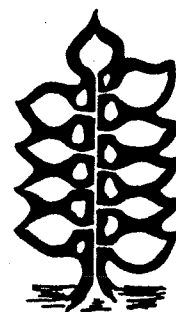
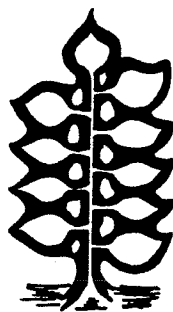


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## USE OF LYSOPHOSPHATIDYLETHANOLAMINE, A NATURAL LIPID, AS AN AID FOR FRUIT RIPENING AND IMPROVING KEEPING QUALITY

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In our previous studies we have used lysophosphatidylethanolamine (LPE) to enhance the effectiveness of ethephon spray on cranberries (5). In this study we found that LPE alone enhanced anthocyanin production in cranberry fruit and improved the color uniformity (3). In a subsequent study, We found that LPE stimulate ethylene production in a climacteric (apple) and a nonclimacteric fruit tissue (cranberry) while keeping the respiration low (4).

Since enhancing ripening and reducing the loss of firmness have great economic values, many studies have been conducted to achieve these goals (1,7,8). Recently It has been a challenge to find an alternative to Alar after this product was withdrawn it from the USA and Canadian market in response to public pressure. The objective of our present study was to investigate the influence of LPE on fruit ripening and keeping quality of apple.

Preharvest spray of LPE on McIntosh apple was made on Sept. 21, 1989 by using hand sprayer. Branches were selected and sprayed to the run-off point. LPE (100 ppm) solution contained 1% ethanol to enhance its diffusion across the plant cuticle (2). Fruits were harvested one week later and stored in the dark at 3°C. Four replications were used in a completely randomized design. Fruits were peeled to uniform thickness by using a Daisey peeler. Anthocyanin content of the peel was determined by the method of Fuleki and Francis (1968). For storability test, harvested fruits which were in air storage at 3°C for 5 months were taken out to room temperature and left under a laminar air flow hood at 76-82% relative humidity for 4 days then tested for firmness.

Postharvest treatment of apples (cvs. McIntosh, Delicious, and Golden Delicious) was done by vacuum infiltration. For this purpose fruits were washed with tap water then with deionized water for 1 min and then

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surface sterilized for 0.5 min with NaOCL (0.5% v/v of 5% solution). Fruits were dipped in the treatment solution for 2 min (about 1 cm under the surface), vacuum infiltrated for 3 or 10 min, then left for 2 min in the solution for equilibrium, wiped with tissue papers, then placed in wide mouth jars under laminar air flow hood at  $25 \mu \text{ mol cm}^{-2} \text{ sec}^{-1}$  of continuous fluorescent light. Gas samples were taken at time intervals. Jars were opened after each sampling time and aerated with a fan. Ethylene and  $\text{CO}_2$  were determined by using gas chromatography (Schimadzu 9-AM) equipped with flame ionization detector. Fruit firmness was tested by using Effegi pressure tester. Total soluble solids were determined by a hand refractometer. In case of dipping treatment, fruits were dipped for 3 or 10 min then the same procedure as outlined above was followed.

Our preliminary experiment with LPE spray on McIntoch apple indicated that there was a marked increase in fruit peel anthocyanin content. The fruit color uniformity was improved. The green area around the stem end of the fruit (peduncle) almost disappeared. Firmness test after 5 months of air storage in the cold then 4 days at room temperature showed that LPE treated apples had higher firmness especially on the blush side of the fruit.

Postharvest LPE treatment of McIntosh apples resulted in higher rate of ethylene production while the respiration rate was slightly less than the control. At the end of the incubation time, LPE treated fruits had higher firmness than the control especially at the blush side of the fruit. Total soluble solids in the LPE treated fruits were generally unaffected or slightly less than the control at the green side of the fruit. Calcium chloride (10 mM) enhanced the effectiveness of LPE in stimulating ethylene production without adversely affecting the fruit firmness. Vacuum infiltration of Delicious and Golden Delicious with LPE (100 ppm) resulted in delaying the loss of their firmness. Dipping the McIntosh fruit in LPE solution even for 3 min stimulated ethylene production by about 15% over the control which lasted over many days.

This work suggests that (a) preharvest spray of LPE has the potential to enhance anthocyanin production in the skin of McIntosh apples and delay the loss of their firmness without any visible adverse effect on the plant growth (b) LPE treatments can consistently delay the loss of firmness especially at the blush side of the fruit (c) LPE can have these desirable

effects on fruit quality even under relatively high ethylene concentration during the storage condition. Normally apples are stored under low ethylene environment to get the desirable effects of Alar (8).

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