



# The Influence of Controlled Atmosphere Storage Conditions on Chemical Composition of Two Lettuce Cultivars

## INTRODUCTION

Lettuce (*Lactuca sativa* L.) is one of the best known leafy vegetables originated native to Mediterranean, commonly used as a main part of salads and mix of vegetables basically known as market product 'ready to eat'. After harvest the structure and healthy activity of lettuce are strongly affected by changing conditions.

The degradation losses in their structure and quality are highly noticeable. It is proved that controlled atmosphere may be one of the best ways to restrict this post harvest problem. Extension of demand fresh lettuce can be achieved by short-term storage. The rate of change in the stored material is dependent on temperature, relative air humidity and gas composition of the atmosphere. Such controlled conditions allow longer storage period of up to four, or even six weeks.

## MATERIAL AND METHODS

In this research the effect of different storage conditions on lettuce, quality, dry weight, total sugars, nitrates, macroelements, carotenoids, phenolic compounds was investigated. The influence of storage duration time and composition of atmosphere, cultivar and the form of storage on the listed parameters was also investigated. The experiment was carried out on the experimental field in Wilanów in the years 2008 and 2009 in the spring (I), and summer (II) time. The aim of the study was the quality evaluation of lettuce rosettes stored in controlled atmosphere in different form (whole rosettes and sliced) for 2 and 4 weeks. The study included two cultivars of lettuce 'Kitare' and 'Versai' stored in different form (cut and whole) for 2 and 4 weeks under the following conditions: (a) NA, air, (b) ULO 1.5% O<sub>2</sub>, 1.5% CO<sub>2</sub>, (c) CA 3% O<sub>2</sub>, 1.5% CO<sub>2</sub>, (d) CA 1.5% O<sub>2</sub>, 10.0% CO<sub>2</sub>. The storage was performed at 1-2 °C.

The results were analyzed statistically with the three and two factor analysis of variance at the level of significance  $\alpha=0.05$  (ANOVA 3 and ANOVA 2 software).

## RESULTS

The results showed that 2 weeks of storage in case of lettuce causes more decrease in total sugars content than 4 weeks. Low accumulation of nitrates was strongly affected by condition of CA (1.5:1.5) in sliced as well as whole lettuce. This gas combination also positively restricted losses of dry matter in sliced lettuce. Content of carotenoids was highest in cv'Kitare' in gas combination (3.0:1.5). Each combination of storage shown impact on synthesis of zeaxanthine in sliced plants. Amount of violaxanthine was positively affected by condition (3.0:1.5) and (1.5:10).

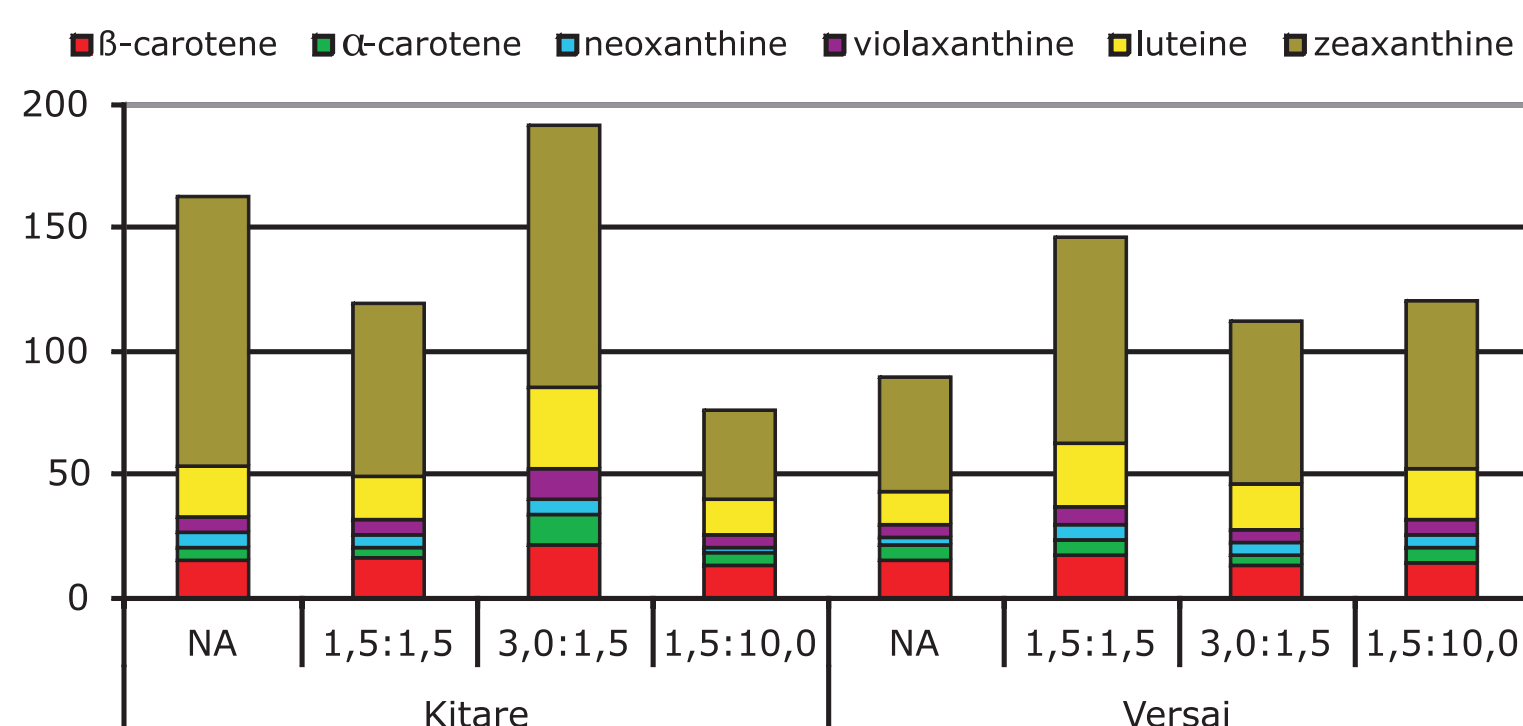


Figure 1. Content of carotenoids in sliced lettuce depending on different storage conditions

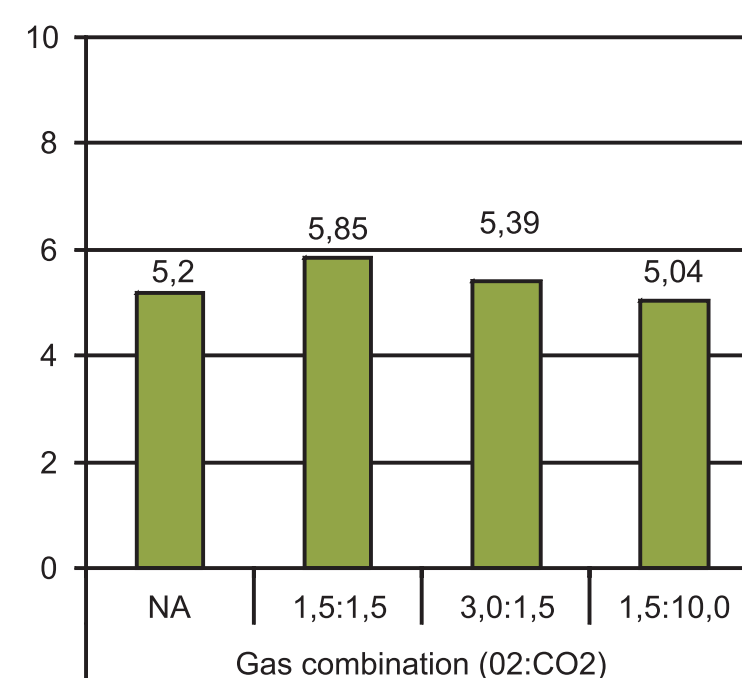


Figure 2. Content of dry matter in sliced lettuce depending on storage conditions (%)

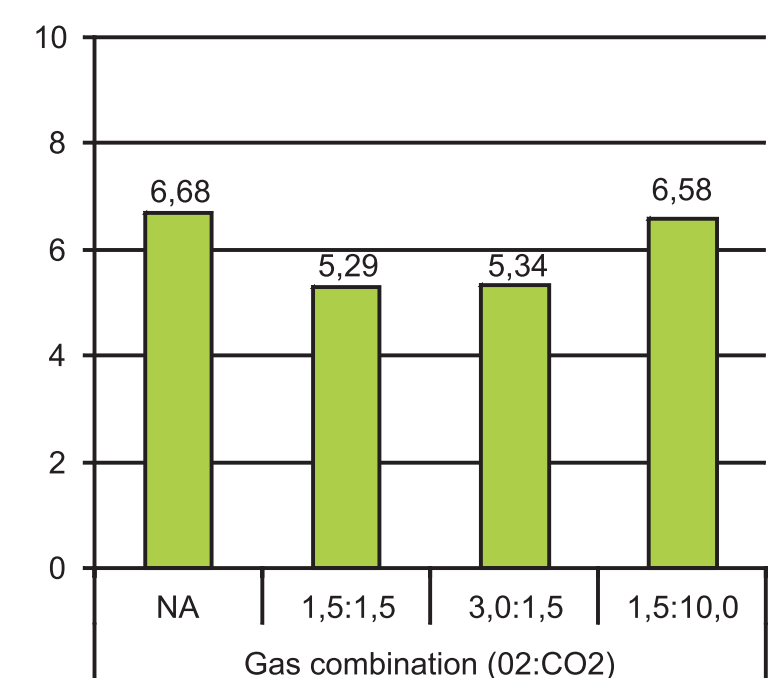


Figure 3. Content of dry matter in whole lettuce depending on gas combination (%)

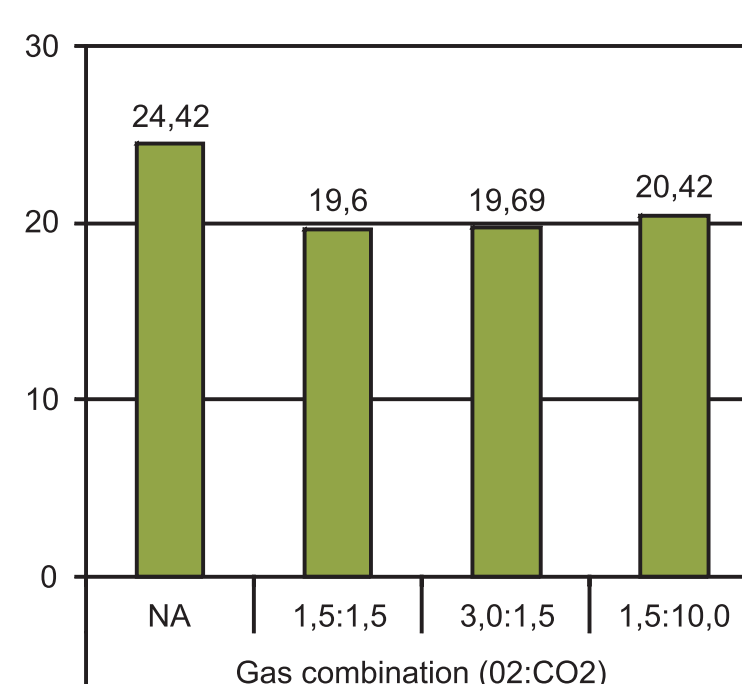


Figure 4. Accumulation of nitrates in sliced lettuce depending on storage conditions (mg 100g<sup>-1</sup> f.m.)

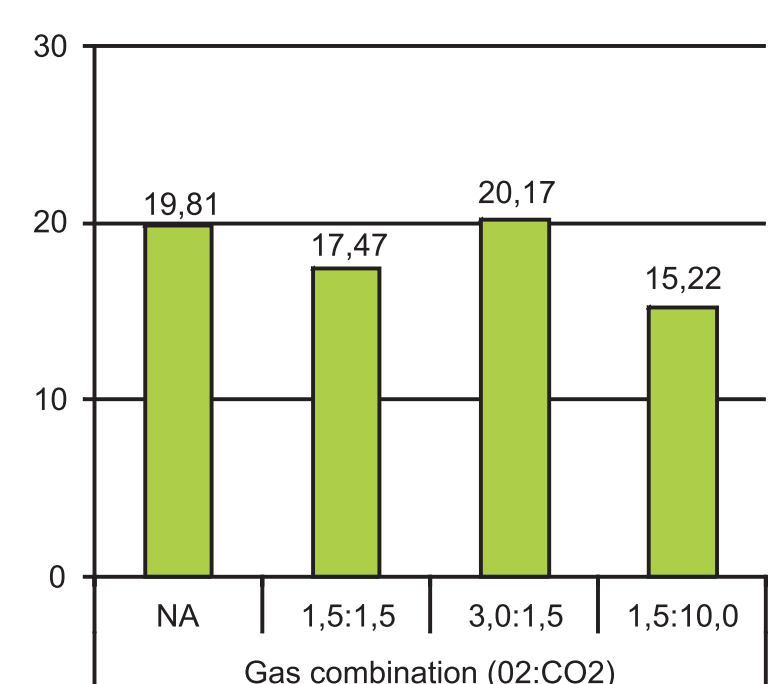


Figure 5. Accumulation of nitrates in whole lettuce depending on storage conditions (mg 100g<sup>-1</sup> f.m.)

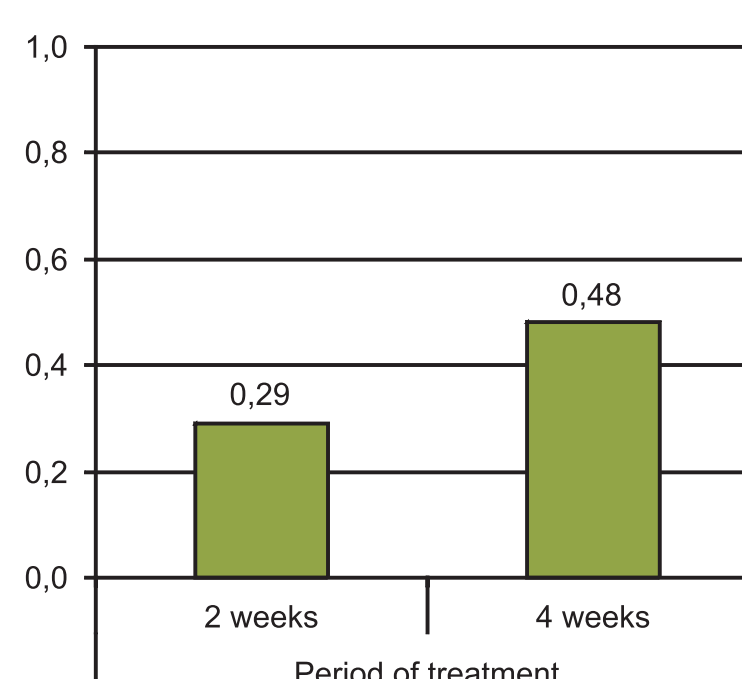


Figure 6. Content of total sugars in sliced lettuce in various period of treatment (mg 100g<sup>-1</sup> f.m.)

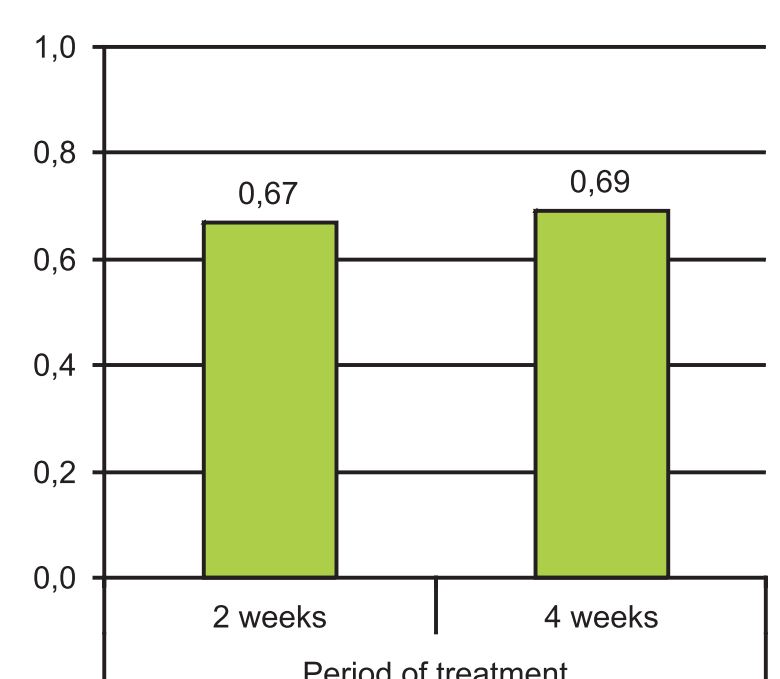


Figure 7. Content of total sugars in whole lettuce in various period of treatment (mg 100g<sup>-1</sup> f.m.)

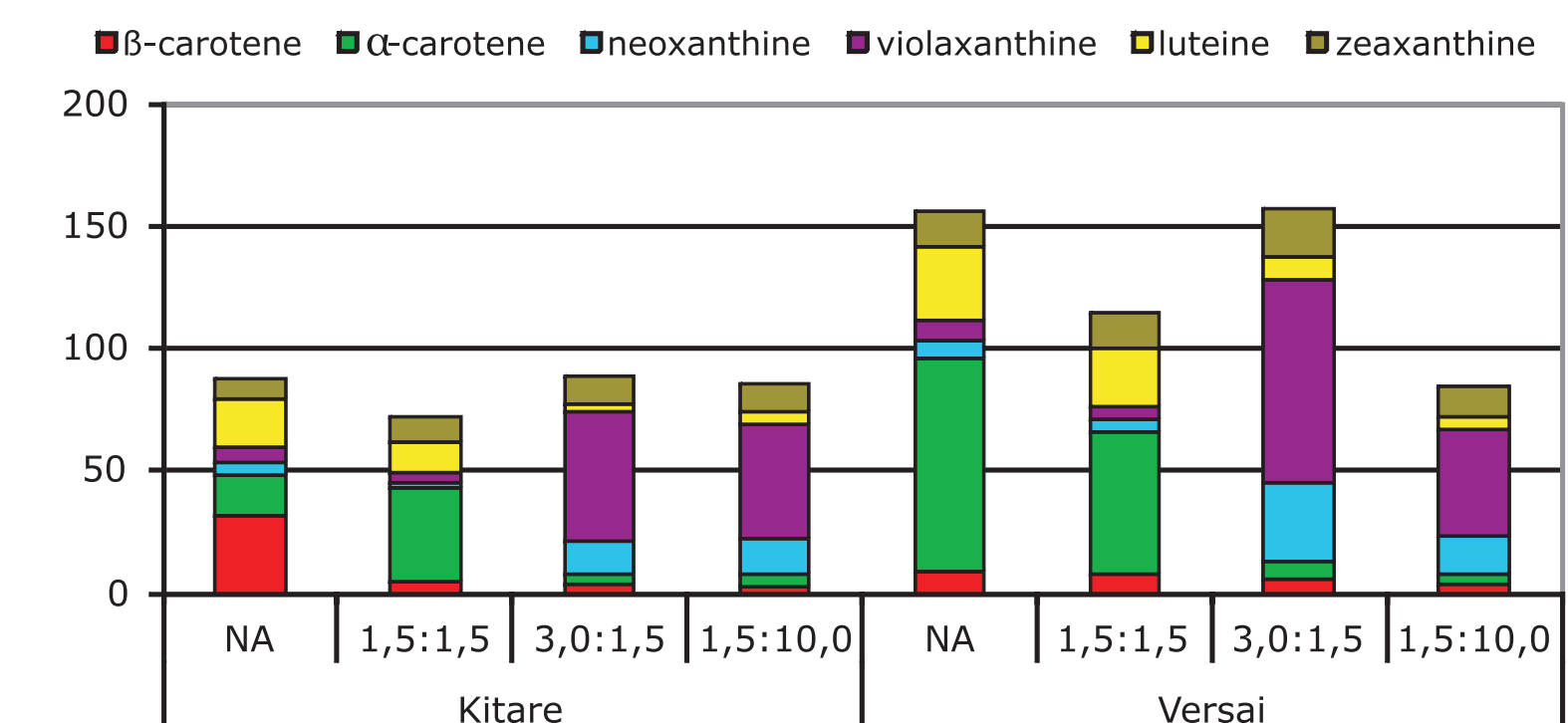
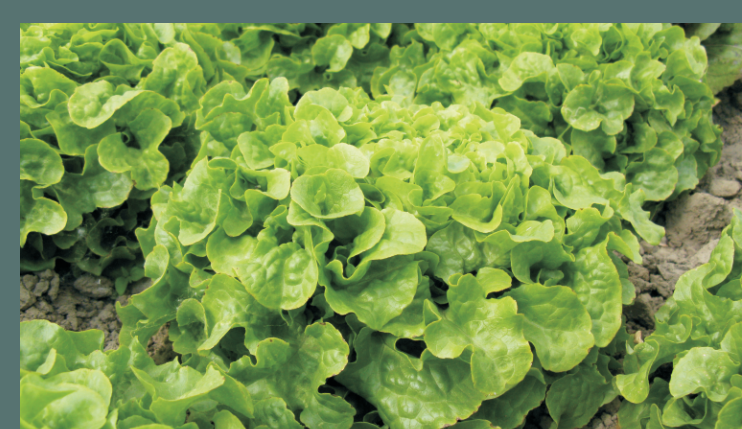


Figure 8. Content of carotenoids in whole lettuce depending on different storage conditions

## CONCLUSIONS

1. The controlled atmosphere allows reducing loss of water and decreasing content of nitrates.
2. In some cases cutting caused decrease of biological value and also increased the content of active compounds such as phenols and carotenoids.
3. Gas combination (1.5:1.5) seems to be one of the most effective method of storage for lettuce.



'Kitare'



'Versai'