# Application of Prior Research

## accumulated information obtained by research often provides ready solutions to many problems of agricultural production

Paul F. Sharp

**The immediate** commercial value of research information enabling scientists to solve rapidly many of the problems facing agriculture has been demonstrated repeatedly; what might have happened without this information is awesome to contemplate.

Less than 20 years ago a noxious weed was discovered in the Klamath River Valley. The weed—called Klamath Weed—was toxic but not fatal to cattle and sheep. It spread rapidly until it infested some 400,000 acres of rangeland and crowded desirable range forage plants. Botanists identified the weed as the St. John's-wort, a plant native to Central Europe where it was kept controlled by a small beetle that would eat nothing else. War conditions prevented obtaining specimens for colonization in California. Entomologists identified two varieties of the beetle as those taken to Australia years before to combat the St. John's-wort infestations there. Because the beetles were native to the Northern Hemisphere, entomologists—by drawing on previous research—were able to reverse the life cycle of the beetles so they could live in Australia. California entomologists obtained specimens of the beetles in Australia, brought them back to the Northern Hemisphere, returned their life cycle to that in Middle Europe. The scientists propagated the beetles in the insectary until sufficient quantities were available for colonization in the Klamath Weed infested ranges of northern California. The beetles became established and spread rapidly. The Klamath Weed, that once threatened some 400,000 acres of California rangeland, is no longer an economic problem in most areas. If findings of research had not been available, cattle and sheep ranchers might have been forced out of much of northern California. Instead, a monument to the Klamath Weed beetle has been erected at Eureka.

On May 26, 1953, an outbreak of the rice leaf miner was reported in Colusa County. On May 28—three days after the outbreak was detected—control treatments were started. Insecticides—available after years of research in chemistry—were applied by airplane, which in itself resulted from many years of study. Between 10% and 20% of the rice crop was destroyed at a loss of about $16,000,000. In addition, $1,200,000 were spent for insecticide control. However, more than 200,000 acres were treated and within 48–96 hours after treatment 99% to 100% of the rice leaf miner larvae were dead. From 10 to 17 days after treatment the rice plants began to show new healthy growth. Again, information available through research made it possible to save most of the 1953 rice crop in the Colusa area.

A third example began in February 1954 when a single aphid taken from a burr clover plant in San Diego County was identified as a specimen of the spotted alfalfa aphid.

The first economic outbreak of the spotted alfalfa aphid in California was detected in the Imperial Valley, late in June 1954, and spread into Riverside and San Diego counties.

Insecticides such as parathion, malathion and Systox—new materials produced after years of research—were available and applied as sprays to infested alfalfa fields.

The insecticides curbed the aphid in treated areas but new infestations developed. Before the end of 1955 an estimated 726,680 acres of alfalfa in 23 counties of the state were infested. In 1956 the aphid began to develop strains resistant to parathion and, to some degree, to malathion.

In the meantime—because agricultural scientists suspected the spotted alfalfa aphid was controlled by natural enemies in the Middle East—three species of parasitic wasps from the Mediterranean area and four predators of the aphid from India were introduced to California.

Insect pathologists found at least five species of fungi capable of producing epizootics—epidemics—among the aphid. Some 1,800 cultures of the fungi were placed in infested fields in 12 alfalfa producing counties.

Scientists in Nevada—employing the principles of genetics—had developed a new variety of alfalfa, for local climatic conditions. The new variety, Lahontan, is resistant to the aphid and is replacing susceptible varieties in some new alfalfa plantings in California, although plant breeders are far along in a program designed to incorporate the resistance of Lahontan to varieties more suited to California climatic conditions.

The effectiveness of the control measures put into operation because of the availability of the results of years of research in many sciences is again reflected in the case of the spotted alfalfa aphid. A year after the aphid was discovered in California crop damage and treatment costs amounted to more than $12,000,000. Three years later the loses had dropped to $1,694,064.

If scientists did not have the accumulated knowledge developed through research available for swift application, the agricultural economy of California—and the United States—would be subject to sudden and unknown changes.

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## LEMONS

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direct effect on the population of the red scale.

The results of the Carpinteria experiment showed that, when used in conjunction with Chlorobenzilate, Delnav and Trithion were associated with somewhat reduced parasitization in the field, Tedion exhibited no appreciable laboratory or field toxic effects, and Kelthane showed little if any effect on parasitization in the field.

The experiment also reaffirmed that efficient ant control is essential in maintaining a satisfactory degree of biological control of California red scale and that biological control can be greatly enhanced if selective insecticides only are used, to avoid upsetting the parasite-host relationship.

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