

The usage of Modified Atmosphere Packing (MAP) as a useful method in maintaining the quality of agricultural products

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INTRODUCTION

One of the most important technologies for preserving food quality and fruit shelf-life extension is modified atmosphere packing (MAP). MAP means changed gas environment in the product packaging. Fresh food products continued to "breathe" after the harvest, even when they are packed or because they contain microorganisms that "breathe". In this process, the oxygen the present air is consumed, and carbon dioxide and water vapor are produced, which changes the gas environment.

MATERIAL AND METHODS

When agricultural products are taken out of the natural environment after harvesting, a reversed reactions of decompositions (degradation) of carbohydrates, proteins and fats begin. They react with O₂ and release CO₂, water vapor and heat, which is the basic function of cellular respiration. Therefore, the concentration of O₂ should be reduced, the concentration of CO₂ should be increased, and the humidity and temperature should be regulated in the packaging. These parameters affect the development of various microorganisms as addition to primary decomposition processes.

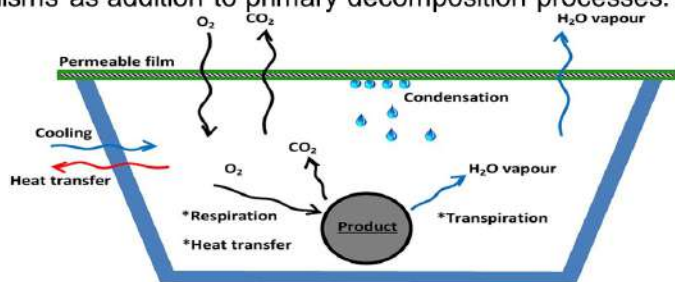


Figure 1. Overview of the continuous phenomena in MAP fresh product (Zinash et al., 2016).

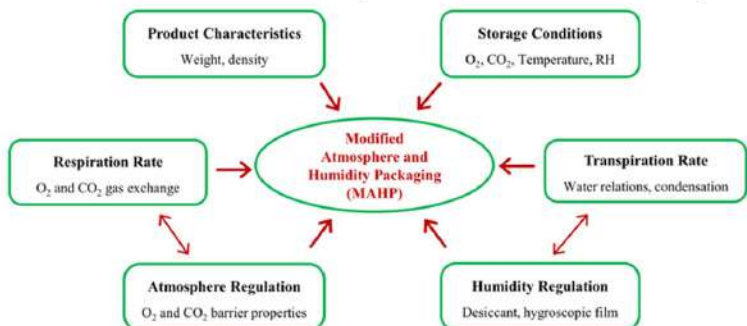


Figure 2. Factors involved in designing modified atmosphere and humidity packaging (MAHP) for fresh fruit and vegetables (Mahajan et al., 2014).

RESULTS

Table 1. Food gases approved by EU for MAP (©Copyright Messer Group GmbH www.messergroup.com).

Food Gases approved by the EC		
E-no.	Gas	Name
E 290	Carbon dioxide	Gourmet C
E 938	Argon	Gourmet A
E 939	Helium	Gourmet He
E 941	Nitrogen	Gourmet N
E 942	Nitrous oxide	Gourmet L
E 948	Oxygen	Gourmet O
E 949	Hydrogen	Gourmet H
E941/E290	70% Nitrogen 30% Carbon dioxide	Gourmet N70
E941/E290	50% Nitrogen 50% Carbon dioxide	Gourmet N50
E948/E290	70% Oxygen 30% Carbon dioxide	Gourmet O70

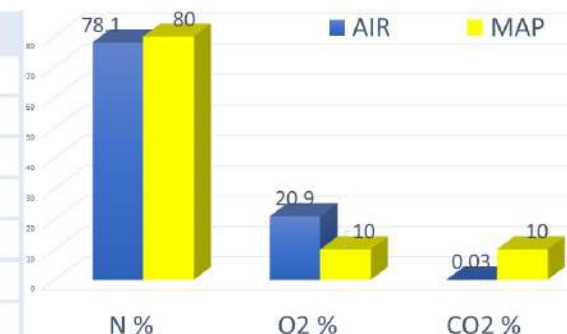


Figure 3. Percentage of nitrogen, oxygen and carbon dioxide gases in the air and in MAP for vegetables

Table 2. Recommended MAP for some vegetables (Soltani et al., 2015)

Products	Temperature °C	Recommended MAP		Potential
		%O ₂	%CO ₂	
Bean	5-10	2-3	4-7	Fair
Broccoli	0-5	1-2	5-10	Excellent
Cauliflower	0-1	2-4	4-6	Excellent
Cabbage	0-5	2-3	3-6	Excellent
Corn	0-5	2-14	5-10	Good
Leek	0-5	1-2	3-5	Good
Lettuce	0-5	1-3	0	Good
Onion	0-5	1-2	2-5	Good
Pepper	8-12	3-5	0	Fair
Spinach	0-5	Air	0-20	Good
Tomato	12-20	3-5	0-3	Good

CONCLUSIONS

MAP successfully inhibits the chemical, enzymatic and microbial processes associated with the degradation of fresh food, thus it contributes to omitting the use of other chemical or thermal processes, such as freezing, dehydration and sterilization