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The Effect of Modified Atmosphere Storage on the Quality of Fresh Dill (*Anethum graveolens* L.)

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INTRODUCTION

Dill (*Anethum graveolens* L.) is an annual aromatic herb of the Umbelliferae family, grown widely throughout Europe, America and Asia for use as a fresh herb and for the production of essential oil, which is extensively used by the food industry for flavouring foods and beverages (Clark and Menary 1984).

Culinary herbs have always been an important component of the human diet adding variation and flavor to staple foods, as well as being used for food preservation. In recent years a marked increase in the demand for a continuous supply of fresh culinary herbs has developed (Cantwell and Reid, 1993) which resulted to the need of packaging and storage of herbs with modified atmospheres.

The benefits and hazards of Modified Atmospheres (MA) have been reviewed (Brecht, 1980; Kader, 1980). Reduced O_2 or elavated CO_2 can reduce respiration and ethylene production rates, retard softening, and slow down various compositional changes associated with ripening (Kader, 1986).

Therefore, the aim of the present study was to examine whether modified atmospheres based on changes in CO_2 and O_2 concentrations would benefit the quality characteristics of dill during storage.

MATERIALS AND METHODS

Seeds of dill cv. Ducat were sown on 16/01/2010 in a substrate of peat and perlite (1:1 v/v). The harvest took place on 20/04/2010 (93 days after sowing), while the plants were at the fresh market stage (before flowering). Randomly selected leaves were weighed, placed in airtight plastic bags and stored for 10 days at 5°C. The atmospheres within the containers (O_2-CO_2-N_2) were initially as follows: (1) 20-0-80 (air), (2) 20-10-70, (3) 10-0-90, and (4): 10-10-80. The changes in O_2-CO_2 concentrations were monitored during storage, while fresh weight, chlorophyll, vitamin C and total phenolics concentrations were measured before and after storage.

RESULTS

Weight loss increased with increasing concentration of CO_2 or reducing concentration of O_2 comparing to the air composition (Figure 1).

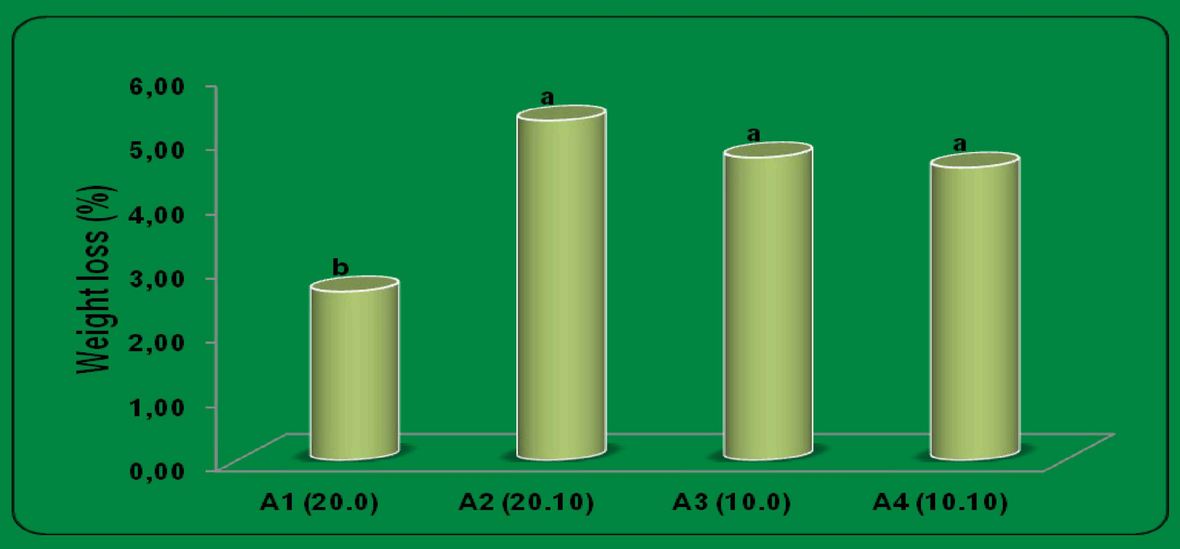

Figure1: Effect of modified atmospheres on the weight loss (%) of leaves.
Means for each harvest with the same letter are not significantly different at *P*=0.05.

Dry matter (%) was not affected from the storage conditions, while it was increased compared to the measurements before storage (Figure 2).

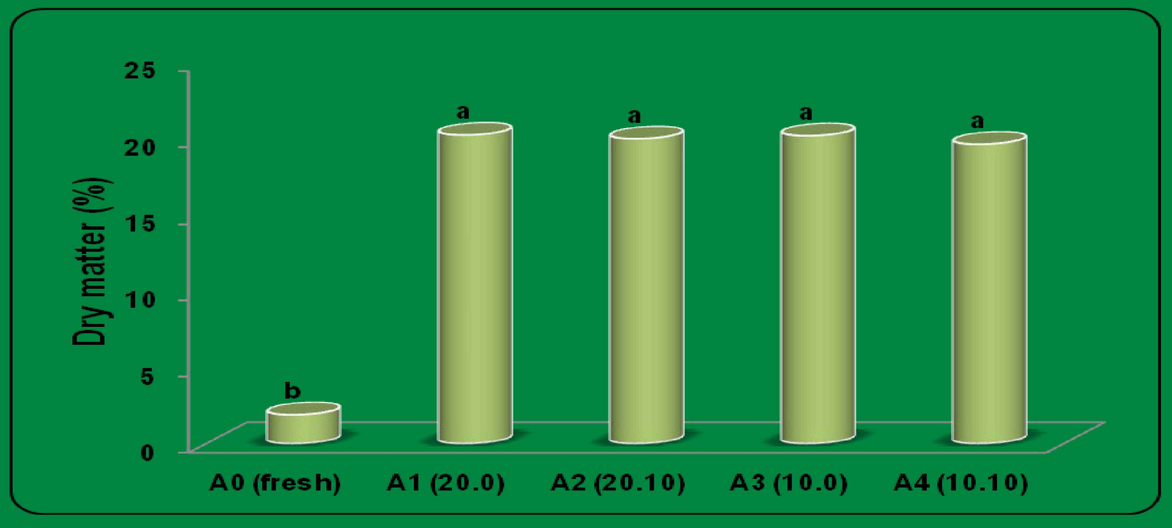

Figure 2: Effect of modified atmospheres on the dry matter (%) of leaves.
Means for each harvest with the same letter are not significantly different at *P*=0.05.

The oxygen concentration within the bags during storage fell to 12.5% (A1) and 17.9% (A2) indicating a reduction of respiration due to the inclusion of 10% CO_2 within the initial atmosphere (20% O_2). At an initial concentration of 10% O_2, the oxygen level decreased to 5.5% and 5.8% in the absence or presence of 10% CO_2 (A3 and 4), respectively. In each case, the decrease in O_2 was accompanied by a corresponding increase in CO_2 concentration.

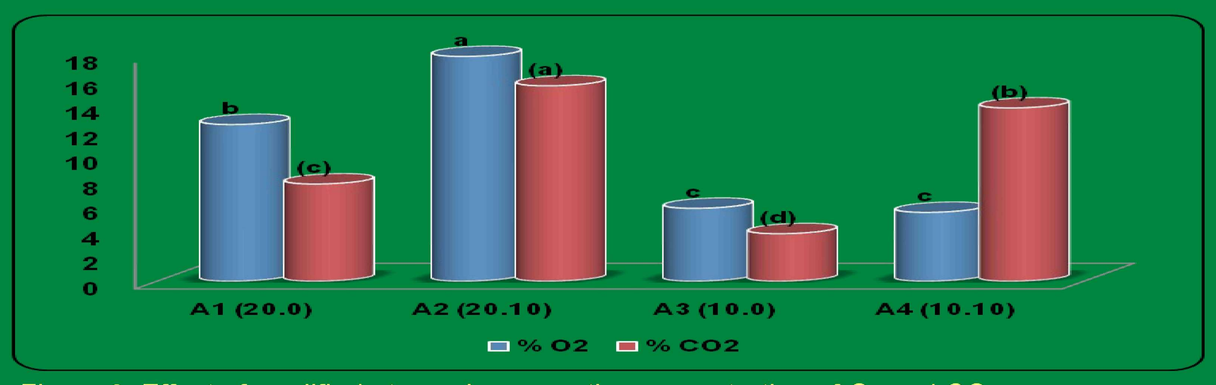

Figure 3. Effect of modified atmospheres on the concentration of O_2 and CO_2.
Means for each harvest with the same letter are not significantly different at *P*=0.05.

Vitamin C (figure 4) and chlorophyll (figure 5) concentrations decreased during storage. Vitamin C loss was similar in all treatments, but chlorophyll loss was significantly higher in the treatments with 10% CO_2. Total phenolics levels (figure 6) decreased in all treatments except treatment 3 (10-0-90).

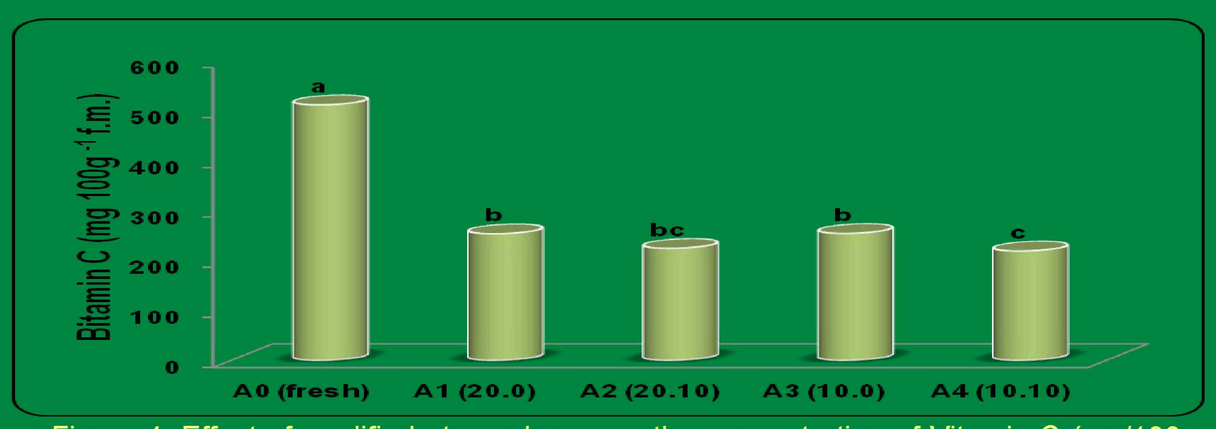

Figure 4. Effect of modified atmospheres on the concentration of Vitamin C (mg/100g f.m.). Means for each harvest with the same letter are not significantly different at *P*=0.05.

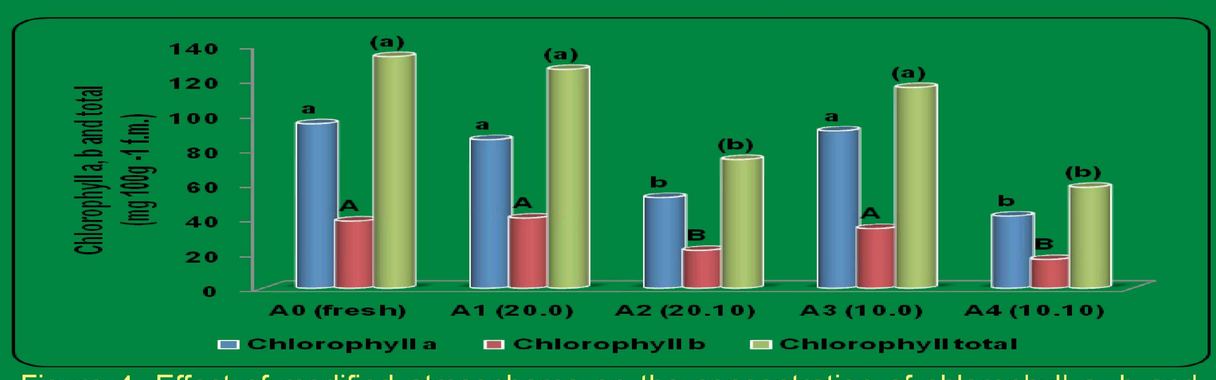

Figure 4. Effect of modified atmospheres on the concentration of chlorophyll a, b and total (mg/100g f.m.).
Means for each harvest with the same letter are not significantly different at *P*=0.05.

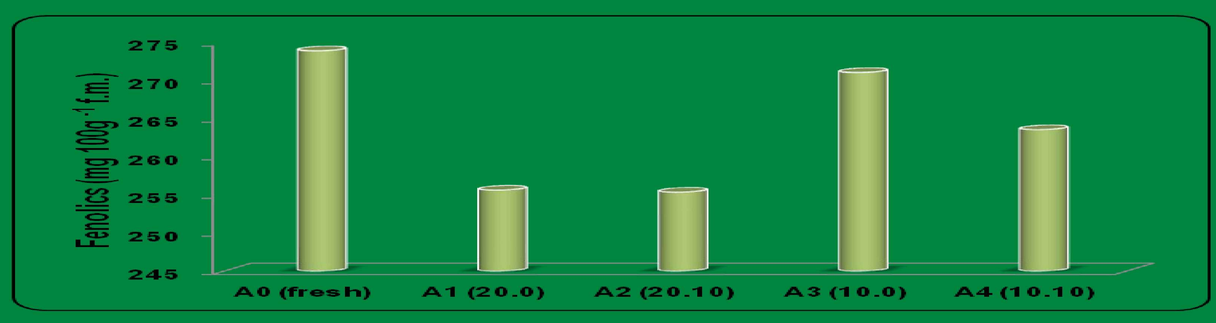

Figure 4. Effect of modified atmospheres on the concentration of fenolics (mg/100g f.m.).

CONCLUSION

In conclusion, although modified atmospheres containing 10% CO_2 reduce respiratory activity they are of questionable value for dill because the decrease in chlorophyll concentration causes a decrease in quality.

ACKNOWLEDGEMENTS

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