

#### Abstract:

Experiments were conducted to determine levels of low O<sub>2</sub> exposure needed to prevent the occurrence of abnormal respiration, and to characterise the relationship between respiration and membrane lipids of apple fruit. The membrane lipid-associated lipase activity was also measured. Exposure of 'Braeburn' apples to 3% and 6% O<sub>2</sub> at 10°C markedly reduced CO<sub>2</sub> production relative to 21% O<sub>2</sub>; however, CO<sub>2</sub> production rapidly increased when O<sub>2</sub> level was further reduced to 1.5 or even 0%, due to anaerobic respiration. Free fatty acids were high in fruits exposed to air atmosphere for 4 days and decreased gradually with the exposure period, whereas a delay in the increase of the fatty acids was observed exposed to 6 or 3% O<sub>2</sub> within 12 days. Compared to 6 or 3%, exposure of apples to 1.5 or 0% resulted in higher content of the fatty acids. Furthermore, among these fatty acids analysed, the largest amount was palmitic acid, followed by stearic acid. The change in lipase activity had similar patterns, but a rapid increase in the enzyme activity coincident with the higher content of the fatty acids occurred in apples exposed to 21 or 0% O<sub>2</sub> for 4 days. In contrast to the fatty acids, there were more dramatic changes in the fatty acid composition of polar lipids when apples were exposed to various O<sub>2</sub> concentrations. Exposure to 6 or 3% O<sub>2</sub> exhibited a better maintenance of membrane lipid composition, as judged by relatively stable saturated/unsaturated fatty acid ratios in combination with respiration rates throughout this experiment. The results suggested that responses of apples to reduced O<sub>2</sub> concentrations are involved in the breakdown and modification of membrane lipids which may further influence respiratory patterns.