

# A SUMMARY OF THE BIOLOGIC AND ECONOMIC ASSESSMENT OF PESTICIDE USAGE ON CRANBERRY

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This assessment attempts to provide a critical evaluation of the impact and importance of pesticides in the production of cranberries in the United States. The report contains detailed information and general conclusions regarding the use of insecticides, fungicides, and herbicides used in cranberry production in the United States during the period of 1987-1992. It provides an overview of the uses of the major chemicals and describes the economic and social benefits of those uses to the cranberry industry. This information may be useful for decision making regarding pesticide registrations, for designing improved, environmentally sound pest control programs, and in establishing goals for reducing or eliminating certain pesticide inputs in cranberry production.

Numerous insects, plant pathogens, and weeds must be controlled to produce a quality cranberry crop. Most of the current pest control strategies in cranberry include the use of pesticides, although there is an attempt to reduce pesticide use through the implementation of IPM programs and research on non-chemical control measures.

The use of pesticides in the different cranberry growing regions is dictated by the pest complex and intensity of pest pressure, the time of year and weather conditions, specific management objectives, and the properties of the pesticides. The loss of registration of even a few pesticides would have a severe impact on the cranberry industry. In some cases satisfactory control of certain pests could be achieved with alternative chemicals; however, more applications of less effective and sometimes less environmentally sensitive pesticides would be required to produce a quality cranberry crop. Also, growers would have reduced flexibility in timing and choice of materials and diminished capacity for pesticide resistance management with fewer alternative materials available to rotate.

“Currently, growers rely mainly on about a dozen pesticides of the 27 still labelled for use on this crop.”

## Acres, production and value of cranberries, United States, 1987-1992a.

Year	Area Harvested (acres)	Total Production (barrels <sup>b</sup> )	Value
1987	26,700	3,391,000	\$150,906,000
1988	27,300	4,080,000	\$186,340,000
1989	27,500	3,747,000	\$164,720,000
1990	27,800	3,391,000	\$156,365,000
1991	28,300	4,219,000	\$206,783,000
1992(c)	28,700	4,080,000	\$213,292,000

(a) Source : USDA Agricultural Statistics, 1993.

(b) Barrels of 100 pounds

(c) Preliminary

Cranberries are grown commercially in the united states in Massachusetts, New Jersey, Oregon, Washington, and Wisconsin on over 28,000 acres. Fruit production exceeded 400 million pounds in 1992, with a value of approximately \$213 million. Most of the cranberry crop today is used for processed products, with 10 percent or less sold as fresh fruit.

There are many species of insects that affect the roots, shoots, and fruit of the cranberry plant. Most of these pest are native to North America. Most are indirect pests, feeding on the foliage or roots, reducing the vigor of the plant. A few feed directly on the blossoms and developing berries, causing significant reduction in yield and quality.

Although insecticide use fluctuates each year depending on pest pressure, insecticide use in Massachusetts and Wisconsin is relatively high, while use in other States is considerably lower. The decrease in parathion use did not result in a dramatic increase in use of other insecticides, perhaps because of the implementation of IPM programs. The two biological insecticides, Bt and nematodes, have only been available for use on cranberry since 1989 and 1988, respectively. Their use has increased, although they have not been adopted yet in New Jersey.

“Of the insecticides currently registered for use on cranberry, chlorpyrifos, diazinon, and azinphos-methyl have predominant use in cranberry production, although parathion was the most extensively used insecticide in all areas prior to its cancellation.”

Insecticides are extremely important, especially to prevent damage from direct fruit pests in the East Coast growing areas where there is heavy insect pressure. Insects cause up to 40% berry damage in Massachusetts if beds are left untreated. Yield is also indirectly affected. Fewer insect problems exist in Wisconsin and on the West Coast; however insecticides are still necessary to produce a crop. In most places yields would be significantly reduced since the remaining insecticides are not as effective and cultural or biological alternatives do not provide as good or as fast control as the chemicals. At least half of the crop could be lost to direct pests alone the first year in East Coast beds,

with yield reductions of 15-50% estimated elsewhere. In subsequent years, pest pressure would be higher and losses more severe, enough **to drive many growers** out of business. Expected **substantial yield reductions** due to regional insect **problems will produce** important short-run **economic losses**.

“Without insecticides, yields would be reduced 15 -50 percent the first year. In subsequent **years pest pressure would be higher and losses would be more severe.**”

There are numerous plant pathogens that cause disease on cranberries under the proper conditions. Some cause injury only to the vines or roots, but the majority infect berries, causing direct damage. Fruit rots, all caused by fungi, are the most important disease problem in cranberry. In East Coast beds, most berry damage is due to fruit-rotting fungi, rather than insects or mechanical injury; losses to fruit rots in both the field and in storage can be very high. Fungal diseases tend to be the most serious in regions with long growing seasons and relatively high summer temperatures, such as are encountered in New Jersey. In Wisconsin and the Pacific Coast region, disease pressure is usually low and field rots other than cottonball are rarely encountered. Storage rots are usually considered together as a group because the symptoms produced by most of the fungi on the berries are so similar that it is practically impossible to visually distinguish fruit rots caused by different fungi.

The most fungicides are used in Massachusetts, where fruit rot disease pressure (both field and storage) is most severe. New Jersey and Wisconsin treat close to the same acreage with fungicides, but a much larger percentage of the total acreage in New Jersey is treated because of higher disease pressure. Much of the fungicide use in Wisconsin is triforine for cottonball control rather than fungicides for fruit rot control. On the smaller acreages on the West Coast, where disease pressure is less severe, less fungicide is used.

“The most important fungicides for cranberry production are clorothalonil and the EBDC, mancozeb.”

“Without fungicides for fruit rot and vine disease control, overall yield reductions of 20 percent would be common (although it would range from 0 to 100 percent in individual beds); the incidence of storage rot would increase; and it is questionable whether growers in areas of high disease pressure would be able to continue to produce a crop of high enough quality to justify harvesting.”

Fungicides are applied to prevent direct damage from fruit rots and indirect effects on yield and vigor from diseases of the leaves, shoots, and roots. In general, recommended fungicide spray schedules provide good control of fruit rots and allow production of a high quality crop. Chlorothalonil and mancozeb provide good control of field and storage rots, while copper products are less effective. Timing of applications affects the incidence of field and storage rot, with earlier schedules providing

better control. Growers in areas of high disease pressure would have difficulty producing a quality crop for fresh fruit without fungicides.

Many native and introduced plant species are considered weeds when they invade managed cranberry marshes. Most of the weeds affecting cranberry production are adapted to a wet, marshy environment and grow directly in the beds. Others tend to be found mainly in the ditches or edges of beds. In cranberry beds under dry cultivation, upland weed species cause more problems.

Herbicides are generally applied either in the fall or spring as pre-emergence broadcast applications or as a post-emergence wipe during the summer to weeds above the vine level. Glyphosate is used only for wiper-application spot treatment. Approximately 48% of all growers use glyphosate in any one year. New Jersey used very little herbicide other than glyphosate. Dichlobenil was used on the greatest acreage. Herbicide usage was highest in Massachusetts, and then in Wisconsin.

“Dichlobenil, napropamide, and glyphosate are the most commonly used herbicides.”

The herbicides registered for use on cranberry are effective and generally selective to cranberries when used according to recommendations, but none of the herbicides available will control all weed species. A combination of herbicides applied in sequence is normally used because of the great variety of weeds that infest cranberry beds. Yield reductions of 50-60% are likely based on the fact that growers with poor weed management practices currently have significantly lower yields than average. Without some selected herbicides or any herbicide, up to half of the growers would eventually go out of business because it would no longer be profitable to farm when their beds become overwhelmed by weeds in 5 to 10 years. Mechanical weed control would be a poor

“Without the major herbicides more herbicides that are less efficacious would be used, but yields would decline significantly. Many weeds would have no effective alternative controls. The major impact on yields would not be seen for several years as bogs would be gradually overwhelmed by weeds.”

replacement for herbicides in terms of yield, and although the use of bog renovation would help prevent devastating yield reductions in the Northeast, expected per acre impacts are still significant. The short-run economic impact of loss of herbicide availability is expected to be especially important to Wisconsin producers and also to have major deleterious consequences for producers in the Northwest.

Pesticide use is a major issue. There is considerable concern by growers and the general public over the use and fate of pesticides. Although cranberry is a small crop in terms of acreage, it is a high value crop where future pesticide regulation may be critically important. Because of the wetlands habitats where much of the cranberry production areas occur, and the extensive usage of water in cranberry culture, protection of water quality and wildlife is a major concern. The potential for movement of pesticides to groundwater is very low because of the high organic matter content of most cranberry bogs; stratification that facilitates the horizontal movement of water while downward penetration into lower soil layers is inhibited; the dense fibrous root system of the cranberry vines in the upper 2 to 4 inches of the bed that slows the downward movement of water; and because water is generally flowing into, rather than out of, most wetland type cranberry bogs. Retaining potentially toxic compounds on the bog where they are degraded to insignificant amounts by the biological and chemical properties of the cranberry ecosystem reduces the possibility of surface water contamination.

“Most pesticides are applied through chemigation systems, aerially, or with ground spray units. The use of pesticides in the different cranberry growing regions is dictated by the pest complex and intensity of pest pressure, the time of year and weather conditions, specific management objectives, and the properties of the pesticides.”

Cranberry IPM programs started by the University of Massachusetts, and later by the University of Wisconsin, have been extremely successful and were turned over to and adopted by the industry. Now 80% of the cranberry acreage in these states is scouted regularly. Similar programs have been instituted by the national grower cooperative in other States, and there are also private consultants that offer IPM programs. The pest management procedures developed in these programs to improve timing of pest controls to coincide with crucial parts of the pest and/or plant life cycle, result in better choice of control methods based upon the pest populations detected through regular scouting and reduce usage of pesticides when pests were not present.

“In most cases, good alternatives are not available for control of important pests.”

Economically, the short-run impacts of the loss of availability of selected pesticides would be substantial and long-run impacts may be much more significant, especially for herbicides. Without insecticides, yields would be reduced up to 50 percent the first year and losses would be more severe in subsequent years. Without

“Loss of the major herbicides, fungicides, and insecticides is expected to result in short-run economic welfare changes of at least \$65 million, \$39 million, and \$21 million, respectively. Consumers and producers of cranberries are expected to share these losses approximately equally.”

fungicides, overall yield reductions of 20 percent would be common, storage rot would increase, and growers in areas of high disease pressure may not be able to produce a crop worth harvesting. Without the major herbicides, more herbicides that are less efficacious would be used, but yields would decline significantly and many weeds would be uncontrolled. After several years many bogs would be overwhelmed by weeds. The short run economic welfare changes due to the loss of availability

of individual pesticides is relatively small, because the remaining pesticides are reasonable substitutes in most cases. However, loss of availability of any group of pesticides is expected to impose large reductions in yield and quality, with the largest impact resulting from the loss of herbicides.

“Without chemical pesticides fruit quality would be drastically reduced and it would be virtually impossible to economically produce a cranberry crop.”