

Determination of Load Bearing Capacity of Two Nigerian Fresh Tomato Varieties

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ABSTRACT--- *Tomato cultivars – Roma and Ibadan local (Ibadan L) at stage five degree of ripeness were subjected to rupture test by application of varying weights of 1 – 2.5kg to determine the time it takes to rupture the fresh tomato samples. Roma cultivar of 23g size took 28 min and 1.2 min to rupture under 1kg and 2.5 kg weight respectively while the same variety of 76g size took 90min and 50min to rupture under 1kg and 2.5 kg weight applied respectively. For Ibadan Local (Ibadan L) of 23g size, it took 17 min and 0.67 min to rupture under 1kg and 2.5 kg weight respectively while that of 76g size took 70 min and 15 min to rupture respectively. This result showed that for any variety, the bigger the size of the fruit, the longer the time taken for the fruit to rupture under any particular load applied. The extent fresh tomatoes are able to keep and maintain freshness in their ripen state depends on their load bearing capacity.*

Keywords--- Tomatoes varieties, Applied weight, Load bearing capacity

1. INTRODUCTION

Tomato (*Lycopersicon esculentum*) constitutes one of the most important supplementary sources of minerals and vitamins in human diet. The estimated annual production of fresh tomatoes in Nigeria was 1.7 million tons of about 129.65 million tons of the world's tomato production [1]. This represents about 1.3% of world tomato production output. In addition Nigeria imported processed tomato paste to the tune of 105,000 metric tons valued at over ₦16 billion between 2009 and 2010 [2]. This constitutes a huge drain on the country's scarce foreign exchange. A loss of 50% has been reported to occur between harvesting, transportation and consumption of fresh tomatoes [3]. Limited shelf life and losses in quality have been identified as the major problems faced in the marketing of fresh tomatoes [4].

Refrigeration and cold storage system often used in advanced and temperate countries for fresh produce storage may not be suitable for use in Nigeria due to their high cost of energy requirement. Also most tropical fruits and vegetables like tomatoes are subject to chilling injury when stored at refrigeration temperatures [5]. Since tomato consumption in Nigeria is mainly in the fresh form, it is essential that they are stored in a system that can maintain their freshness until when consumed without any noticeable physiological disorder.

According to reports [6] tomato cultivars with thick skin are generally more resistant to handling practices, storage diseases or physiological disorders so are usually preferred for storage in their fresh forms. Firmness of tomatoes is determined by consumers using finger feel and under other conditions slicing characteristics which tend to reflect quality via the degree of softness observed. In recent years, much popular concern has been expressed regarding the deteriorating quality of fresh tomatoes available in the Nigerian consumer market [5, 7, 8]. Tomato fruit quality has been reported to comprise of subjective and objective attributes [9]. Appearance, colour and flavor are primarily subjective tomato quality attributes which influence consumer acceptability while fruit acidity, pH, total solids, pigment content etc are objective attributes that can be quantified and related to quality [10] carried out simulated transit studies on tomatoes: effects of compressive load, container, vibration and maturity on mechanical damage while [11] studied the effect of evaporative cooler environment on the visual qualities and storage life of fresh tomatoes. The extent fresh tomatoes are able to stay in these systems will depend on their ability to withstand pressure and their load bearing capacity. Hence, the objective of this study is to determine the effect of applied weight on the load bearing capacity of fresh tomato varieties.

2. MATERIALS AND METHODS

2.1 Procurement of fresh tomatoes

Fresh tomatoes of the “Roma” and Ibadan Local (Ibadan L) cultivars at stage 5 (full red colour) [12] were obtained from the retail fruit stands of Mile 12 market in Lagos, Nigeria

3. METHOD OF STORAGE

A modified method [11] was used for the storage of fresh tomatoes prior to the testing. Tomato fruits free of any visible defects were washed carefully under tap water and allowed to drip dry at room temperature conditions. These samples were unpackaged and laid out in the laboratory bench for testing. Each tomato fruit of a particular cultivar was weighed and sorted according to sizes and their individual weights were noted.

4. TEST FOR THE LOAD BEARING CAPACITY

A modified method [10] was used for this study. Tomatoes of the same cultivar were sorted according to sizes and their weights varying from 23, 28, 39, 52, 63, 72, 74, and 76g were noted. The control compression machine mode (CAT T104) of load varying from 1kg, 1.5kg, 2.0kg, and 2.5kg was used to compress these tomatoes and the time taken for each tomato to rupture was noted.

5. RESULTS

The results of the time taken for the Roma tomato sample of the same weight/ sizes to rupture under varying weights of 1.0 – 2.5kg are shown in Table 1. Table 2 shows the result of the time taken for the Ibadan local tomato sample of the same weight/ sizes to rupture under varying weights of 1.0 – 2. From Figs. 1 and 2, it is clear that a relationship exists between the weight of tomato and the time taken to rupture under different applied weights. It can be seen from the graphs that the time of rupture for both tomato varieties depend on the load applied. Therefore, to prolong the time of rupture and extend the freshness of tomato, the tomatoes maybe sorted to size before packaging or a new form of package designed. This result has showed that as currently done in which baskets are used to transport fresh tomatoes from production centres in Northern Nigeria to the Southern part of the country; the tomatoes at the bottom tend to rupture faster compared to those at the top. To avoid this, tomatoes of smaller sizes should be at the top while those of bigger sizes are at the bottom. It can be suggested from this result, that wooden flat boxes or crates should be used in order to avoid tomatoes from resting directly on themselves and as well reduce the rate of rupturing of tomatoes before getting to the final consumers.

6. DISCUSSION

The results of the time taken for the Roma tomato sample of the same weight/ sizes to rupture under varying weights of 1.0 – 2.5kg are shown in Table 1. Table 2 shows the result of the time taken for the Ibadan local tomato sample of the same weight/ sizes to rupture under varying weights of 1.0 – 2. The results showed that for any one variety under varying load that the time taken for the tomato to rupture has a direct relationship with the size of the fruit. It was observed that for any variety, the bigger the size of the fruit, the longer the time taken for the fruit to rupture under any particular load applied. Moreso, the bigger the applied load (kg) for the same size of tomatoes, the shorter the time taken for the tomato to rupture. These results are in agreement with the findings of earlier workers [10].

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Table 1: Time (min) of Rupture of Tomato (Roma variety) under varying weight

Weight of tomato	Applied Load (kg)			
	1.0	1.5	2.0	2.5
23g	28min	25min	10min	1.2min
28g	32min	29min	13min	3.5min
39g	41min	32min	19min	5min
52g	55min	36min	25min	7min
63g	59min	40min	40min	27min
72g	83min	46min	49min	33min
74g	87min	72min	55min	39min
76g	90min	79min	60min	50min

Table 2: Time (min) of Rupture of Tomato (Ibadan Local variety) under varying weight

Weight of tomato	Applied Load (kg)			
	1.0	1.5	2.0	2.5
23g	17 min	12 min	3 min	0.6 min
28g	20 min	18 min	6 min	1 min
39g	25 min	20 min	8 min	1.5 min
52g	30 min	23 min	12 min	1.8 min
63g	38 min	28 min	25 min	5 min
72g	40 min	31 min	29 min	8 min
74g	51 min	50 min	32 min	10 min
76g	70 min	51 min	48 min	15 min

LEGEND TO FIGURES:

Figure 1: Graph of time of rupture (mins.) against weight of samples under different applied weights (Roma cultivar)

Figure 2: Graph of time of rupture (mins.) against weight of samples under different applied weights (IbadanL cultivar)

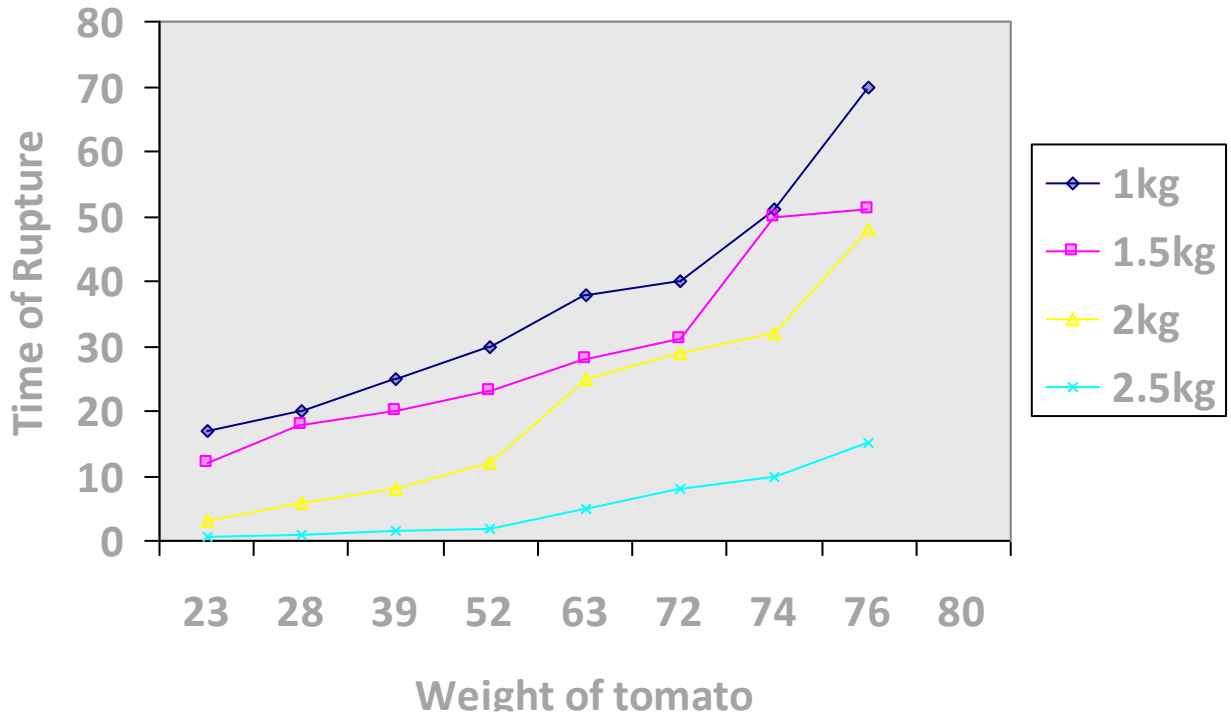


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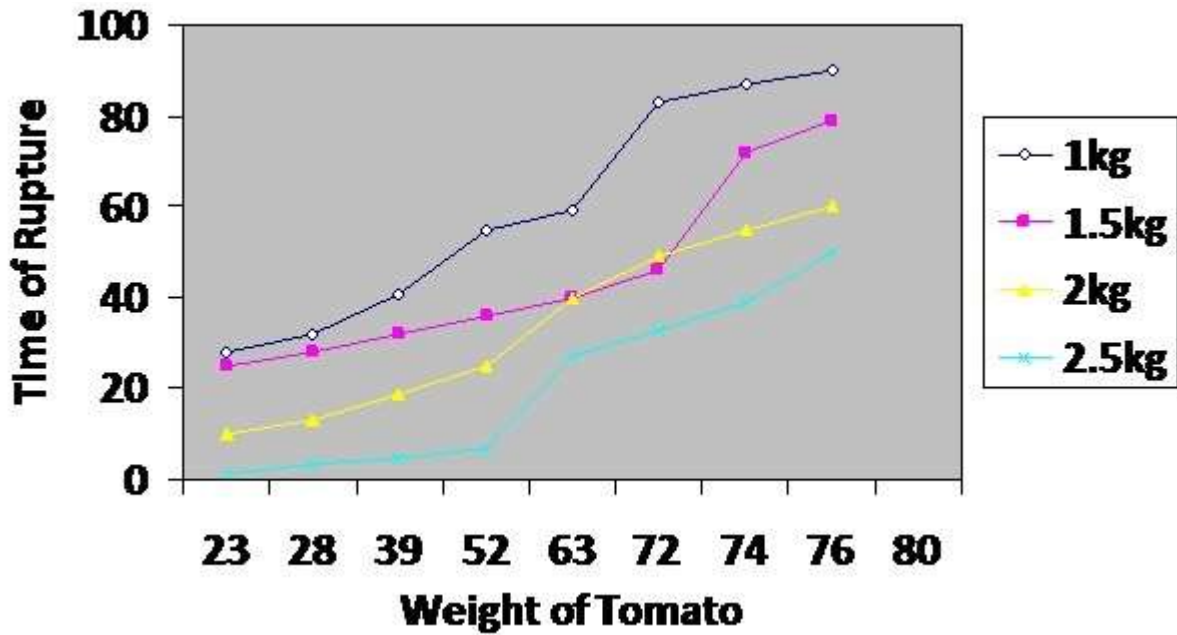


Figure 2: Time of rupture (min) against weight of samples under varying Weights (IbadanL cultivar)