

**Title** Controlled atmosphere, modified atmosphere and modified atmosphere packaging for vegetables

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### **Abstract**

**Purpose of Review:** This review is aimed at illustrating the directions in which research on controlled atmosphere (CA), modified atmosphere (MA) and modified atmosphere packaging (MAP) for fresh and fresh-cut vegetables has been focused since about 2000, and to highlight significant new findings in the field.

**Findings:** In the last 5 years, little research with vegetables has been carried out to attempt to elucidate the underlying physiological and biochemical mechanisms related to the effects of CA and MA on produce. In contrast, there have been several applications of CA, MA and MAP to a surprisingly large number of previously underexploited vegetables and fresh-cut vegetable products; the potential for using superatmospheric O<sub>2</sub>, primarily in MAP, has also been extensively evaluated. Coincident with the continuing development of fresh-cut products, there has been great interest in how the growth of microbial pathogens can be controlled in MAP.

**Limitations/implications:** Since little economic incentive exists for long-term CA or MA storage of most vegetables, recent research has been more focused on using MAP for better quality maintenance within existing supply chains. The main limitations of more successful application of MAP are the seemingly inherent problem of fluctuating temperatures that occurs during distribution, and problems with mixed loads of different products held at compromise temperatures, both of which interfere with the maintenance of proper package atmospheres.

**Directions for future research:** Understanding the basic mechanisms that explain vegetable product tolerance to different gas atmospheres could help to streamline the optimisation of MA systems for new products. Feedback systems that allow atmospheres to be adjusted in response to indications of product stress could replace current static MA systems and address the problem of fluctuating temperatures.