

Investigation of some Effective Parameters on Tomato Fruits Losses at Post Harvesting

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ABSTRACT

In order to prevent from losses of gardening products, after packaging and during transport, it should be done on operational and different procedure on them; this operation based on type of product, and how that distance and to carry is different. The study on fruit-specific tomato, to determine the appropriate harvest time in days (d_1, d_2) , type of packing boxes in four levels (b_1, b_2, b_3, b_4) , distance road transport at two levels (L_1, L_2) , and time after harvest at two levels (t_1, t_2) , on weight loss characters and mechanical damages, during a factorial experiment in completely randomized design was conducted. Analysis of variance showed that at the time t_1 , and t_2 , the percentage of weight loss during harvest time d1 was more than d_2 , also in the same condition, mechanical losses was vice averse. The minimum and maximum weight loss was observed respectively, 1.3% and 4.99% for packing b_1 , at the time of review (t_1) , and for (b_2) , at the time of review (t_2) . In addition; Mechanical wastes after harvest at the time of review (t_1) and (t_2) , for Packing (b_4) , at time (t_1) as a minimum, and for (b_1) at the time of review (t_2) was obtained the highest rate.

KEYWORDS: Tomato fruits, weight loss, transportation, post harvesting time, mechanical losses.

INTRODUCTION

One unpleasant result of increasing the level of mechanization in agriculture is increasing mechanical losses and what this phenomenon is accompanied by unwanted would be, increase corruption rate and reduce product quality. This reduce in the quality is caused mechanical losses in products. Mechanical damage in agricultural products is a phenomenon; that provide the situations directly and indirectly for the creation of wastes. This damage can be created in harvest process, post harvest replacement, packaging, transportation and distribution of fruits and vegetables. On this basis, identify conditions and factors affecting agricultural mechanical damages in products can lead to reduction of wastes in this sector [1].

Another factor affecting wastes is the temperature, determine harvest time during the day due to changes in temperature, affect the mechanical damages. In this relation, study by Carlos et al (1993), which have done on cherry, it was found that ability to mechanical damage in this fruit by increases tissue temperature from zero to 30°C, gradually decreases. In another study on the two types of apples, three levels of temperature and three relative humidity levels were determined which with increasing humidity from 50-100%, the amount of vulnerability of apples will increase [1]. Temperature is the most important environmental factors in the penetration and rot of products after harvest. For height every 10°C the risk of crush, 2 to 3 times increase [10].

In determining the type of packaging, different study was conducted and after storage for 148 days of apple, weight loss have reported in wooden box about 5.36 percent and in plastic box about 3.53%, and in continued their experiments, the percentage of corruption in the wooden box was more than plastic box [5]. Idah et al (2007), also by reviewing contact tomato fruit with different levels (cardboard, wood, metal, plastic and foam) found that the maximum energy absorption, was obtained due to the metal surface and has direct relationship with height falling.

The other researchers on the stage of waste were reported that during the transport of peach product by distance 260 km, about 40 percent of total product caused damage from transportation. In another study to identify and determine levels of damage on apple fruit due to filling stage and move to large apple boxes and transport them to place of packing has been done and Results showed that transport distances less than 6 km; substantially doesn't affect the form of physical waste of fruit [1]. Dixit and Sharan (2008), knows, the long distance of transportation on percentage of waste has direct effect. He used carton for most the wooden box about determination of the type of waste packaging and transportation over 250 km distance. In a study to determine the type of box that was performed Guyana East Coast research institution, Use cartons with a capacity of tomato fruit weight of 9 and 11 Kg with good ventilation for the transportation are offered (14). In time after harvest, Mohammadi Aylar et al (2009), in review mechanical properties, came to the conclusion that with over time, the resistance of tomato fruit against force pressure is low. Vursavus and Ozguven (2003), in evaluation of vulnerabilities in the peach fruit, reached to this conclusion that the mechanical vulnerability over time from harvest process, significantly increase.

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MATERIALS AND METHODS

This study accomplished as a one 4 factorial test $(2 \times 4 \times 2 \times 2)$ in a completely randomized design with three replications on tomato fruit, type of Early-CH. Factors tested, respectively, are two levels of harvest (d₁- 8 am, d₂- 1 pm). Box packing (B) at four levels with the following specifications:

(b₁) packed in large plastic box with dimensions 30×47 and 37 cm height.

 (b_2) packed in a wooden box with dimensions 31×47 and 29 cm height.

 (b_3) packed in small plastic box with dimensions 28×38 and 20 cm height.

 (b_4) packed in carton boxes with dimensions of 33×49 and 20 cm height.

Road transport (L), at two levels (L_1 - to the distance of 70 km, L_2 - to distance of 210 km from production place to consumption) and time after harvest (T), at two levels (t_1 - 24 hours after harvest and t_2 - 72 hours after harvest). Effect of mentioned treatments on the traits, percent weight loss (E), and mechanical waste (F), were studied and at each stage of harvest, the number of 24 boxes at picked randomly from tomato product by training workers, was done manually, was placed directly in encoded boxes, so that the height of fruits was lower from surface of boxes.

Required materials for the test of box packing, by 24 number of each type, a digital scale with precision 0/001 grams, construct Iran-PAND industry, Model 8000–PAND, tomato fruit about 2400 kg and a machine model 2400 Nissan Saipa Was used. For determine the percentage weight loss we have used from difference of weight, but to obtain the percentage of mechanical wastes were used visual sensory & clear seed to seeds of tomato fruit method. All obtained data in tables were predetermined and recorded and were analyzed statistically in SPSS & Excel software.

RESULTS AND DISCUSSION

According to the results from harvest time, package type, and distance road transport for most considered traits was significant. These results show that an appropriate factor to determine the percentage changes in weight and mechanical lesions of tomato fruit has been used in this study. So that we can easily reduce mechanical wastes by control and selected factors directly.

To determine the percentage weight loss in study 24 hours after harvest (t₁), it was found that the wooden box and carton has the highest percent (4.49) in the morning harvest, and the lowest (1.2) percent in the afternoon. This difference in the 1% level of probability was significant (fig. 1). And in examination 72 hours after harvest (t₂), this weight loss for the wooden box increased to 5.1% and also Carton 2.9% (fig. 2). Other findings also show a complete correlation between time and the evaporation of moisture (weight loss) exists [3]. Also, Zmorrody (2005), in comparison to wooden and plastic boxes for keeping apple, concluded that weight loss in the wooden box was respectively 5.6% and in plastic box 3.56%. Najib et al (2010), in his study found that red tomatoes stored at temperatures 22°C toward 12°C, had more weight loss from 3.44% after 10 days.



Fig. 1 & 2: show the comparison weight loss during day at evaluation times (t_1) and (t_2) .

Also the results showed that the percentage of mechanical wastes at time study (t_1) , for Carton was 13.02, in the morning and for wood box was 23.35, respectively in noon harvest that had minimum and maximum percentage (fig. 3), but in review (t_2) this results, respectively rose to 25.88% and 38.89 (fig. 4). Linke and Geyer (2002), suggested that if the air flow and temperature control, we can say that it can have a positive effect on fruit quality of tomato. Afkari Sayyah (2009), in consider the effect of temperature and fruit size to achieve a probability of tomatoes vulnerability under the effect of impulse, concluded that reducing the keeping temperature from 20 to 4°C was caused reduction of resistance to amount of 27%, They tested their research sixth day after harvest at temperatures 4 and 20°C and humidity 75%.



Fig. 3&4: show the comparison mechanical wastes during day at evaluation times (t_1) and (t_2) .

Another important result of this study was that in study of weight loss at the time (t_2), type of packaging and transport roads, the results showed that with increasing distance road, percentage weight loss is higher, this weight loss was 4.21%, for wooden box after the distances L_1 , and for large plastic basket after the distance L_2 , was 4.76% percent more than other packages (fig. 5).



Fig. 5: Effect of package type with road transport on the percent weight loss of tomato fruit at time t₂.

Geyer et al (2003), in review to determine the percentage of wastes in the tomato fruit found that after 2 hours of road transport, wastes was more than 4% of fruit weight, and in continue their research concluded that with the fall of tomato fruit on wood surface from height 1 m, the loss reached to 7%, and after the transport, intensity of damage has reached to 30% fruit weight. Linke and Geyer (2002) also found that plastic basket has better impact on time of maintaining tomato fruit. Van linden et al (2007), considered handling and road transport, as dynamic forces operating on apples which cause more damage and injury, and ultimately results Sharan et al (1999), confirmed that type of Packaging and distance road transport, has direct effect on wastes, also they determined the severity of damage to their packing cartons 2.8% and for the wooden box was 4.6%.

RESULT

Considering the obtained results of each harvest in day, either noon (temperature higher of morning) the closer, we observe less weight percent with increasing time after harvest, this weight loss in this probable level 1% Was significant. It is better not to harvest too early in the morning because the results showed significant differences compared to noon harvest about the increase in losses.

Although the percentage difference about weight loss between harvest in morning to noon were (0.1-2%), but in comparison with mechanical losses, harvesting at morning toward noon had less percent wastes about (1.1-7.3%).

With time after harvest in this study, it was found that at the time 24 hours after harvest to consumption market is necessary, because at the time (t_2) , (72 hours after harvest), percentage of mechanical losses growth would be reached to 2-3.5.

In transport road, whatever road traffic distance is more, the percentage of more would be less, because toward more distance (70-210 km), losses has increased to 96%.

Carton and small plastic basket, compared to other packages had less weight loss and mechanical damages, but in comparison these together, carton conditions were better.

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