Influence of post-harvest storage temperature and duration on quality of baby spinach (*Spinacia oleracea* L.)

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Introduction

• Intake of baby spinach vegetables have been known to have a positive attributes on human health

• Correlated to a decreased risk of most degenerative diseases of ageing, such as cardiovascular disease (Arts and Hollman, 2005)

• Reduces risk of

  - Alzheimer’s disease (Commenges et al. 2000)
  - Cataracts (Brown et al. 1999)
  - Prostate cancer (Kang et al. 2005)
Introduction Cont…

• Good source of phenolics, ascorbate, carotenoids, flavonoids

• Source of several minerals such as Magnesium, iron, zinc

• Storage conditions influence phytochemical content of vegetables
Storage time and temperature can significantly determine a shelf-life and the quality of vegetable produce.

The aim of this work was to study the influence of storage time at various temperatures on the quality of *Spinacia oleracea* L.
Materials and Methods

- Baby spinach (*Spinacia oleracea* L.) plants were grown in the glasshouse.
- Plants were uniformly treated with nutritive solutions containing 100 kg/ha mineral nitrogen (*NH*$_4$)$_2$SO$_4$.
- Planting media had rates recommended by Nemadodzi et al., (2014).
- After 36 days all plants were then harvested.
- The samples (leaves) were washed in running, portable water, dried and packed in plastic perforated containers.
- These containers were stored for 0, 2, 4, 6, 8, and 12 days in two different temperatures, one cooled to 4°C and the other equal set was placed at 22°C.
- Weight loss was determined by weighing all samples with a balance MK-500C (± 0.001g) at the beginning and end of each storage period.
Materials and Methods Conti...

- All chemical analysis (including mineral and trace elements) in this study were done using van der Walt et al. (2009) method.
- Total phenols were determined according to the Folin Ciocalteau with a modification by Waterman and Mole (1994).
- Carotenoids was analysed by reversed-phase HPLC, using a method described by Kidmose et al. (2001).
- The total flavonoids was measured using a modified calorimetric method (Yoo et al., 2008).
- Antioxidant activity (by free radical scavenging) of the extracts was determined using Trolox Equivalent Antioxidant Capacity (TEAC) assay as described by Awika & Rooney (2004).
- Data were subjected to analysis of variance (ANOVA) using PROC GLM (General linear model) procedure of SAS version 11.
Results and Discussion

• Weight loss was positively related to temperature

• Samples held at 22°C had greater weight loss than samples stored at 4°C
Almost all variables showed the strong correlation except the selenium.
Results and Discussion Cont...
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• Similar trends were also reported by Ayala-Zavala et al. (2004) who stated that storage temperature significantly affect antioxidant capacity, phenolic compounds and overall quality of crops Brassiceae family.
Summary of results

- Overall, our results showed that the quality of baby spinach deteriorate as the storage time and temperature increases.

- Magnesium, zinc and iron deteriorates at 4°C started after 8 days of storage, whilst samples stored at 22°C decreased in 2 days of storage.
• Total phenols and carotenoid contents was stable constantly at 4°C and decrease after 6 days of storage, whilst at 22°C the level of carotenoid declined after 2 days
• Total antioxidant activities steadily decrease after 2 days of storage at 22°C, whereas at 4°C total antioxidant activities decrease after 6 days
• Vitamin C content was constant at 4°C and decrease after 6 days
• However, the vitamin C stored at 22°C decrease after 2 days
Conclusion

• From this study, it was evident that shelf life can be extended at the storage of low temperature of 4 °C as most of the variables can last for 4-6 days of storage.
• Mg, Fe, and Zn stored at 4 °C decreased after 8 days of storage.
• Carotenoids, total phenols and vitamin C stored at 4 °C decreased after 6 days of storage.
Thank you