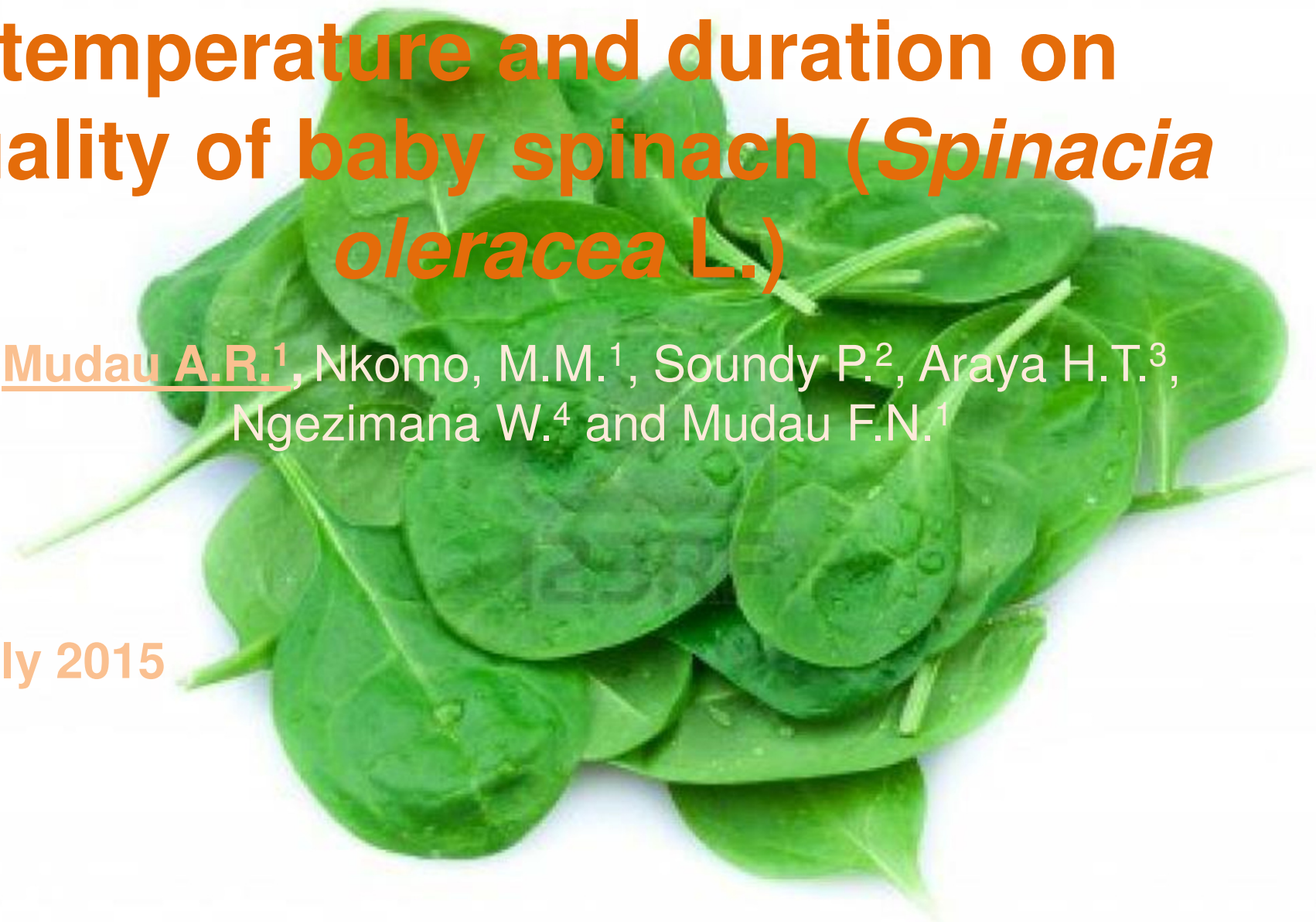


Influence of post-harvest storage temperature and duration on quality of baby spinach (*Spinacia oleracea* L.)

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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

Introduction Conti...

- 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 $(\text{NH}_4)_2\text{SO}_4$
- 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
- These container 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 ($\pm 0.001\text{g}$) 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 Ciocalteu 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

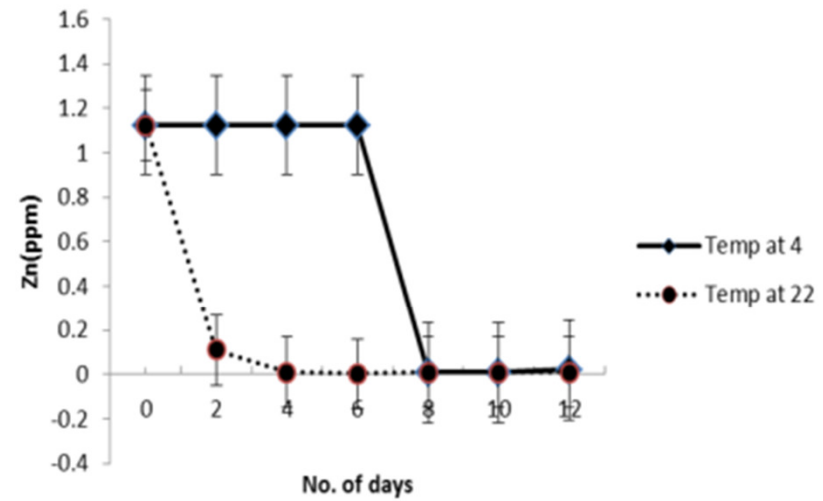
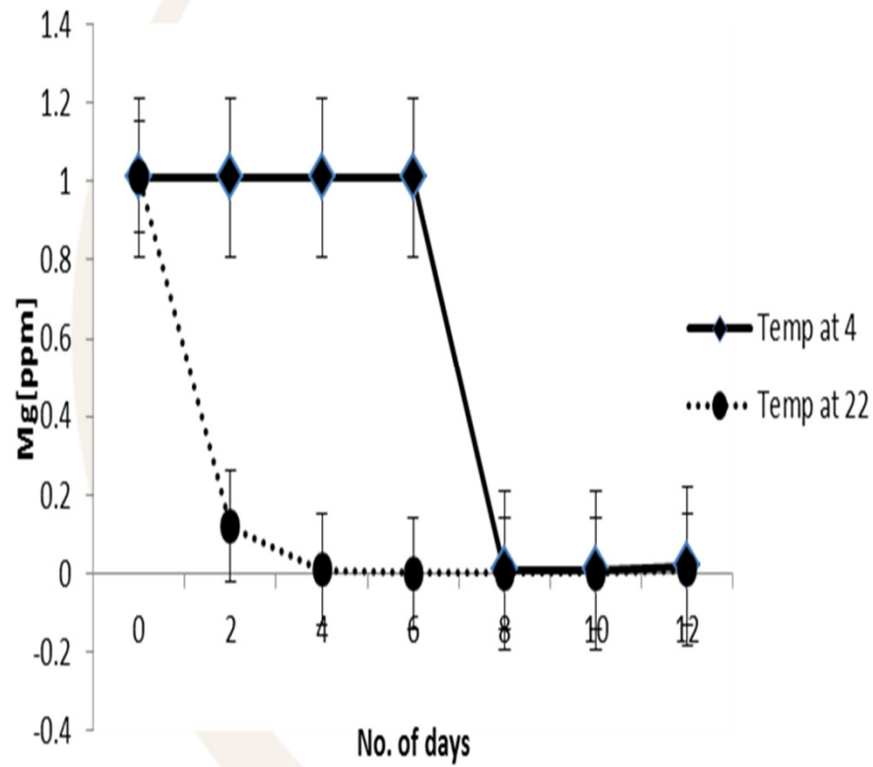
- Weight loss was positively related to temperature
- Samples held at 22°C had greater weight loss than samples stored at 4°C

The correlation between variables

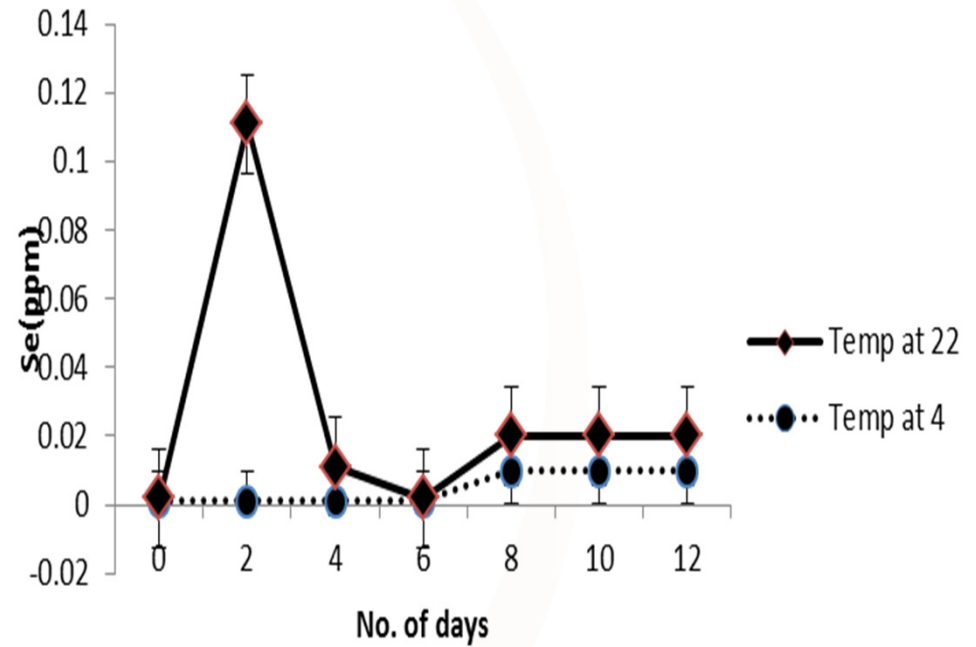
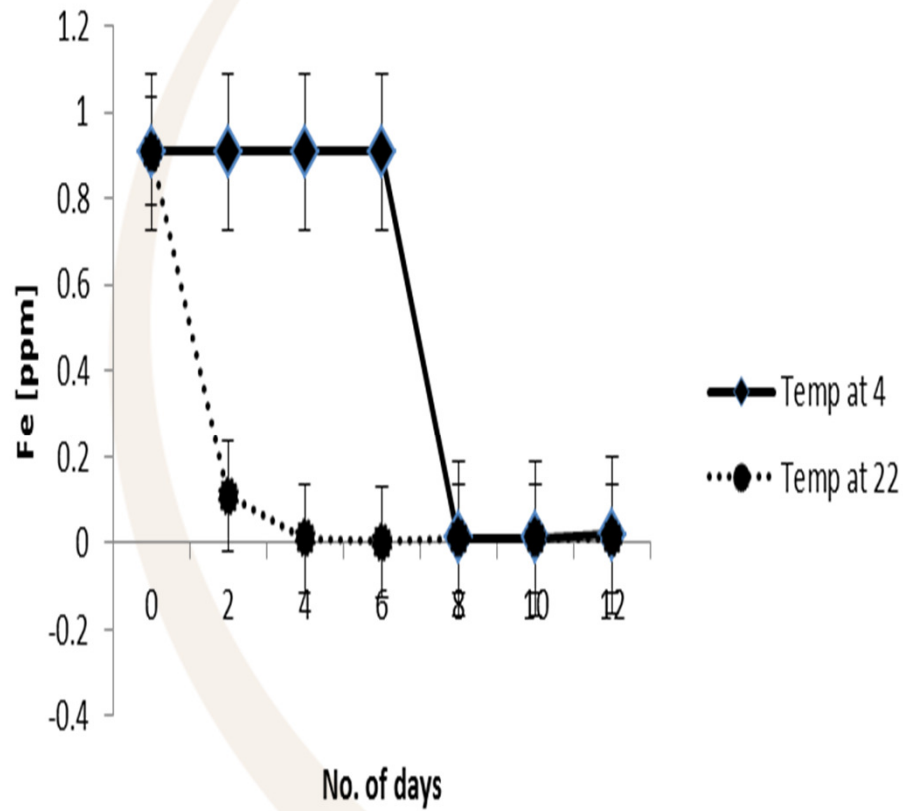
	<i>Mg</i>	<i>Fe</i>	<i>Zn</i>	<i>Se</i>	<i>TP</i>	<i>TC</i>	<i>TfLAV</i>	<i>TAA</i>	<i>Vit C</i>
<i>Mg</i>	1								
<i>Fe</i>	0.999976	1							
<i>Zn</i>	0.999874	0.999904	1						
<i>Se</i>	-0.21804	-0.21848	-0.23189	1					
<i>TP</i>	0.671019	0.669601	0.665036	0.182451	1				
<i>TC</i>	0.758713	0.757887	0.758714	-0.23375	0.589424	1			
<i>TfLAV</i>	0.814696	0.813985	0.808462	0.213901	0.785747	0.826555	1		
<i>TAA</i>	0.717243	0.717179	0.715754	-0.05978	0.665751	0.845369	0.771634	1	
<i>Vit C</i>	0.846831	0.846208	0.839336	0.306194	0.724597	0.631019	0.906724	0.663159	1

Almost all variables showed the strong correlation except the selenium

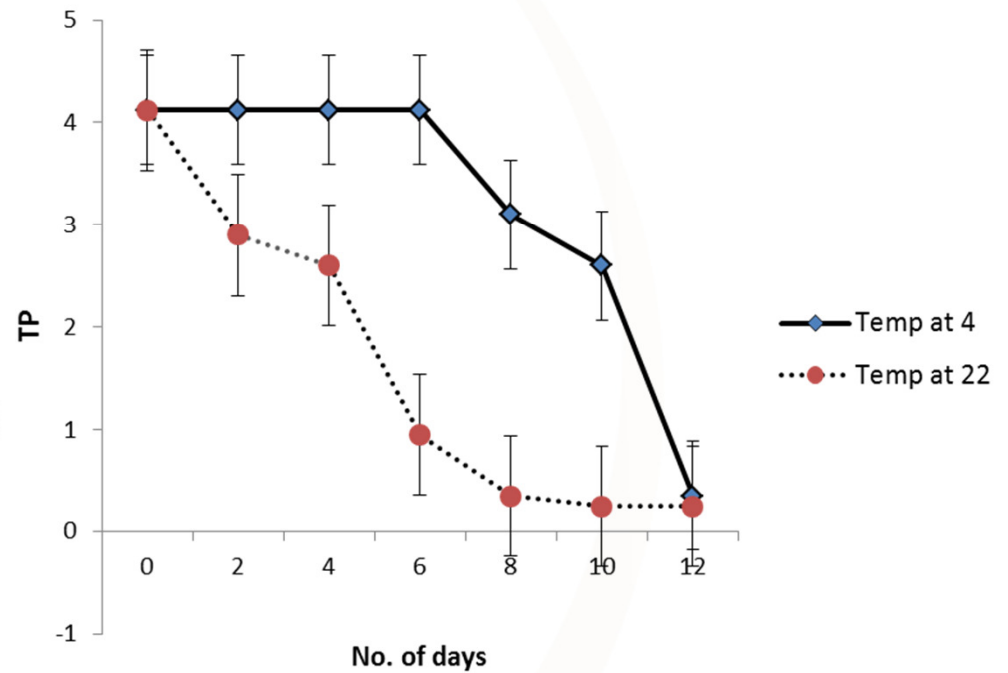
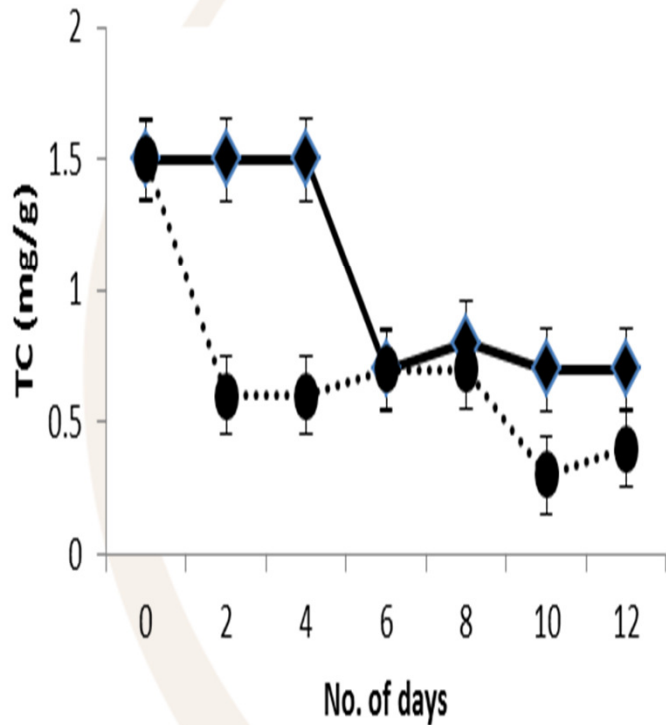
Results and Discussion Cont...



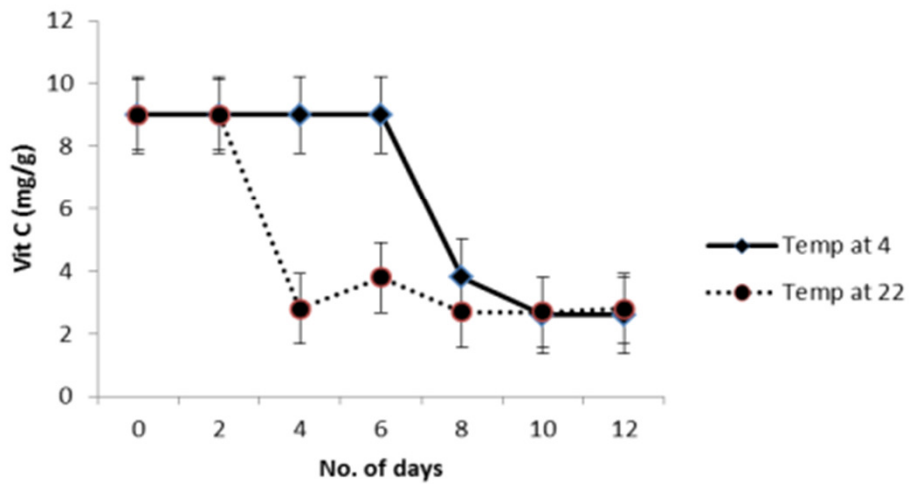
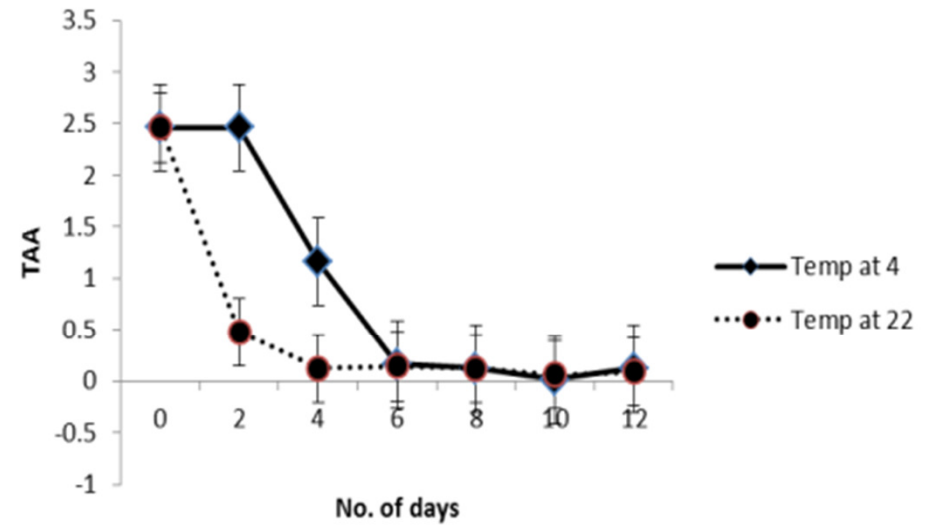
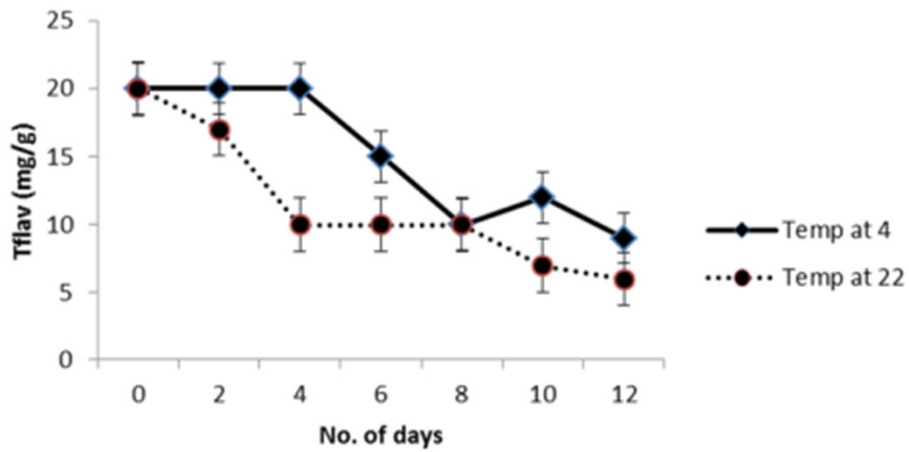
Results and Discussion Cont...



Results and Discussion cont...



Results and Discussion cont...



Results and Discussion cont...

- Similar trends were also reported by Ayala-Zavala et al. (2004) who stated that 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

Sum Cont...

- 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

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