

Comparison of Firmness of Tomato Varieties Grown in Sri Lanka

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ABSTRACT

Firmnesses of farm fresh samples of three tomato (*Lycopersicon esculentum*) varieties grown in Sri Lanka, named, Maheshi, HF-2 and T-146 were studied. The firmness of the tomatoes was measured using Effegi type Bishop FT 327 firmness tester. Measurements were carried out for three consecutive days after plucking them from plants. Ever since tomatoes were harvested, the firmness was found to decrease daily. Throughout the three-day period of shelf life, all three varieties registered a higher firmness value for sun-shaded side than the corresponding firmness value for the sun-exposed side. Among the three tomato varieties, Maheshi at all times registered the highest firmness value while T-146 variety registered the lowest. Also the Maheshi variety indicated the lowest rate of loss-of-firmness with time. As a result, the first officially released hybrid tomato variety Maheshi stands out with its superior and promising quality over the other two varieties, throughout the handling process, storage and shelf life in marketing chain. (The firmness measurements were made on peeled-off tomatoes, with a plunger of diameter 11.3 mm).

INTRODUCTION

Tomato (*Lycopersicon esculentum*) is native to central and south America and southern part of north America. Tomato is considered the main horticultural crop in the world with a production of 60 million tonnes and three million hectares planted every year [1]. Several tomato varieties are grown in Sri Lanka. Farmers cultivate tomato varieties which have been recommended by the Horticultural Crop Research and Development Institute (HORDI), Sri Lanka. Certain local hybrid tomato varieties experimented by HORDI are also grown in trial plots. T-146 is a recommended tomato variety. HF-2 and Maheshi are both hybrid varieties. At the time of this investigation Maheshi variety was grown in trial plots and was in the experimental stage. The firmness is a criterion often used to evaluate fruit quality as it is directly related to fruit development, maturity, ripening and storage potential. It is also related to the likelihood of bruising when fruits are subjected to impact during handling [2]. Several methods have been developed for evaluation of fruit firmness [3]. The relevant parameter used to determine the fruit quality which changes during fruit growth and maturation, is the flesh firmness. In some countries, there is a well defined margin for firmness that should be maintained for marketable fruits [4, 5]. The “firmness” in food materials is analogous to “stiffness” in engineering materials, and is more conveniently described by the force-deformation relationship. A number of instruments have been developed to measure firmness of fruits. Amongst these instruments, the Effegi type penetrometer is widely regarded as a standard firmness tester [6, 7, 8].

METHODOLOGY

3.1 Selection of samples

Samples of three tomato varieties Maheshi, HF-2 and T-146 at equal maturity level were harvested directly from a farm maintained by HORDI at Gannoruwa. Maturity level was determined by the colour of the tomato. While harvesting tomatoes, the sun- shaded side (generally the side closer to the tree stem) was marked on the tomato [9]. Tomatoes having equator diameter in between 45 mm to 70 mm and polar diameter in between 35 mm to 50 mm have been selected for the investigation. The firmness of the tomatoes was measured using Effegi type Bishop FT 327 firmness tester (See figure 1). The plunger of diameter 11.3 mm was used for determination of firmness of tomatoes. Attention was paid not to select any of the radial arms of pericarp for tomato testing [10]. The anatomy of tomato is shown in the simplified diagram in figure 2. A circular portion of the peel of diameter about 2 cm was removed before applying the plunger of the firmness tester in order to eliminate the effect due to the peel [4].



Figure 1: Effegi type (Bishop) FT 327 firmness tester

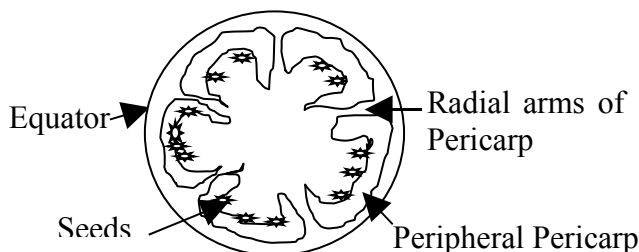


Figure 2: Cross section of a tomato

3.2 Firmness measurements

Forty eight tomatoes from each variety were selected from farm-fresh tomatoes plucked from plants. Firmness on the sun-exposed side and the sun-shaded side (of 16 fruits from each variety) were measured soon after plucking. The rest of the tomatoes were kept in an untreated environment. The same firmness test was carried out on the samples (16 fruits a day from each variety) which were kept in the untreated environment after 2 and 3 days of shelf life.

ANALYSIS AND DISCUSSION

Figure 3 shows the variation of the firmness of sun-exposed and sun shaded sides measured for tomato varieties T-146, Maheshi and HF-2 on the harvesting day (day 1), second and third day after the harvest.

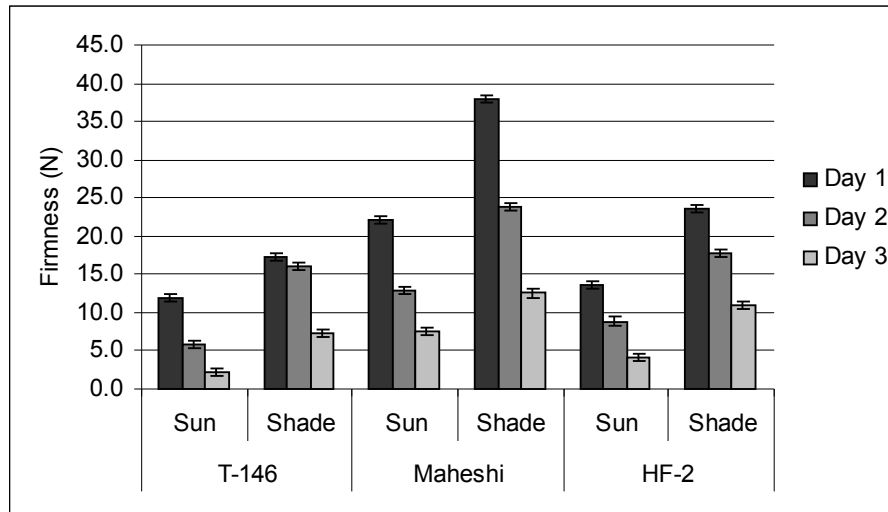


Figure 3: Variation of firmness of the sun-exposed and sun-shaded sides of each tomato variety with shelf-life.

Shaded side shows higher firmness compared to that of the sun-exposed side of the tomatoes of all varieties. This was also apparent to naked eye from its colour and texture. Shaded side was selected as the closer side of the fruit to the stem of the plant. Due to lack of sunlight, the rate of fruit maturing has been retarded.

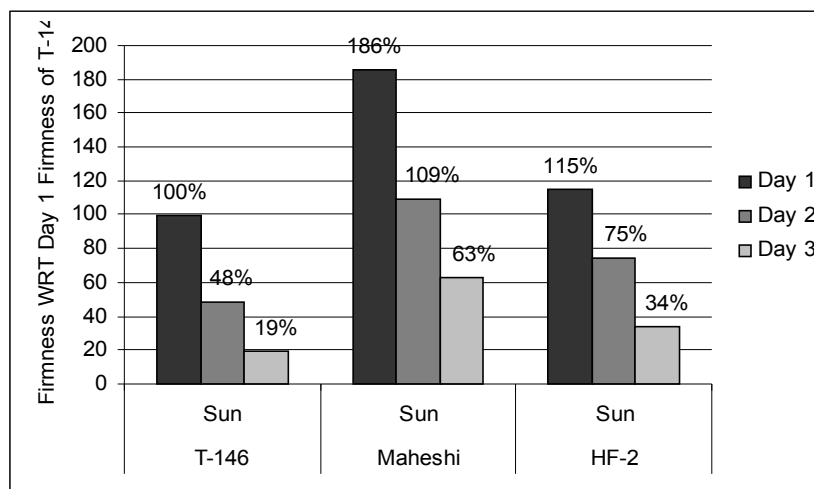


Figure 4: Percentage firmness of three tomato varieties with respect to the Day 1 firmness of T-146 variety.

A comparison between the day 1 firmness of the sun-exposed side of all three tomato varieties normalized to the firmness value (100%) of T-146 is given in Figure 4. Maheshi variety recorded the highest firmness, whilst T-146 variety indicated the lowest firmness at corresponding stages throughout the period of shelf life. The firmness of Maheshi variety on day 1 was nearly twice the corresponding value for T-146.

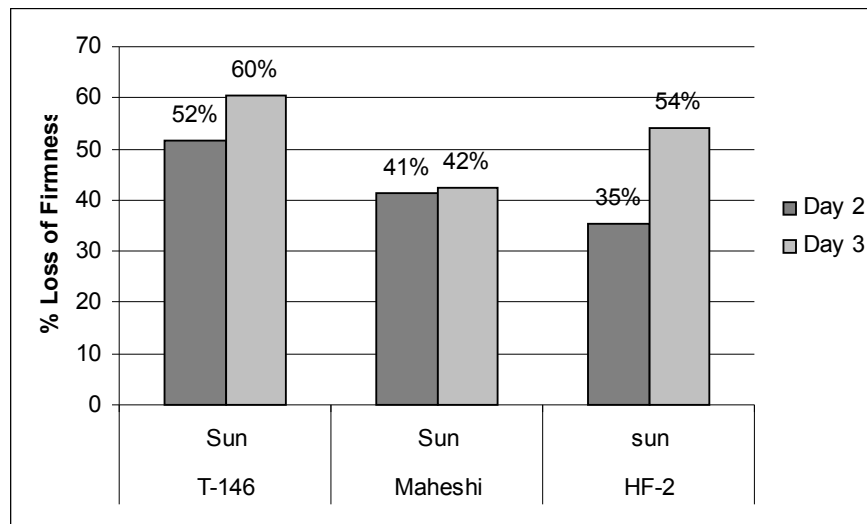


Figure 5: Loss-of-firmness of sun-exposed side with respect to the firmness of the previous day

Loss of firmness is an indication of degradation of fruit cells. The loss of firmness with shelf life is again an important parameter in marketing. As far as the daily percentage loss of firmness with respect to that of the previous day is concerned, T-146 variety suffered the largest degradation (figure 5). The percentage loss of Maheshi variety remained low, about 41% and, was almost the same for both days. T-146 is a recommended variety for the Sri Lankan farmers by HORDI, and Maheshi and HF-2 are local hybrids. Maheshi variety shows highest firmness compared to the other two varieties. HF-2, which is again a hybrid variety, also has a high firmness compared to the recommended T-146 variety. Loss of firmness is low for both hybrid varieties Maheshi and HF-2, compared to that of T-146. In the aspect of firmness and the loss of firmness due to shelf life, the hybrid variety Maheshi shows superior properties compared to the other hybrid variety HF-2 and the recommended variety T-146 both.

CONCLUSIONS

In general all three tomato varieties indicated a higher firmness on the sun-shaded side, compared to that of the sun-exposed side. Throughout the period of shelf life under the investigation, the Maheshi variety indicated the highest firmness and the lowest loss-of-

firmness compared to the corresponding values of the other two varieties. The descending order of corresponding firmness values was found to be Maheshi, HF-2 and T-146 and the same order holds for the ascending pattern of loss of firmness all the time. It strongly backs for the expected superior quality of Maheshi variety over the other two during handling processes, storage and shelf life in marketing chain. Maheshi is the first officially released, locally hybrid tomato variety in Sri Lanka. Seeds of Maheshi variety are now available for local farmers. Competing with other imported hybrid tomato varieties, the Maheshi variety is expected to have a promising demand among farmers because of the low price of seeds.

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