

Design and Manufacture of a Pistachio Peeling Machine

R. Khodabakhshian, M.R. Bayati, M. Shakeri and M. Khojastepour

Department of Agricultural Machinery,
Ferdowsi University of Mashhad, P.O. Box: 91775-1163 Mashhad, Iran

Abstract: Pistachio is one of the important horticulture crops and second exportable non-crude oil product after carpet. Generally, in Iran pistachio is peeled by bolt type peeling machines and the subsequent processes, including washing and dehydrating is fulfilled by a another machines. These peeling machines are made without any attention to mechanical properties of pistachio that this causes to break considerable percentage of pistachio when peeling. Therefore, it is essential to design a peeling machine with high efficiency that can carry out washing and dehydrating processes, too. So, a pistachio peeling machine designed and developed that can do peeling, washing and dehydrating processes simultaneously. The machine is designed on the basis of physical and mechanical properties of pistachio and all calculations related to strength of material done. In order to peel pistachio in this machine, centrifugal force is used. The unit consists of two main parts: the peeling set and the power transmission system. The peeling set consists of a rotating drum and a separate rotating circular base - plate. These two parts rotate in opposite directions, employing two separate electrical motors. The power transmission system of machine is mechanically by belt and pulley, so that they convey power of 3 hp between electrical motors and peeling set.

Key words: Pistachio % Mechanical properties % Peeling machine % Centrifugal force

INTRODUCTION

Pistachio is one of the important horticulture crops in Iran. Most of the pistachio nuts are exported to countries around the world. For the first time in year of 2003, after petroleum and carpet, pistachio with 72 thousands tones gained the first score in export goods, bringing 272 million dollars to the country. Iran owns about 48 percent of the pistachio world production, United State, Turkey and Syria are other main producers [1]. Within the seventy years ago, pistachio specially has gained a commercial and economical value and Iran reputed as the first and main exporter in the world. From that time, the area cultivation of this product is increasing more and more. Developing this product in many regions is not practical because of weather condition limitation. So, for taking a good ranking at the world production of this strategic product, we should increase it's yield [2].

Pistachio is one of the products which can not be entered to market directly after harvest. It should follow stages for rendering to market. In fact, these stages are processes that call retention and preservation.

These processes are (1) hulling, to separate the soft hull from nuts; (2) trash and blank separation, to remove blank pistachios and trashes such as small branches, remaining shells and leaves; (3) unpeeled pistachios separation, to remove unpeeled and unripe nuts; (4) washing, which involves spraying water at high pressure on the pistachios to clean the nuts; (5) drying, to decrease moisture content of pistachios from 37% to 4% to appropriate level; (6) split nuts separation, to separate split nuts from non-split ones; (7) roasting; and (8) packaging [3].

In production process of pistachio, peeling is the most important process after harvest. In Iran, peeling of pistachio is different according to softness or hardness of it. Those which have soft skin are peeled by bolt type peeling machine and pistachio with hard skin are peeled by another machine that name unripe peeler. Bolt type peeling machine is the only commercial mechanized method in Iran. The machine has been developed and improved during the last 50 years. The main part of the machine is a rotating drum covered by the heads of M6 bolts. The soft skin is detached by vertical and shear stresses produced by these bolts