Using Natural Lipids to Accelerate Ripening (Uniform Color Development) and Promote Shelf Life of Cranberries

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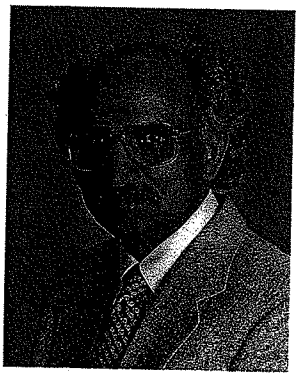

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The goal of our research is to accelerate fruit ripening and improve shelf life of cranberry fruit using natural lipids. From this research we hope to add value to cranberry fruits intended both for fresh and juice markets. Cranberry fruit ripens in late fall when the crop is subjected to frost daily. Wisconsin growers are forced to harvest less than ripe fruits. Some seasons we do not get good color development due to less than optimal environmental conditions. Unripe fruit means less natural color and flavor and thus less economic yield in the juice product. Uneven ripening also forces the fruits to be used for juice rather than fresh market. Furthermore, as Wisconsin cranberries are harvested by flooding the fields, large quantities of fruits intended for fresh market are lost during storage to rot. We have recently discovered that a natural lipid (LPE) is able to promote fruit ripening and enhance shelf life. University of Wisconsin Foundation (WARF) has obtained two patents (pre- and post-harvest application of LPE on fruit crops).

LPE can be extracted from raw products such as soybeans and egg yolk. Currently no product is available to our growers that will improve shelf life and promote uniform ripening and improve marketable yield. LPE has several desirable attributes: (1) LPE promotes fruit ripening without softening, thus enhancing shelf life of ripened fruit; and (2) LPE is a natural product present in all living cells of plants and animals.

In 1996, we initiated a study to investigate the impact of pre- and post-harvest application of LPE on cranberry quality. We also investigated impact of pre-harvest application of LPE on fruit color. 1996 was a good color year. We conducted field experiments at two locations. LPE treatment increased color only in one location. Post-harvest dip treatment of cranberry fruits with 100 ppm LPE reduced both fruit ethylene production and fruit respiration. **In 1997 we expanded these studies.** We tested both pre-harvest and post-harvest dip treatments. **A spray application of 200 ppm LPE, 2 weeks before harvest, increased anthocyanin contents by about 30% as compared to control. These treated berries stored better.** There were 10% more marketable fruits when LPE application was applied before harvest. A post-harvest dip of cranberries in 50 and 100 ppm LPE solution also enhanced shelf life although in 1997 fruits did not store very well. **In a related study we also found that ripened fruits stored better.** In general, as the anthocyanin contents increased, the shelf life of the fruits improved dramatically. We found the better shelf life of red fruits was related to its lowered respiration

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rate as well as to thicker cuticle and more wax coating. We continued these studies further in 1998.

Following are the highlights of our 1998 research:

1. We were able to obtain pure LPE preparation from soybean. We compared the effect of Soy LPE, and Egg LPE for improving color and shelf life. A combination of Soy and Egg LPE was also investigated.
2. In general, fruit color was good for the 1998 season. **Pre-harvest applications of Egg and Soy LPE improved color at both locations.** This improvement was seen at 7 to 34 days after application. Egg LPE gave better response at one location but Soy LPE was better at another location.
3. Pre-harvest application of a combination of Soy+Egg LPE tended to give better color production than Egg LPE alone. This was true at two separate locations. Both of these treatments were better than control.
4. **Post-harvest dip application of both Soy and Egg LPE improved shelf life of fruits. However, Soy LPE gave better response.**
5. It appears that the ideal mixture for best response may be a combination of Soy LPE, Egg LPE, Ethanol and Detergents. We plan to investigate this in 1999.
6. **We have discovered that LPI, a sister molecule to LPE, is very effective (more than LPE) especially in maintaining the health of fruit and leaf tissues.** A patent was submitted by WARF on this in 1998. We plan to study the response of cranberry fruit to LPI application in 1999.
7. We have also discovered that both LPE and LPI are able to protect fruit and leaf tissues from the injury by chemicals. We also plan to investigate in-season application (starting at flowering) of LPE and LPI on fruit set, fruit yield and fruit health.

Conclusion

Both Soy and Egg LPE were found to improve color and shelf life of cranberry fruit. There is a possibility to enhance LPE effectiveness by choosing a right combination of Egg and Soy products. Future studies will be directed to find ideal mixtures for obtaining desired response for both pre- and post-harvest applications. **Our study showed that ripened cranberries have better storage life and higher quality.** As fruit ripens, rate of anthocyanin accumulation increases rapidly. Our results show that low fruit respiration and thicker cuticle contribute to better shelf life of ripened fruit. ■