RESULTS AND DISCUSSION

1. Part I: Persimmon Quality during Storage

1.1 Physicochemical determinations

Persimmon is a climacteric fruit whose ripening is regulated by ethylene (Wills *et al.*, 1981). In climacteric-type fruits, the rise in respiration, which reflects enhanced metabolic activity, occurs at the transition from the growth phase of the fruit to its senescence phase. However, the vacuum packaging as inhibitors of ethylene action, can delay the respiration rate in persimmon fruit. The change in percentage cumulative weight loss and total soluble solid (TSS) under cold storage conditions for 6 weeks are presented in Figure 4. The weight loss increased with storage time on account of the utilization of food reserves in the tissue. At the end of 6 weeks storage, the cumulative loss of weight was 6.11%. The high rate of change in soluble sugar concentration may be attributed to the monosaccharide being used in the respiration process during storage. The TSS values increased with time which is an indication of ripening. At the end of the storage period, the TSS value reached 19 °Brix. This result agreed with the changes in firmness and skin color of the fruits. The a* value of the skin color increased whereas the L* and b* decreased as storage time increased (Figure 5). The skin color of persimmon developed an orange-red color during ripening. However, the L*, a* and b* value of the flesh color decreased (Figure 6). A marked decreased of firmness from 32.52 N to 19.55 N over the storage period of 6 weeks (Figure 7), due to the transformation of pectic substances from protopectin to pectic acid and pectinic acid which are water soluble (Dostal, 1970).

Although a slight fluctuation in pH was observed and the % acidity marginally decreased (Figure 8), the overall variations were not significant. The pH and % acidity of persimmon over the 6 week storage period were close to 5 and 0.2%, respectively. The astringent substance in persimmons is soluble tannin formed in the tannin cell. The uses of vacuum packaging, and the resulting generation of

anaerobic conditions, stimulate the production of aldehydes which coagulate soluble tannin and polymerise it into insoluble forms, thus reducing astringency (Kitagawa and Glucina, 1984). The result obtained showed a decrease in tannin content with time and correlated with a decrease in astringency intensity value based on sensory evaluation (Figure 9). After 6 weeks storage the quantity of soluble tannin was below 1.0 mg/g which lower than the threshold. The soluble tannin content in P2 persimmon was significantly reduced after 1 week of storage time.

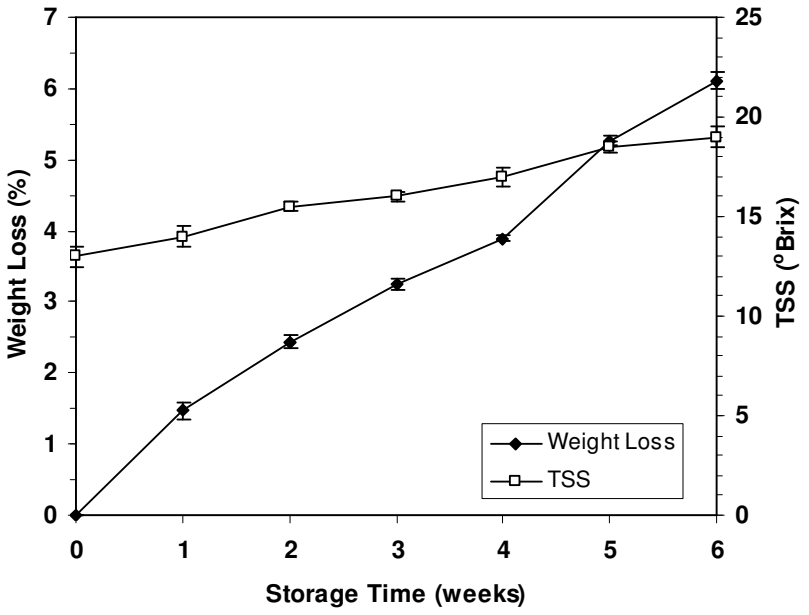

Figure 4 Weight loss and total soluble solid of persimmon during storage at 4-6 °C.

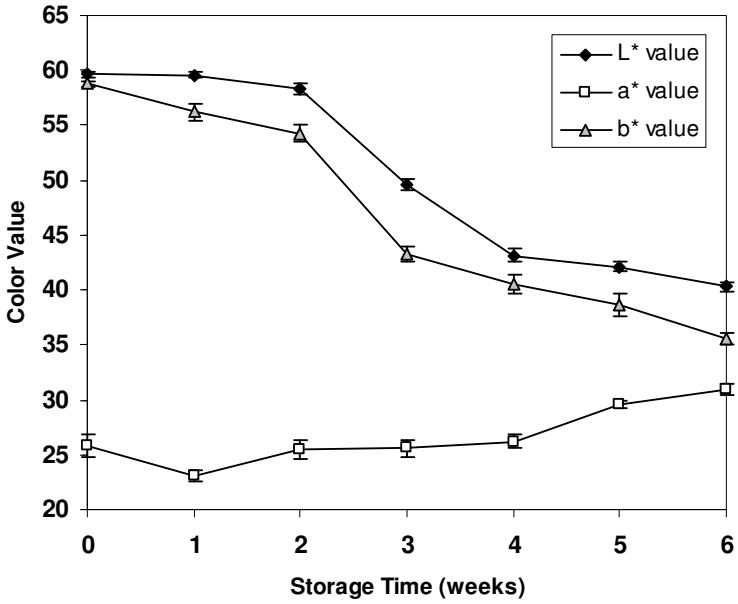

Figure 5 Skin Color value of persimmon during storage at 4-6 °C.

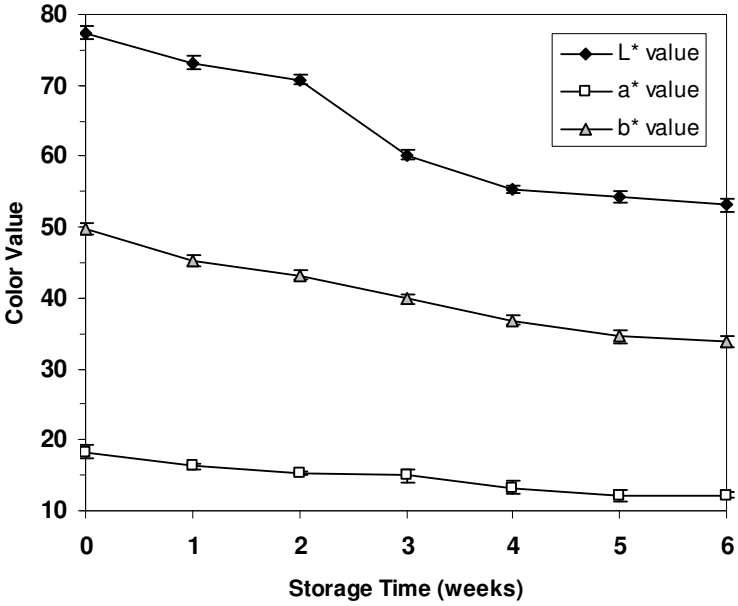

Figure 6 Flesh color value of persimmon during storage at 4-6 °C.

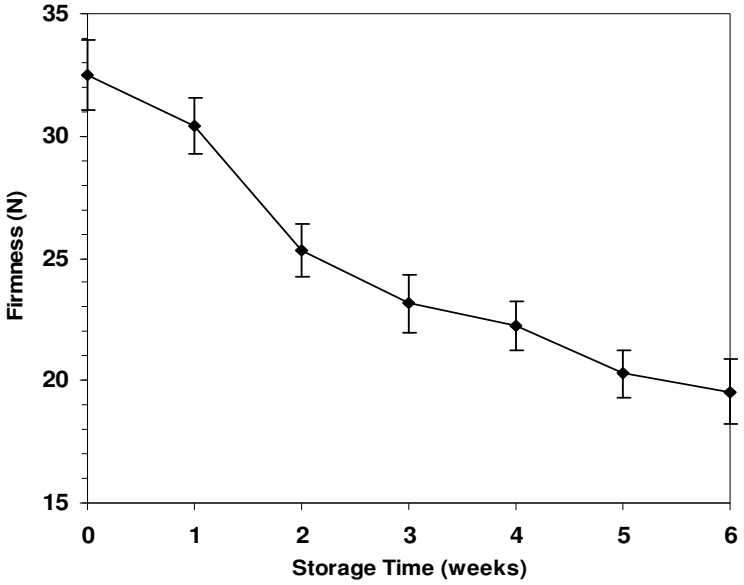

Figure 7 Firmness of persimmon during storage at 4-6 °C.

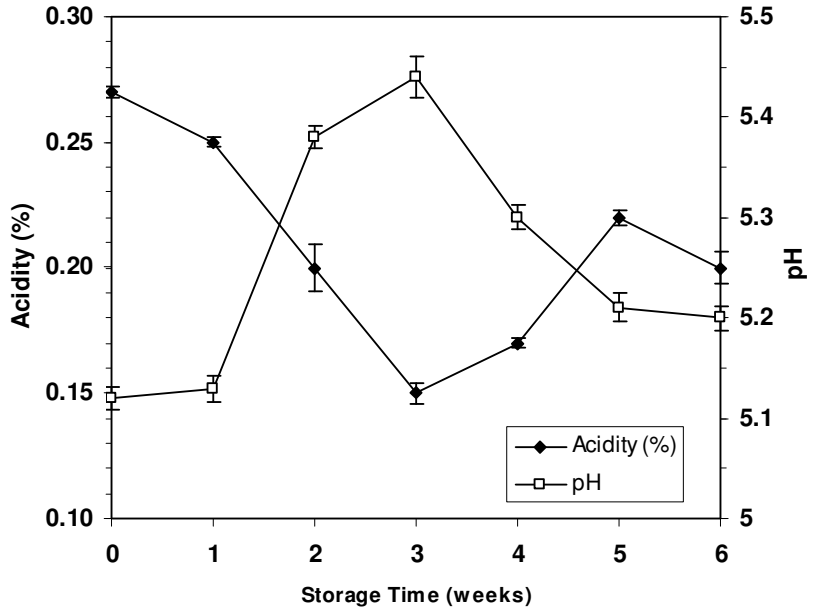

Figure 8 %Acidity and pH of persimmon during storage at 4-6 °C.

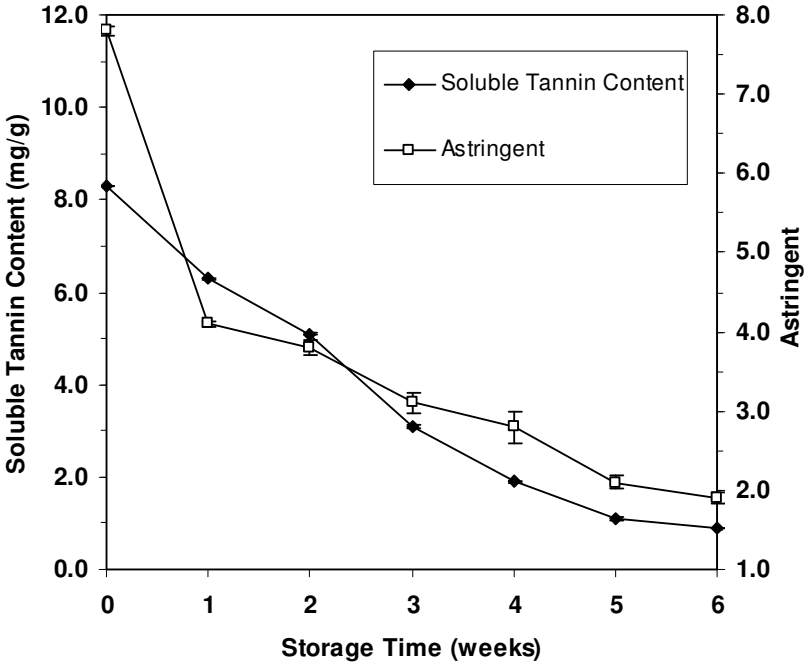

Figure 9 Soluble tannin content and astringent intensity from sensory evaluation of persimmon during storage at 4 -6 °C.

1.2 The sensory quantitative descriptive analysis (QDA)

The mean values for the sensory attribute rating obtained by undertaking a QDA showed significant differences over the storage period (Table 3). Of the seven attributes of persimmon considered, six attributes, namely: orange color, sweetness, bitterness, grassy odor, grassy flavor and firmness varied significantly in the first two weeks of storage. The intensity rating on orange color and sweetness increased significantly, whereas the corresponding values for bitterness, grassy odor, grassy flavor and firmness decreased. It is evident that the value for astringency decreased sharply during the first week. This was followed by a relatively gradual drop in subsequent weeks. As mentioned earlier, this observation correlated with a drop in tannin content. Figure 10 represents the same data in graphical terms.

Table 3 Intensity values were obtained using quantitative descriptor analysis

Storage time (weeks)	Attributes						
	Orange Color	Sweetness	Bitter	Grassy Odor	Grassy Flavor	Firmness	Astringency
0	4.51 ± 0.03^{d}	6.41 ± 0.03^{b}	0.82 ± 0.03^{a}	3.41 ± 0.03^{a}	8.61 ± 0.03^{a}	8.21 ± 0.03^{a}	7.81 ± 0.05^{a}
1	5.41 ± 0.03^{d}	7.22 ± 0.03^{b}	0.71 ± 0.03^{a}	3.12 ± 0.03^{a}	7.63 ± 0.03^{a}	7.41 ± 0.03^{a}	4.11 ± 0.03^{b}
2	6.82 ± 0.03^{c}	9.33 ± 0.03^{a}	0.36 ± 0.03^{b}	2.42 ± 0.03^{b}	6.74 ± 0.03^{b}	5.33 ± 0.03^{b}	3.82 ± 0.10^{b}
3	7.46 ± 0.03^{bc}	9.93 ± 0.03^{a}	0.26 ± 0.03^{c}	2.76 ± 0.03^{b}	6.26 ± 0.03^{b}	5.74 ± 0.03^{b}	3.15 ± 0.13^{b}
4	8.03 ± 0.03^{b}	9.26 ± 0.03^{a}	0.24 ± 0.03^{c}	2.34 ± 0.03^{b}	6.88 ± 0.03^{b}	4.13 ± 0.03^{c}	2.81 ± 0.20^{c}
5	8.35 ± 0.03^{b}	8.91 ± 0.03^{a}	0.14 ± 0.03^{d}	1.94 ± 0.03^{c}	5.93 ± 0.03^{b}	4.34 ± 0.03^{c}	2.12 ± 0.09^{c}
6	9.98 ± 0.03^{a}	9.19 ± 0.03^{a}	0.13 ± 0.03^{d}	1.83 ± 0.03^{c}	5.72 ± 0.03^{b}	4.33 ± 0.03^{c}	1.91 ± 0.08^{c}

Note: Values within columns followed by a different letter are significantly different at the 95% confidence level (Duncan's Multiple Range Test)

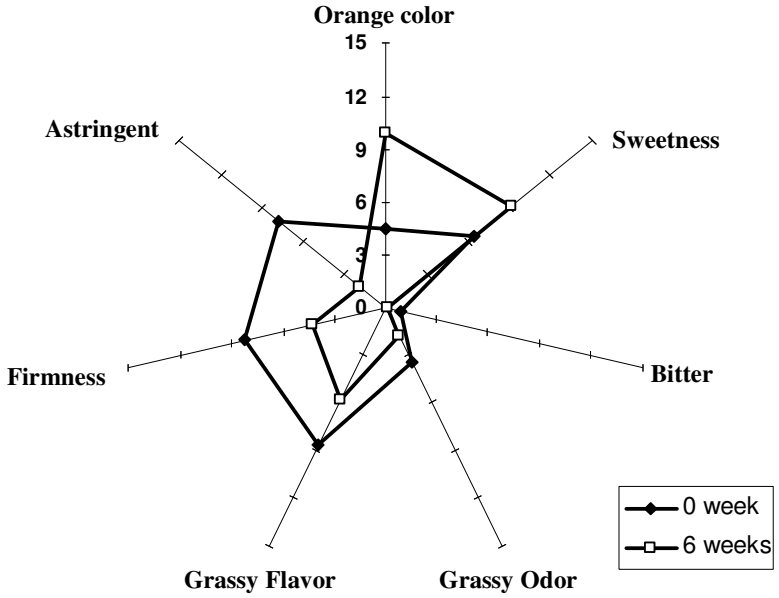

Figure 10 Sensory profile of persimmon over 6 weeks of storage at 4-6 °C.

It is evident from Figure 10 that the physical, chemical and sensory attributes changed significantly over the six weeks storage period. Despite these changes the quality of the fruit still remained unobjectionable. It is also clear that vacuum packaging can reduce astringency from the fruit. Hence, it is a suitable technology to preserve the fruit prior to further processing.