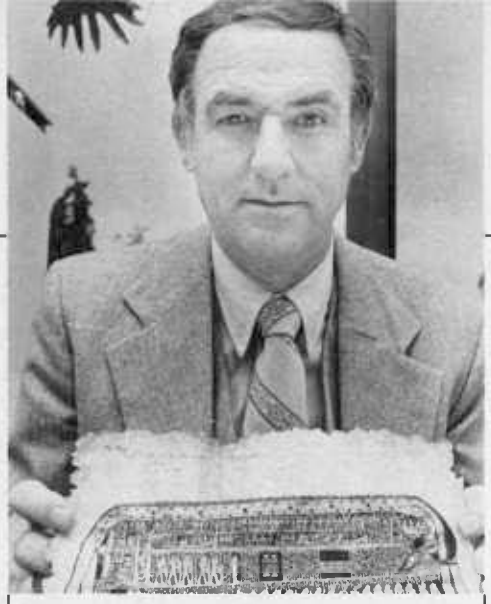
In the fall, Yungen harvested a crop of vigorous-looking, 10- to 14-foot-high Jerusalem artichoke plants, which are more closely related to sunflowers than the thistlelike artichokes many grocery stores sell.

He hopes to evaluate the long, leafy plant tops' potential as silage, and to find out how well the white, pear-shaped tubers that developed underground produced sugar and starch suitable for making ethanol—plus learning more about how the crop should be grown.

The late Harry Schoth, a U.S. Department of Agriculture crop scientist stationed at OSU for many years, published a report in 1929 that "just about covered all the bases" for Jerusalem artichokes' uses, including their potential for alcohol production, according to Yungen.

John Yungen

profile



Egyptians were growing crops with water from the Nile River, which flows through their country's eastern desert, thousands of years before the first pioneer sunk a plow in Oregon soil.

So what made OSU agricultural engineer Roy Brooks think he could help modern-day farmers of that civilization with their irrigating?

"Believe me, I started wondering when I got to Cairo," said Brooks, who returned to Corvallis in January after three years as director of an eight-person U.S. research team sent to Egypt to try and improve water management on Egyptian farms.

"I took my family to some temples and tombs just outside the city and ended up standing there looking at drawings of irrigated agriculture scenes, 3,000 or 4,000 years old, on the walls. I had a sense of, 'What am I doing here? How can I possibly help these people when this is probably the oldest irrigated area in the world?' "

The Experiment Station scientist, who came to OSU in 1967 from a job as a USDA irrigation and drainage specialist at Colorado State University, remembered why he was there when he called to mind the monstrous Aswan Dam, built across the Nile in southern Egypt in 1970 to produce electricity, control flooding and stretch the agricultural growing season.

"They changed the whole game by building the dam," he explained. "These people were used to growing one crop a year after it flooded. They were used to seeing water up to here (he holds his hand three feet off the floor) once a year and then none. Now they have water all the time and grow two or three crops a year.

"It was pretty obvious to us when we went to work that they were irrigating too much, raising the water tables to where it was beginning to decrease production," he continued. "And the salinity of the soil was increasing."

Brook's team, which included fellow OSU agricultural engineer John Wolfe and economists, sociologists and agronomists assembled by the Consortium for International Development (an organization of 11 western universities, including OSU) and supported by the U. S. governments Agency for International Development, spent most of their three years getting to know farmers, analyzing their methods and outlining pilot programs to help them improve water management.

"Now it is up to the researchers who replaced us to carry through with the programs, although as a project director I'll continue to stay in touch," he said, adding that a simple key to solving many problems will be teaching Egyptian farmers (most are illiterate and work hard to produce the maximum possible on their farms of an acre or so) that too much water can be bad.

"I started wondering when I got to Cairo."

The 53-year-old Brooks, who lived in a house in a Cairo suburb with his wife and two of their six children (the two still in high school), said he learned a lot himself.

He found the Egyptians, in the city and the poverty-ridden villages where most farmers live in one-room huts with their large families, friendly.

"They love Americans and can't seem to get enough of western culture and technology," he said. "I think educated Egyptians, especially, feel they were deprived of it during the years of Nasser (Abdel Nasser, Egyptian president before current leader Anwar Sadat) when they were aligned with Russia. They really appreciate the aid we give them."

The Egyptian government appreciated Brooks' efforts so much it helped arrange for him to travel, just before he returned to Oregon, to east-central Africa where the headwaters of the Nile spill out of the highlands on their 4,000-mile journey to the Mediterranean Sea.

That was one of his personal goals: to end his assignment at the beginning of the great river that has provided the lifeblood of Egypt's agriculture since ancient times.

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