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# DESIGN AND ANALYSIS ON DURIAN OPENER

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"I hereby, declare this thesis is result of my own research except as cited in the references"

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To my beloved family

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# ABSTRACT

The present investigation primarily designs of the durian fruit opener that easy to use and create the model for the design. To build up the idea of design the durian opener, research on the different body shape and size of durian fruit from different species have to be done well in order to get the dimension for the design. Beside that, research on old type methodology of opening a durian fruit also will be consider to find out the weaknesses of the methodology and solve the weaknesses with new idea of design. There are many different types of durian fruit opener that used by people nowadays. Therefore, research will be done on those openers to find out the weaknesses such as its size, method of use, safety factor, etc. From these, more information will be collect for analyses so that a more easy to use and comfortable durian opener idea can be create for the conveniences of durian fruit fans. After the full concept design have done, a model of durian fruit opener will be fabricate for the analysis test on its toughness and the force that it can afford on it. A suitable material to fabricate the design of durian fruit opener also will be considering in this project.

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## ABSTRAK

Projek ini adalah kajian tentang mereka cipta satu alat pembuka buah durian yang mudah untuk digunakan dan membangunkan model rekabentuk tersebut. Untuk membina gagasan reka bentuk pembuka buah durian yang sempurna, kajian ke atas pelbagai bentuk dan saiz buah durian daripada pelbagai spesis hendaklah dikaji dengan baik untuk mendapat dimensi rekabentuk tersebut. Selain itu, kajian ke atas kaedah lama yang digunakan untuk membuka buah durian juga akan dipertimbangkan untuk mengetahui kelemahan-kelemahan kaedah tersebut dan menyelesaikan kelemahan-kelemahan dengan idea baru rekabentuk. Terdapat pelbagai jenis alat pembuka buah durian yang digunakan sekarang. Oleh itu, kajian akan dibuat ke atas alat pembuka yang sedia ada untuk mengetahui kelemahan-kelemahan seperti saiznya, kaedah penggunaan, faktor keselamatan, dan sebagainya. Daripada ini, lebih banyak maklumat dapat dikumpulkan untuk membuat analisis supaya satu rekaan yang lebih mudah dan selesa dapat dibangunkan bagi kegunaan atau keselesaan peminat-peminat buah durian. Selepas idea konsep penuh telah dibuat, sebuah model pembuka buah durian akan difabrikasi untuk ujian analisis ke atas kekuatan alat tersebut. Bahan yang sesuai untuk membina rekabentuk pembuka durian juga akan dipertimbangkan dalam projek ini.

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# CHAPTER I

# INTRODUCTION

## 1.1 Background study

The durian is the fruit of trees from the genus Durio belonging to the Malvaceae, a large family which includes hibiscus, okra, cotton, mallows, and linden trees. Widely known and revered in Southeast Asia as the "King of Fruits", the fruit is distinctive for its large size, unique odour, and formidable thorn-covered husk. The fruit can grow up to 30 centimeters long and 15 centimeters in diameter, and typically weighs one to four kilograms. Its shape ranges from oblong to round, the colour of its husk green to brown, and its flesh pale-yellow to red, depending on the species (Djatmiko W.A. 2007).

Nowadays, there are many recognised durian species available in the international market. There are hundreds of durian cultivars, most of them propagated by vegetative clones; where farmer will mixed up the seeds from different type of durian. Beside vegetative clones, farmer will also propagated by layering, marcotting, or more commonly, by grafting, including bud, veneer, wedge, whip or U-grafting onto seedlings of randomly selected rootstocks. Different cultivars can be distinguished to some extent by variations in the fruit shape, such as the shape of the spines. Most of these durian cultivars have a common name and a code number starting with "D" such as, Kop (D99), Chanee (D123), Kradum Thong, Sultan, Mao Shan Wang and with no common name, D24 and D169 (Djatmiko W.A. 2007).

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The durian fruit is ready to eat when its husk begins to crack. However, the ideal stage of ripeness to be enjoyed varies from region to region in Southeast Asia and by species. Some species grow so tall that they can only be collected once they have fallen to the ground, whereas most cultivars of D. zibethinus are nearly always cut from the tree and allowed to ripen while waiting to be sold. Some people in southern Thailand prefer their durians relatively young when the clusters of fruit within the shell are still crisp in texture and mild in flavour. In northern Thailand, the preference is for the fruit to be as soft and pungent in aroma as possible. In Malaysia and Singapore, most consumers prefer the fruit to be quite ripe and may even risk allowing the fruit to continue ripening after its husk has already cracked open. In this state, the flesh becomes richly creamy, slightly alcoholic, the aroma pronounced and the flavour highly complex (Morton, J. 1987).

The durian rind is greenish-or-yellowish-tan-brown, and covered with thick, sharp- pointed, pyramidal spikes, of many variations in shape. The rind is extremely tough and has evolved so as to be able to fall to the ground without major damage to the fruit (unless it lands on solid rock) from heights as much as 40 meter. Larger durian fruits can be gingerly and carefully picked up bare-handed by placing the fingers between the spikes; smaller fruits with small spikes are difficult to hold bare-handed for more than a few moments. (People who handle durians professionally often use thick gloves.) The weight of the fruit and its spiky armor make a durian grove a hazardous place to be during ripening season, unless the fruits have all been pre-tied with strings or ropes to prevent their fall to the ground, or large safety nets positioned to catch them (Morton, J. 1987)

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## 1.2 Problem Statement

A durian fruit is delicious and it was the 'King' of fruit in Malaysia. However, because of it covered by spikes and the outer flesh of durian fruit are thick and tough it can be difficult to open if you don't know how. Therefore a durian opener which is easy to be use and reliable has to be design to provide convenience for people that like to eat durian fruit.

## 1.3 Objectives

To design and fabricate a durian opener which is easy to be handle and reliable.

## 1.4 Scope

The research will focus on the design of a new durian fruit opener. To complete the design, research on the old type durian fruit opener in market is important. This research is to find out the weaknesses of the old type durian fruit opener so that to improve it at tha new design. Following this, discover the optimum and easy methodology to open a durian fruit. Using the information get from the research to design a conceptual idea of durian opener. Fabricate the model of the new design follow the real dimension so that it can be analyse the strenght of the new design of durian opener.

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# CHAPTER II

# LITERATURE REVIEW

## 2.1 Durian Fruit

The durian, native to Brunei, Indonesia and Malaysia, has been known to the western world for about 600 years. Durian had been famously described its flesh as "a rich custard highly flavoured with almonds" in the 19th century. The flesh can be consumed at various stages of ripeness, and is used to flavour a wide variety of savoury and sweet edibles in Southeast Asian cuisines. The seeds can also be eaten when cooked. (Wallace A. R. 1900). The name durian comes from the Malay word duri (thorn) with suffix -an.

Figure 2.1: Picture of Durio Kutejensis fruits, also known as Durian Merah
(Source: Djatmiko W.A., (2007))

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The durian tree, reaching 27-40 meter in height in tropical forests, is usually erect with short, straight, rough, peeling trunk to 1.2 meter in diameter, and irregular dense or open crown of rough branches, and thin branches coated with coppery or gray scales when young. The evergreen, alternate leaves are oblong-lance-olate, or elliptic-obovate, rounded at the base, abruptly pointed at the apex; leathery, dark-green and glossy above, silvery or pale-yellow, and densely covered with gray or reddish-brown, hairy scales on the underside; 6.25-25 cm long, 2.5-9 cm wide. Malodorous, whitish to golden-brown, 3-petalled flowers, 5-7.5 cm wide, with 5-lobed, bell-shaped calyx, are borne in pendant clusters of 3 to 30 directly from the old, thick branches or trunk. (Morton, J. 1987)

Figure 2.2: Durian tree, compared to human height
(Source: Yun, H. Y., (2008))

Figure 2.3: Durian flowers
(Source: Bryan Loh, (2007))

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## 2.2 Different Species of Durian Fruit

There are 30 recognized Durian species, at least nine of which produce edible fruit. There are hundreds of durian cultivars; most of them have a common name and a code number starting with "D". Among the thirty known species of Durian, nine of them have been identified as producing edible fruits*: D. zibethinus, D. dulcis, D. grandiflorus, D. graveolens, D. kutejensis, D. lowianus, D. macrantha, D. oxleyanus and D. testudinarum*. (O'Gara *et al*. 2004). However, there are many species for which the fruit has never been collected or properly examined, so other species with edible fruit may exist. (Brown, Michael J.1997) .There is over 300 named varieties of durian in Thailand. Only a few of these are in commercial cultivation. In Malaysia, 100 types are graded for size and quality. In peninsular Malaya, there are 44 clones with small differences in time and extent of flowering, floral and fruit morphology, productivity and edible quality (Morton, J. 1987). All Thai durians and most Malaysian durians are varieties and clones of only one species, Durio zibethinus, and the common domestic durian, which has been bred and selected for centuries in Southeast Asia for various desirable qualities (Shunyam Nirav). Some popular clones are Kop (D99 ), Chanee (D123), Berserah or Green Durian or Tuan Mek Hijau (D145 ), Kan Yao (D158), Mon Thong (D159), Kradum Thong and with no common name, D24, D101 and D169. (O'Gara *et al.* 2004).

Figure 2.4: Durio Oxleyanus
(Source: Nirav, S., (2003))

Figure 2.5: Durio Graveolens
(Source: Nirav, S.., (2003))

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Figure 2.6: Durio Oblongus together (Source: Nirav, S., (2003))

Figure 2.7: Three rare Durio species (Source: Nirav, S., (2003))

## 2.3 The Shape of Durian Fruit

The fruits are ovoid or ovoid-oblong to nearly round, 6 to 12 in (15-30 cm) long, 5 to 6 in (12.5-15 cm) wide, and up to 18 lbs (8 kg) in weight. The yellow or yellowish-green rind is thick, tough, semi-woody, and densely set with stout, sharply pointed spines, 3- to 7-sided at the base. Handling without gloves can be painful. Inside there are 5 compartments containing the creamy-white, yellowish, pinkish or orange-colored flesh and 1 to 7 chestnut-like seeds, 3/4 to 2 1/4 in (2-6 cm) long with glossy, red-brown seedcoat. Some fruits split into 5 segments, others do not split, but all fall to the ground when mature. (Morton, J. 1987)

Figure 2.8: Durian fruit is armed with sharp thorns, fully capable of drawing blood. (Source: Takato Marui, (2006))

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