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Effects of storage duration and conditions on quality of kiwifruit cv. Allison

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ABSTRACT: *This study was conducted to investigate the effects of storage duration and conditions on quality of kiwifruit (cv. Allison). A total of 400 fruit were randomly selected and for each storage treatment 200 fruits were taken. Each treatment consists of 20 samples and for each sample 10 fruit were taken. Then, samples were stored at ambient (20.5°C and 78% RH) and cool (7°C and 75% RH) conditions for 3 months and fruit quality characters i.e. Fruit weight, Firmness, TSS and acidity were recorded after 10 days interval. Results indicated that kiwifruit stored at ambient (20.5°C and 78% RH) condition shows a rapid decrease in fruit weight after 10 days of storage and it goes on decreasing continuously. Fruits weight of kiwifruit stored at cool (7°C and 75% RH) conditions remains the same up to 2 months thereafter it starts decreasing slowly. The kiwifruit average firmness before storage was 6.0 kg/cm^2 and after 10 days at ambient and cool storage was 5.0 kg/cm^2 and 5.6 kg/cm^2, respectively and it goes on decreasing but in ambient storage there is a more rapid decrease in firmness of fruit whereas in cool storage, this process occurred with a slow rate . The TSS of Kiwifruit before storage was 6.2 °Brix and it goes on increasing in ambient and cool storage but the rate of increase in TSS is fast in ambient storage as compared to cool storage. Under ambient storage condition fruit acidity goes on decreasing as the storage period advances. In case of cool storage the fruit acidity decrease but the rate of decline is slow. From the studies it is reported that under cool storage conditions (7°C and 75% RH) Kiwifruit cv. Allison can be stored for longer period i.e. 90 as compared to ambient storage (20.5°C and 78% RH).*

Keywords: *Storage condition, duration, quality, Kiwifruit*

INTRODUCTION

Kiwifruit is considered an important commercial fruit. Effects of storage time and conditions on quality control are important aspects of food processing for acceptable nutritional value and providing food safety to consumers. Kiwifruits are classified as climacteric fruit, since they ripen in response to exogenous ethylene, and their ripening is characterized by a period of autocatalytic ethylene production (Whittaker *et al.*, 13). During the ripening, various climacteric fruit increase the 1-aminocyclopropane-1-carboxylate (ACC) concentration by expression of the ACC synthesis gene (Jiang and Fu, 8). The rate of kiwifruit softening is affected by storage period, temperature, ethylene levels and maturity of the fruit (Ritenour *et al.*, 12). The major problem that hinders long-term storage is the flesh softening which occurs fastly under ambient storage condition. Therefore it become important to store fruit under such conditions that can maintain quality and suppress ethylene biosynthesis to different degrees depending on the commodity as well as reduce decay and/or reduce the use of insect and disorder-controlling chemicals. Thus present investigation was carried out to study the effects of storage duration and conditions on quality of kiwifruit (cv. Allison).

MATERIALS AND METHODS

Kiwifruit cv. Allison was harvested in early November from the orchard of Regional Horticulture Research and Training station, Bajaura. Out of harvest fruits, 400 fruits were randomly selected for each treatment i.e. ambient storage and cool storage. For each storage treatments 200 fruits were taken. Each treatment consists of 20 samples and for each sample 10 fruit were taken. Then, samples were stored at ambient (20.5°C and 78% RH) and cool (7°C and 75% RH) conditions for 3 months and fruit quality characters i.e. Fruit weight loss, Firmness ,TSS and acidity were recorded after every 10 days.

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Weight loss (%): Five fruits from each sample were separated for weight loss test. The initial weight of each fruit was noted with the help of electronic balance. The average loss of weight in all the treatments was calculated at 10 days intervals.

$$Fruit\ weight\ loss(\%) = \frac{Initial\ weight - final\ weight}{Initial\ weight} \times 100$$

Total soluble solids (^{0}Brix): Total Soluble Solids of the fruit was determined at 10 days intervals of 90 days storage accordingly. Total soluble solids (TSS) were measured with a hand refractrometer.

Fruit firmness (kg/cm^2): Data pertaining to fruit firmness was recorded with the help of penetrometer. For this purpose five fruits from each sample were taken and penetration force was measured by gently inserting the prob into the equatorial region of the fruit. Fruit firmness reading was recorded and averaged for each fruit. The readings for all five fruit were averaged to represent the corresponding treatments (Pocharski *et al.,* 10).

Titratable acidity: Acidity was determined by titrating fruit pulp solution against N/10 NaOH using phenolphthalein as indicator. A.O.A.C (1).

RESULTS AND DISCUSSION

The percent loss in fruit weight with time for two storage conditions is shown in Fig. 1. The results show that on harvest day the mean fruit weight varied from 130 to 128 gm/fruit. The rate of weight loss at ambient storage due to higher is much more than cool condition.

With increase in storage period till 60 day of storage, the fruit exhibited a rapid decrease in fruit weight but thereafter the decrease in fruit weight was gradual in case of ambient storage but in cool storage the weight loss is very less as compared with ambient storage, weight loss was nearly negligible till 40 days of storage thereafter there is rapid weight loss upto 60 days and after that the loss in fruit weight is gradual till rottening and shrivelling of fruit.

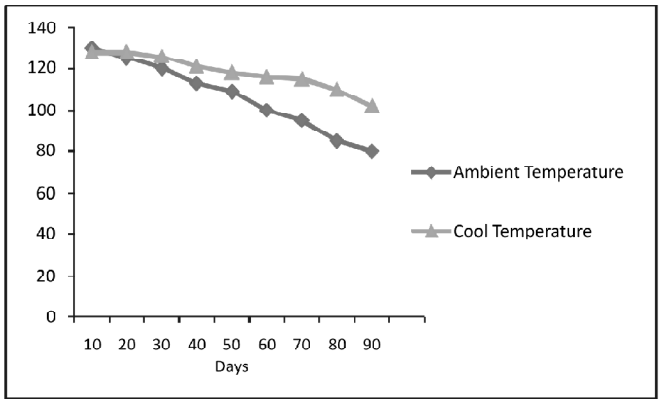

Figure 1: Variation in percent weight of kiwifruit with storage period at two different storage conditions

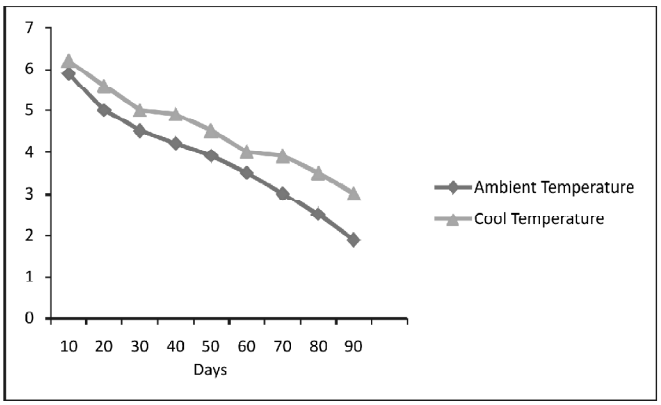

Figure 2: Variation in firmness of kiwifruit with storage period at two different storage conditions

Kiwifruit cv. Allison was evaluated from harvest day to the day till rottening and shrivelling of fruit started. The results are presented in Fig. 2. The fruit firmness varied from 5.9 to 6.2 kg/ cm^2 on harvest day, which further decreased to 1.9 kg/cm^2 at ambient storage and to 3 kg/cm^2 at cool storage after 3 months. It is also clear from Fig. 2 that in ambient storage there is a more rapid decrease in firmness of fruit whereas in cool storage, this process occurred with a slow rate. In addition, Fig. 2 revealed two stages of change in firmness profile during storage**.** There is a rapid decrease in firmness till 30 days of storage indicating rapid water loss but then gradual decrease after 1st month onward indicated slow rate of water loss. Similar trends were also observed by Hertog *et al.* (7) for tomato, Qin *et al.* (11) for mango and by Katsiferis *et al.* (9) for orange.

A total soluble solid of fruits is a major quality parameter which is correlated with the texture and composition. From figure 3. It was predicted that total soluble solids at the time of harvest varied from 6.6 to 7.2 °B. The total soluble solid content increases as the storage period advances. It is clear from Fig. 3.that in ambient storage there is a more rapid increase in total soluble solids of fruit whereas in cool storage, this process occurred with a slow rate. The maximum total soluble solids 15.8 were recorded in fruits stored for 90 days as compared to in fresh harvested fruits. The increase in TSS could be attributed to the breakdown of starch (Beaudry *et al*., 2) into sugars (Crouch, 5) or the hydrolysis of cell wall polysaccharides (Ben and Gaweda, 3).

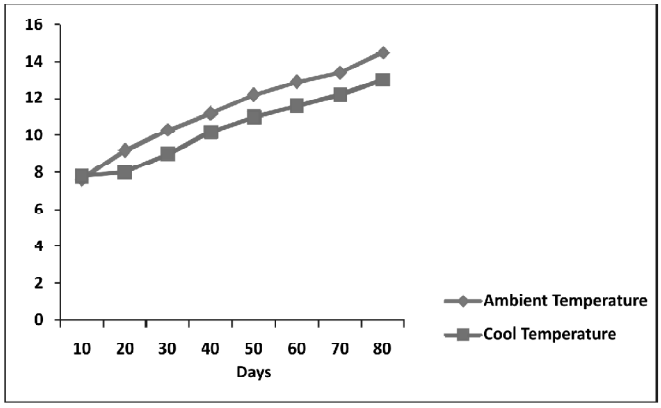

Figure 3: Variation in TSS of kiwifruit with storage period at two different storage conditions

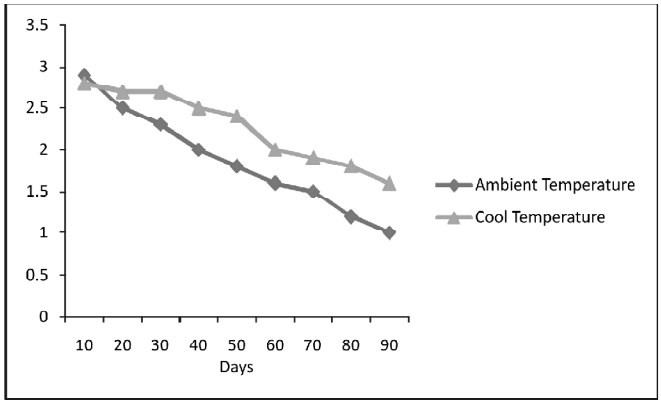

Figure 4: Variation in fruit acidity of kiwifruit with storage period at two different storage conditions

The titratable acidity of Kiwifruit decreased significantly with increasing storage duration, so that it was the highest (2.9%) in fresh harvested fruits while the least (1.0%) in fruits stored for 90 days under ambient storage (Figure 4). The rate of decline in acidity was fast in ambient storage because changes in titratable acidity are significantly affected by the rate of metabolism (Clarke *et al*., 4) especially respiration, which consumed organic acid and thus fruit acidity decline very rapidly during ambient storage (Ghafir *et al*., 6). Whereas under cool temperature the rate of respiration is slow, which further reduces the rate of metabolic activity and as a result the fruit acidity decreases slowly as compared to the fruits which are stored under ambient temperature. Therefore it can be concluded that under cool storage conditions (7ºC and 75%RH) Kiwifruit cv. Allison can be stored for longer period i.e. 90 as compared to ambient storage (20.5ºC and 78% RH).

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