



# Soy-Based Pesticide Carriers and Adjuvants

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### Market Segments

The market for carrier oils and adjuvants in pesticide formulations as estimated by a United Soybean Board (USB) study conducted in 1997:

#### Long-Term Soybean Potential

Market Segment	Million \$
Spray oil concentrates	40
Dormant oil sprays	55
Adjuvants	38
Mosquito control	27

The use of carrier oils includes mineral oil, diesel oil and vegetable oils. Replacement of petroleum-based oils by soybean oil is a growing market opportunity as petroleum oil prices continue to escalate.

### Spray Oil Concentrates

Spray oil concentrate consumption in the United States is estimated at 7–10 million gallons annually, of which 6–8 million gallons are petroleum oils. Methylated vegetable oil use is estimated at 0.8–1.2 million gallons and straight vegetable oils at 0.2–0.5 million gallons annually.

In pesticide applications, spray oil concentrates are used at relatively high volumes to replace much or all of the water normally used as a carrier for pesticides. Formulations normally consist of 80 percent to 90 percent oil and 10 percent to 20 percent surfactant.

Use of vegetable oils has been proven to improve the efficiency of some pesticides, but research has shown little or no difference in efficiency based on the type of vegetable oil used. The trend in the early 1990s toward the use of postemergence herbicide sprays increased the use of spray oil concentrates, but the rapid growth of glyphosate-resistant crops and glyphosate herbicides has reversed that trend.

### Dormant Sprays

Dormant sprays are used primarily on deciduous fruit crops. In this use, the oil acts as the insecticide. Relatively high-volume sprays of oil are made to control scale and smother the eggs of mites and other insects during the dormant season. Paraffinic oils and other mineral oils dominate the category, although some vegetable oils are used.

The lower cost of mineral oil will be a barrier to entry for soybean oil, although soy should compete well with other vegetable oils in price. The low volatility and spreadability of soybean oil may provide advantages over mineral oils.

### Adjuvants/Surfactants

Adjuvants and/or surfactants are purchased by the farmer or pesticide applicator as an aid to mixing and improving the performance of finished sprays. Surfactants are also added to concentrated pesticide products by basic manufacturers to improve solubility.

The potential for additional soy-based surfactant sales into this market will require the development of cost-effective formulations. Lecithin has potential for use in these formulations.

### Mosquito Control

Mosquito control is divided into two segments, larvicidal sprays and adulticidal sprays. Larvicidal treatments of either oil alone or an oil-insecticide combination are applied to standing bodies of water when larvae counts exceed threshold. Adult sprays of an insecticide/oil mixture are applied in the air, generally in the evening, when adult mosquitoes are most active. Product research is under way to develop a soy-based (methyl soyate) larvicide spray focused on the West Nile Virus health threat.

Diesel fuel is the least expensive oil used for both types of applications but has declined in use due to environmental concerns. Mineral oil or premixed mineral oil and insecticide mixtures are growing in popularity due to ease of use and relatively low costs. Spray oil concentrates made from vegetable oil are potentially less intrusive environmentally but have been a more expensive material for this use.

Recent increases in mineral oil prices, however, are making methyl soyate more price competitive. Product performance has been successfully demonstrated in field trials.

## Public Concern

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The use of mineral oils, even at the relatively low levels used in agricultural applications, is a source of environmental and public concern. Public utilities, the U.S. Forest Service, departments of transportation and other industrial users are especially sensitive to these issues and have changed from diesel oil to mineral oil or vegetable oil.

## Performance Advantages

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In agricultural use, vegetable oils are more desirable than diesel or mineral oils. Soybean oil is readily biodegradable and low in toxicity to both humans and non-targeted wildlife, providing both a worker-safety and environmental advantage. Support for use of soybean oil over petroleum products should find wide favor, especially among farmers.

## Issues Affecting Commercial Success

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Soybean oil has been higher priced than mineral oils. But compared with many other vegetable oils, soybean oil is more readily available and lower in cost. The poor low-temperature viscosity of soy and other vegetable oils could be a disadvantage in a limited number of uses, though most use would come in times of moderate to high temperatures. The use of methyl soyate for applications such as dormant-season sprays on crops like apples could prevent this problem.

## Path Forward

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USB has funded research at the University of Tennessee on the use of soybean oil as a dormant oil spray for peaches. With the identification of an effective and cost-competitive formulation, the assistance of a major national agricultural chemical distributor is needed in seeking the approval of the U.S. Environmental Protection Agency.

Ongoing research and commercialization efforts have successfully demonstrated the use of soybean oil and methyl soyate in other applications, such as mosquito control.

Generating and demonstrating demand for soy products, despite higher costs relative to competitive mineral oils, will be necessary to pull products through the distribution chain. This represents the greatest challenge to market penetration. The price competitiveness of soybean-oil-based products is improving.

**The United Soybean Board is made up of 64 farmer-directors who oversee the investments of the soybean checkoff on behalf of all U.S. soybean farmers. Checkoff funds are invested in the areas of animal utilization, human utilization, industrial utilization, industry relations, market access and supply. As stipulated in the Soybean Promotion, Research and Customer Information Act, USDA's Agricultural Marketing Service has oversight responsibilities for USB and the soybean checkoff.** 