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EFFECT OF CONTROLLED ATMOSPHERES ON QUALITY OF GREEN PEPPER POBLANO (ANCHO)

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ABSTRACT. Chile Poblano (ancho) was stored under different Controlled Atmospheres. Oxygen concentrations of 5, 10, 15 and 21% oxygen were used. Carbon dioxide concentrations applied were 5 and 10%. Temperatures tested were 0, 5, 10, 15° C and ambient temperature. Parameters evaluated were ascorbic acid, acidity, soluble solids, firmness and color which were monitored weekly. Results showed that ascorbic acid decreased in a range of 11-70% loss, and it was affected by oxygen concentration and time. Acidity decreased with time, but it was not affected by temperature and oxygen concentrations. Soluble solids were not affected by gas concentrations, decreasing only with time. Firmness decreased significantly with time; however, it depends on oxygen and carbon dioxide concentrations. Weight loss was minimum and color was maintained at all temperatures. The best conditions to store chile poblano (ancho) were at temperature of 0° C and 10% oxygen concentration.

INTRODUCTION. Controlled Atmosphere Storage (CAS) has been successful in maintain quality of fruits and vegetables. Modified Atmosphere Packaging, has also been used for the same purpose. Chile Poblano, is widely used in Mexico but postharvest studies on this type of chile are scarce. On the other side, reports have been numerous on bell pepper, specially, using MAP to enhance shelf life. González-Tiznado, (1993) used bags from LDPE to extend shelf life of bell pepper for 20 days at 10° C. In 1998, González et al., found that a treatment with hot water combined with packaging in bags from LDPE for 4 minutos a 53° C was effective in lower respiration rate, reduce damage, maintain turgency and green color keeping the overall quality for 28 days at 8° C. Other studies have used bell pepper in stripes and cubes storing them under controlled atmospheres using CO₂. Results have been mixed (López-Gálvez et al., 1997; Cantwell et al., 1998).

Regarding "Chile Poblano" (or ancho), it is highly perishable, with a shelf life of one to two weeks at ambient temperature. Refrigeration is not used neither Controlled Atmosphere Storage. In light of the above, these studies were carried out in order to evaluate the effect of Controlled Atmosphere Storage on quality parameters of "Chile Poblano".

MATERIALS AND METHODS. Chile Poblano was purchased from a local distributor "Chilera Serrano" of the Francisco Villa Market of the City of Durango, Mexico, within 24 hrs after harvest or the same day of harvest. The peppers were washed with water and soap, its weight and volume were determined; they were disinfected in a solution of sodium hypochlorite with 200 ppm for 5 minutes. Peppers were drained, dried and placed in the glass chambers in an average of eight peppers per jar.

The atmospheres evaluated were: O₂ concentrations of 5, 10 y 15% and the control at 21% and stored at 5° C of temperature (Experiment "A"; chile from Vicente Guerrero and Poanas, Dgo.). Another experiment, aimed to evaluate the effect of CO₂ in conjunction with O₂ utilized 5 and 10% O₂ with 0, 5 and 10 % of CO₂ and a control of 21% of O₂ and 0% of CO₂ (Experiment "B", chile from Sinaloa and Zacatecas states) at 0° C of temperature. A last experiment was carried out at 5, 10 and 21 % of O₂ with 0 and 10% of CO₂ at temperature of 0° (Experiment "C", chile from Poanas, Dgo).

The parameters evaluated were color (using the scale L, a, b., with a Mini Scan Hunter Lab Mod 4500L) ascorbic acid (Ranganna, 1977) acidity (A.O.A.C. No. 942.15, 1977), soluble solids (Refractometer), acidity and firmness by puncture using an Instron Universal Machine (Mod. 1132) with 5 Kgf.

Data was analyzed using the software STATISTICA for Windows, version 4.3, (Statsoft, Inc., 1993, U. A.) with a level of significance of 5% (p < 0,05).

RESULTS AND DISCUSSION

Ascorbic Acid. Mexican chile is an important source of ascorbic acid. Reported concentrations are in a range of 46.6-243 mg/100 g of dry weight (Wimalasiry and Wills, 1983; Nisperos-Carriedos et al., 1992; Howard et al, 1994; Lee et al 1995). Chile used for this studies was analyzed initially and the values found were: Vicente Guerrero (233 mg/100g), Poanas (262 /100g), Sinaloa (150 mg/100g) and Zacatecas (241 mg/100g). For all treatments evaluated, there was a decrease on these values and it was found that oxygen concentration and time had a significant effect on ascorbic acid loss. Losses were in the range of 11-70% (Figure 1).

Acidity. This value represent the amount of organic acids within the fruit, amount that is decreasing as fruits are maturing (Cantwell, 1994). It has been reported that acids present in *Capsicum* plants are malic and oxalic acids (Dewitt et al, 2000). The results of this study, showed that there was a loss of 25 % on the acidity value and time was the only parameter that affected this value. Neither oxygen or temperature were important (Figure not shown).

Soluble solids. were not affected by oxygen and carbon dioxide concentration and the results were affected just for the time of storage, trend that is confirmed by others authors that mention that soluble solids usually increase as fruit is ripening and once senescence is reach, this value decreases (Gorny and Kader, 1998), (Figure 2).

Firmness. Few studies have shown change in firmness of chile. For the studies reported here, with Chile Poblano it was found that firmness decreases for all treatments evaluated. For example, for chile from Poanas (Dgo), losses were in the range of 22% after 8 weeks of storage at 0o C, while at ambient temperature, after 2 weeks of storage, the value of firmness is similar to that obtained after 8 weeks. Experiments with CO₂ presented higher firmness loss (36%) while oxygen did not affect firmness significantly (Figure 3).

Weight loss. Weight losses for the atmospheres tested were in a range of 1-10%. At 0° C after 8 weeks of storage, weight loss was around 5%, value compared with that reported by Lownds et al (1993), that found percentages of 16-25% (Figure not shown).

Color. For most experiments, values for color obtained were in the range of -4 to -2, values that indicate green color. The temperatures of 0 and 5° C kept the green color better, since those chiles stored at ambient temperature, changed to positive values sooner, which indicates a trend toward a red color (Figure 4).

CONCLUSIONS

Ascorbic acid loss is affected by oxygen and time, while color is affected by temperature. CO₂ affects significantly firmness, while oxygen do not affect this parameter. Oxygen concentration of 10% and a temperature of 0° C are the best conditions for keeping pepper quality; however, further studies are necessary in order to evaluate the possibility of chilling injury at this low temperature.

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Figure No. 2. Effect of time and gas concentrations on soluble solids on chile verde from Poanas, Dgo at 0 °C

Figure No. 3. Effect of time and gas concentration on firmness of Chile Poblano c.v. ancho from Zacatecas at 0° C

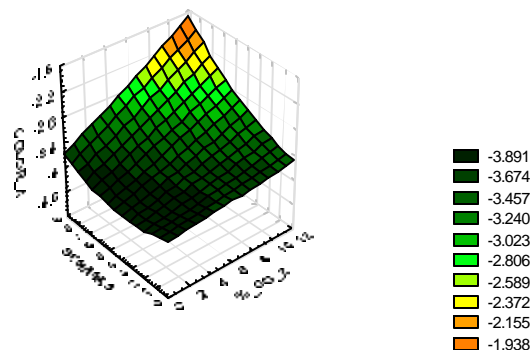


Figure 4. Effect of time and gas concentrations on Chile Poblano from Poanas, at 0° C

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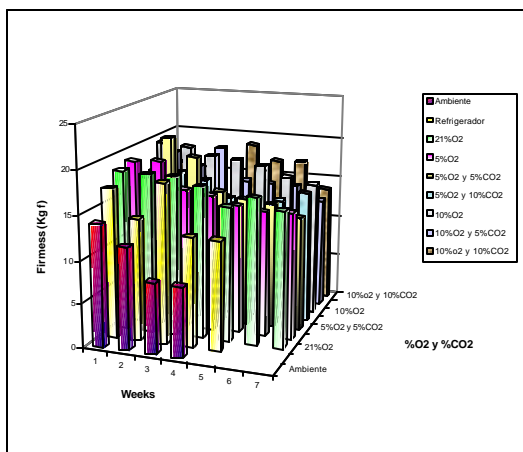


Figure 1. Effect of oxygen concentration and time on ascorbic acid in chile from Vicente Guerrero at 5° C.

