B-75: The response of unripe tomatoes to modified atmosphere packaging

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After harvest, ripening continues and tomatoes become over-ripe very rapidly at ambient temperatures. This results in loss of quality and limited shelf life of fruits. Tomatoes sustain physiological disturbances and chilling injury when exposed to low storage temperatures. Under these circumstances, modified atmosphere depleted in O_2 and, enriched with CO_2 may provide an effective means of retarding deterioration, maintaining the quality and extending the postharvest life of tomatoes. The aim of this study is to compare the internal atmosphere which developed within the packs of tomatoes sealed with a wide range of plastic films and to evaluate the effects of these conditions an the rate of ripening and quality of the fruit.

Mature tomatoes were picked at optimum maturity and packed on the day of harvest. Experimental packs consisted of a rigid polyvinylchloride (PVC) tray 17.4 x 10.2 x 5.1 cm deep with a horizontal rim 0.5 cm in width, to which the test films were attached using double-sided adhesive tape. In each experiment, 4-6 packs were sealed each film and a further 4-6 packs covered with perforated PVC film were included as controls. Each pack contained 360±10g of tomatoes usually six fruits, the area of permeable film (190 cm^2) and the volume of free space (510 ml) within pack. Packs sealed with each of the experimental films were placed in constant temperatures of 10°, 15° and 20°C for 1-3 weeks. All sealed packs were then perforated and transferred to 20°C for ripening. An indicator of the degree of ripeness, the colour of the tomatoes were evaluated on the day of picking and at intervals of 2 days during the experimental period. Tomatoes were assessed for smell, texture and flavour on the scale: Excellent, very good, good, fair, poor and unacceptable.

In control packs, the concentration of O_2 remained >20% and the CO_2 concentration <1.0% whereas in packs sealed with the micro-porous film MY-15, the O_2 level decreased to 16-17% and that of CO_2 increased to 2-3% during the course of the experiments. Tomatoes packed in PVC film, an atmosphere containing 4-7% O_2 + 7-10% CO_2 developed within 3-4 days and the fruits stored well for 2 weeks at 10°C and 1 week at 15°C. Ripening was retarded but continued normally after the packs were perforated and transferred to 20°C. A progressive change in fruit colour from green to orange-red was observed in packs sealed with PVC, polyethylene and micro porous MY-15 film, but this was noticeably slower than in corresponding control packs. In sensory assessments, fruit stored at 10°C or 15°C for 1-2 weeks in packs sealed with PVC, polyethylene and micro porous MY-I5 films, followed by a further 4-6 days ripening in perforated packs at 20°C were found to have a similar or slightly better smell, texture and flavonr than control fruits. In packs sealed with less permeable films such as polyolefin and polypropylene, the internal atmosphere equilibrated to <2% O_2 + 22-24% CO_2 resulting in rotting and tainting of fruits. Modified atmosphere packaging within the tolerance limits has been shown to be beneficial for tomato storage. The reduced level of O_2 and elevated level of CO_2 in the package suppresses respiration, thereby slowing down the ripening process. The beneficial conditions were obtained by the use of a film with proper gas permeability for the particular storage temperature. In the absence of sufficiently permeable films for modified atmosphere packaging for highly respiring tomatoes, micro perforated films offer an effective solution.