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PUBLICATIONS

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Withee, K., and T. Pankasemsuk. 2009. Effect of High Carbondioxide Pressure Treatments on Postharvest Quality in Longan cv. Daw Fruit. Southeast Asia Symposium on Quality and Safety of Fresh and Fresh Cut Produce, 3-5 Aug, 2009, Radison Hotel. Bangkok, Thailand (Poster presentation).

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Journal publications

Withee, K., and T. Pankasemsuk. 2010. Effect of High Carbondioxide Pressure Treatments on Postharvest Quality of Longan 'Daw' Fruit. ***Acta Horticuturae.*** 875: 395-398.

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Effect of High Carbondioxide Pressure Treatments on Postharvest Quality of Longan 'Daw' Fruit

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Abstract

Effect of high CO_2 pressures on respiration, weight loss and pericarp browning of longan cv. Daw fruit was studied. The fruit, harvested at commercial maturity stage, were treated with high CO_2 pressures 1, 1.5 and 2 kg/cm^2 for 1, 2 and 3 h then the fruit were stored at 10°C with 85% RH for 15 days. Results revealed that the most effective treatment in reducing respiration rate (7.45%), weigh loss (15.15%) and pericarp browning score (lower then 3) was 2 kg/cm^2 for 1 h.

INTRODUCTION

Longan (*Dimocarpus longan* Lour.) is an important exported fruit of Thailand, mostly produced in the northern region. One of the major problems is pericarb browning. The most effective practical postharvest for controlling the pericarp browning which uses commercially is sulphur dioxide fumigation. However, sulfur residue in longan could cause allergic symptom in some people. Researchers had studied on many alternative treatments but their effects are still less than the sulphur dioxide fumigation. Many paper reported that high CO_2 content could retain firmness of many fruit, such as strawberries, apple, and pear (Kader, 1992; Siriphanich, 1998). In this study, the effect of high CO_2 pressure on postharvest quality of longan was investigate.

MATERIALS AND METHODS

Mature uniform longan fruit were harvested in August 2008 from an orchard in Chiang Mai province. The fruit stems were cut-off, approximately 0.5 cm left. The fruit were treated with CO_2 at the pressures of 1, 1.5 and 2 kg/cm^2 for 1, 2 and 3 h in the pressure tank. The high CO_2 pressures were obtained by increasing the atmospheric pressure with pure CO_2 from a CO_2 tank then the fruit were stored at 10°C with 85% relative humidity. The experiment design was CRD, 3 replication 15 fruit per replication.

Measurements of Fruit Responses

Weight loss percentage was determined by weighing the whole fruits packed in foam tray before and after storage. Browning was evauated visually by estimating the total browning areas of the pericarp on each of fifteen fruits. The following scale was used: 1 = no browning (excellent quality); 2 = slight browning; 3 = browning less than 25% of the total surface; 4 = 25-50% browning; 5 ≥50% browning (poor quality) (Jiang and Li, 2001). Ten fruits were sealed in respiration jar for 1 h at 25°C. CO_2 contents in gas samples were analyzed by Shimazu GC-8A gas chromatograph with a thermal conductivity detector and molecular sieve 5A column at 50°C.

RESULTS AND DISCUSSION

Respiration rates increased within the first 12 days and then declined. The different high CO_2 pressure treatments cause wide variation in respiration rate after 9 days

storage. Application high CO_2 pressure of 2 kg/cm^2 for 1 hr significantly reduced the rate of respiration and delayed the appearance in their peaks. Weight loss increased progressively along with storage time (Fig. 2). High CO_2 pressure reduced weight loss, with the 2 kg/cm^2 CO_2 pressure for 1 h exerting a more dominant effect than the other treatments. Pericarp browning increased progressively along with storage time (Fig. 3). The high CO_2 pressure of 2 kg/cm^2 for 1 and 2 h could delayed pericarp browning better than other treatments. Both treatments pericarp color were still accepted which browning score were under three (25% browning). These results agreed with many reports which using high CO_2 content to reduce respiration rate, reduce weight loss and maintain peel color of many fruit Sopee (2006).

CONCLUSIONS

The high CO_2 pressure, 2 kg/cm^2 for 1 h, was effectively reducing respiration rate (-7.45%), weight loss (-15.15%) and pericarp browning score (lower than 3).

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Figures

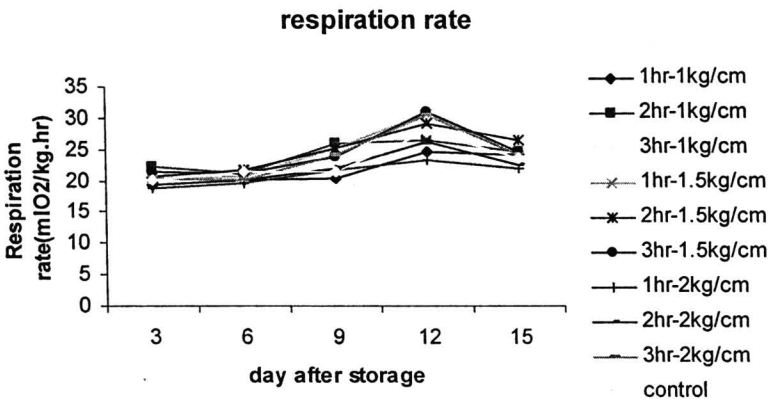

Fig. 1. Changes in respiration rate of longan 'Daw' fruit treated with high CO_2 pressures and stored at 10°C.

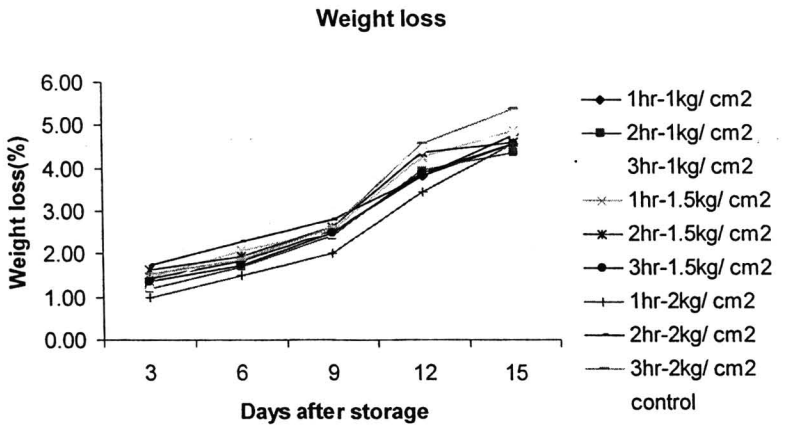

Fig. 2. Changes in weight loss of longan 'Daw' fruit treated with high CO_2 pressures and stored at 10°C.

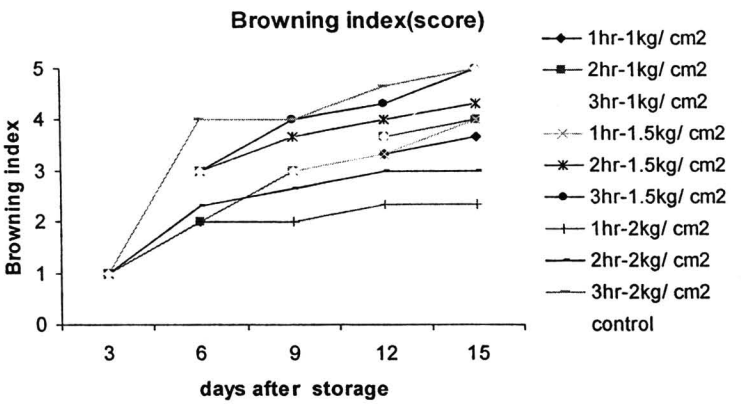

Fig. 3. Changes in browning index of longan 'Daw' fruit treated with high CO_2 pressures and stored at 10°C.

Effect of High Carbondioxide Pressure on Some Biochemical Changes of Longan 'Daw' Fruit

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Keywords: longan, carbondioxide, polyphenol oxidase, PPO

Abstract

Effect of high carbondioxide on pericarp polyphenol oxidase (PPO) activity, titrable acids (TA), pH and reducing sugars of the aril of longan cv. Daw fruit was study. The fruit were treated with high CO_2 pressure of 2 kg/cm^2 for 1 and 2 hr and non-treated. The treated and non-treated fruit were packed in foam trays, wrapped with PVC film and stored at 5°C, 85% RH for 24 days. The results showed that high CO_2 pressure also reduced PPO activity. However, TA and pH did not significant from the control. Reducing sugars tended to increased during the storage. The untreated fruit tended to have the highest reducing sugars content.

INTRODUCTION

Longan has been one of the most leading exports fruit of Thailand. After harvesting, longan has faced rapid pericarp browning which causing an end of its shelf life. Browning of longan's pericarp was resulted from the oxidation of phenolic compounds by endogenous polyphenol oxidase (PPO) (Jiang et al., 2002; Lin et al., 2005). Rambutan fruit shelf life is also suffering from browning. Sopee et al. (2006) reported CO_2 could maintain fruit color of rambutan.

MATERIALS AND METHODS

Mature uniform longan fruit were harvested on August at an orchard in Chiang Mai province. Longan fruit were harvested by hand and stems of the fruit were cut, left approximately 0.5 cm, then treated with CO_2 pressure of 2 kg/cm^2 for 1 and 2 h and non treated. The high CO_2 pressures were obtained by increasing the atmospheric pressure with pure CO_2 from a CO_2 tank then the fruit were stored at 5°C with 85% relative humidity. The experiment design was CRD, 4 replications 15 fruit per tray, one tray as an experimental unit.

pH TA and Reducing Sugar of Fruit Juices

The pH was measured by a pH meter (Consort 431, Belgium). Titrable acidity was determined by titrated the aril juice with 0.1 N NaOH solutions to pH 8.2 using an autotitrator (Titroline easy, Schott, Mainz, Germany) under continuous stirring and expressed as mg acid per 100 ml of pulp juice. Citric acid was used as a dominant acid in the juice. Reducing sugar was measured according to the modified method of Somogyi (1954).

Polyphenol Oxidase (PPO) Assay and Protein Determination

The pericarps from ten fruit of each treatment were frozen with liquid nitrogen and then powdered using a cooking blender. The powdered pericarps (3.0 g) were homogenized in 24 ml of 0.1 M phosphate buffer (pH 6.4) at 4°C. The homogenate was centrifuged at 15,000X g (Herolab-Unicen 15 DR, Germany) for 20 min and then the supernatants were collected to assay PPO activity according to the modified method of

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Jiang (1999), by measuring the oxidation of pyrocatechol. The increase in absorbance capacity at 400 nm at 25°C was automatically recorded for 5 min, using a spectrophotometer (SPE Cord M 40, Germany). One unit of enzyme activity was defined as the amount causing a change of 0.001 in absorbance capacity per minute. The protein content was determined according to the dye-binding method of Bradford (1976) using albumin bovine serum as the standard.

RESULTS AND DISCUSSION

PPO activities of all treatments tended to increase until day 15 of the storage and then decreased (Fig 1). However, both high CO_2 pressure treatments had lower PPO activities than the untreated. The lowest PPO activity was found in CO_2 2 kg/cm^2 for 1 h treatment. Thus, PPO was an enzyme related to pericarp browning (Vangnai et al., 2006). The reduction of PPO activity could lead to the reduction of pericarp browning. TA and pH in longan fruit juices did not affect by high CO_2 pressure treatments (Fig. 2). TA and pH did not significant from the untreated. Reducing sugar of fruit juices increased along storage time. This could be caused by the fruit hydrolyzed their storage sugars as a source energy during the storage. The untreated tended to has higher reducing sugars content than the fruit were lower than the high CO_2 pressure treated fruit. This could infer that high CO_2 pressure treatment could has some potential in prolong shelf life of the longan due to the reduction of the PPO activity and the slower metabolic activity of the fruit.

CONCLUSION

High CO_2 pressure, 2 kg/cm^2 for 1 and 2 h, treatments could reduced pericarp polyphenol oxidase (PPO) activity of longan fruit. TA and pH did not affect by high CO_2 pressure treatments but reducing sugars of the high CO_2 pressure treated fruit tended to lower than the control.

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Figures

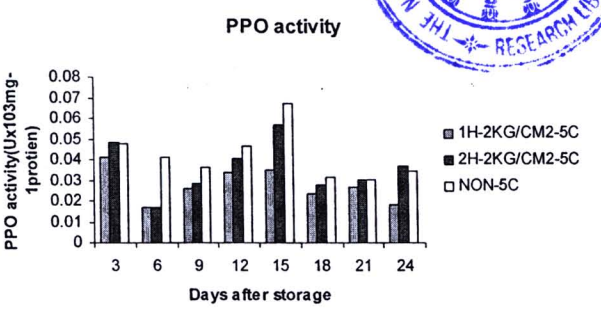

Fig. 1. Changes in PPO activity of longan 'Daw' fruit treated with high CO_2 pressure and stored at 5°C.

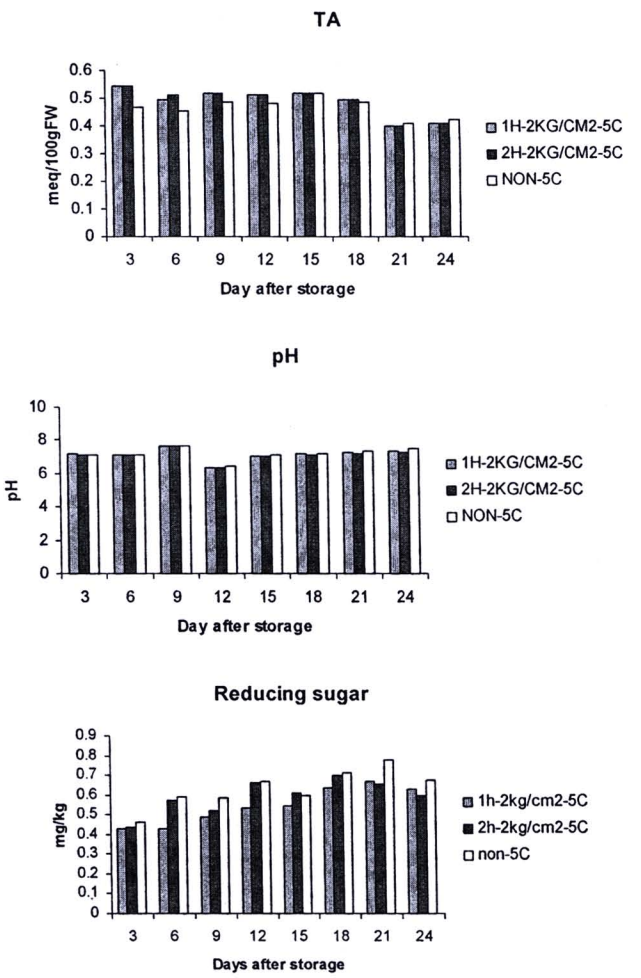

Fig. 2. Changes in TA, pH and reducing sugars of longan 'Daw' fruit juices treated with high CO_2 pressure and stored at 5°C.