RECYCLE FOOD WASTE INTO ANIMAL FOOD (DOG)

MARY ANAK UDIN

B051810010

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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RECYCLE FOOD WASTE INTO ANIMAL FOOD (DOG)

This report is submitted in accordance with requirement of the University Teknikal Malaysia Melaka (UTeM) for Bachelor Degree of Manufacturing Engineering (Hons.)

by

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MARY ANAK UDIN

B051810010

941202-13-6112

FACULTY OF MANUFACTURING ENGINEERING

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Tajuk: **RECYCLE FOOD WASTE INTO ANIMAL FOOD (DOG)**

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Alamat Tetap:
Rumah Ama, Nanga Keluton,
96510 Pakan, Sarikei, Sarawak

Tarikh: 27/6/2022

Cop Rasmi:

NIK MOHD FARID BIN CHE ZAINAL ABIDIN PhD
PENSYARAH KANAN
FAKULTI KEJURUTERAAN PEMBUATAN
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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DECLARATION

I hereby, declared this report entitled "Recycle Food Waste into Animal Food (Dog)" is the result of my own research except as cited in references.

Signature :

Author's Name : MARY ANAK UDIN

Date : 27 June 2022

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka as a partial fulfilment of the requirement for Degree of Manufacturing Engineering (Hons). The member of the supervisory committee is as follow:

.....

(Dr. Nik Mohd Farid Bin Che Zainal Abidin)

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ABSTRAK

Sejumlah besar sisa makanan yang tidak dimakan termasuklah sisa tulang ayam dijana setiap hari. Malaysia mempunyai masalah anjing liar yang besar yang biasanya memakan hampir semua jenis sisa makanan untuk terus hidup. Anjing liar mudah tertarik dengan sisa makanan terbuka kerana mereka sensitif kepada bau makanan. Hal ini boleh menyebabkan penyakit dan masalah seperti cirit-birit, muntah, tercekik, kurang selera makan, sembelit, kecederaan pada mulut, pendarahan rektum dan kematian yang paling teruk kepada anjing liar. Namun, masih kurang kajian untuk menghasilkan makanan untuk makanan anjing liar. Oleh itu, penyelidikan ini tertumpu untuk membangunkan proses pembuatan untuk mengilang semula sisa tulang ayam menjadi makanan anjing liar berdasarkan standard. Alternatif ini boleh membantu untuk mengelakkan masalah diet kepada anjing liar yang. Dalam penyelidikan ini, makanan anjing liar kering telah dihasilkan dalam bentuk biskut. Mesin dan peralatan yang digunakan dalam pembuatan makanan anjing liar ialah ketuhar pengering, ketuhar elektrik, mesin penghancur, pengisar berkelajuan tinggi, penimbang elektronik dan acuan tulang anjing. Makanan anjing liar dihasilkan mengikut urutan proses yang telah dibangunkan. Elemen penting dalam proses pembuatan ialah parameter proses termasuk suhu dan tempoh bakar, komposisi ramuan bahan mentah, pengikat dan penstabil dalam setiap sampel. Bahan mentah yang digunakan ialah sisa tulang ayam, bahan pengikat ialah kanji jagung, telur dan minyak kelapa, manakala penstabil yang digunakan ialah serbuk kunyit. Di akhir kajian ini, sampel makanan anjing liar telah dihasilkan dan diuji kepada anjing liar menggunakan pendekatan ujian pemakanan. Didapati bahawa parameter untuk mengilang semula makanan anjing terbiar daripada kitar semula sisa tulang ayam adalah pada suhu 130° selama 80 minit menggunakan komposisi 20% sisa tulang ayam, 47% tepung jagung, 20% minyak kelapa, 10% telur keseluruhan, 3% serbuk kunyit. Sampel makanan yang dihasilkan juga turut lulus eksperimen ujian pemakanan kepada anjing liar. Oleh itu, terbukti bahawa sisa tulang ayam boleh dikitar semula menjadi makanan anjing liar menggunakan parameter yang dicadangkan dalam penyelidikan ini.

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ABSTRACT

Huge amount of unconsumed food waste (FW) include chicken bone waste is generated everyday including. Malaysia has a massive stray dog problem that will often eat almost any kind of waste including edible and non-edible produced by human to survive. They are easily attracted to open FW as the most important diet of a stray dog is the smell of the item. This may result in diseases and eating problem to them such as diarrhea, vomiting, choking, lack of appetite, constipation, injuries to mouth, rectal bleeding and worst-case death to the stray dogs. There is still lack of research of producing food for stray dog food. Therefore, this research is focused to develop manufacturing processes to remanufacture chicken bone waste into stray dog food based on standard. This alternative may help to avoid mentioned problems to stray dogs eating diet. In this research, dry stray dog food has been produced in the form of biscuit treats. The machines and equipment used in the stray dog food manufacturing are drying oven, electric oven, crusher machine, high speed blender, electronic scale and dog-boned mould. The stray dog food is produced according to the developed process sequence. Important element in the manufacturing process is controlled process parameters including baking temperature and duration, ingredients compositions of raw material, binders and stabilizer in each sample. The raw material used is chicken bone waste, binders used are corn starch, whole egg and coconut oil, while stabilizer used is curcumin powder. At the end of this research, stray dog food samples have been produced and tested to the stray dogs using feeding trials approach. It is found that the parameters to remanufacture the stray dog food from recycle chicken bone waste are at 130° for 80 minutes using composition of 20% chicken bone waste, 47% corn flour, 20% coconut oil, 10% whole egg, 3% curcumin powder. The produced food samples also passed feeding trials experiment to the stray dogs. Therefore, it is proven that chicken bone waste can be remanufactured into stray dog food using the suggested parameters in this research.

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DEDICATION

To my beloved parents and family members,
That give me unconditional loves and support towards completing this report,

To my adored friends,
That gives me help and encouragement along this journey,

Also,
To the most important person, my supervisor,
That give me guidance, time, patience, cooperation, and understandings,

And lastly,
For those whoever pray for me towards completing this report,
Thank You So Much & God Bless You All Forever

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LIST OF ABBREVIATIONS

UK	-	United Kingdom
AD	-	Anaerobic digestion
EU	-	European Union
LCF	-	Low opportunity-cost feed
BSF	-	Black soldier fly
BSFB	-	Black soldier fly bioconversion
FW	-	Food Waste
CFLF	-	Chicken food liquid fertilizer
FLW	-	Food loss and waste
NFPC	-	Non-food parts of crops
CBW	-	Chicken bone waste
BHA	-	Butyl-hydroxytoluene
BHT	-	Butylated hydroxy toluene
PER	-	Protein Efficiency Ratio
SDAP	-	Spray-dried Animal Plasma
FSC	-	Food supply chain
NRC	-	National Research Council
NFPC	-	Non-food parts of crops
GA	-	Guaranteed analysis
AAFCO	-	Association of American Feed Control officials
FDA	-	Food and Drug Administration
SCP	-	Single cell protein
PER	-	Protein efficiency ratio
GSE	-	Grape seed extract
NDF	-	Neutral detergent fibre
NIR	-	Infrared reflectance
ADF	-	Acid Detergent fibre
ADL	-	Acid detergent lignin
NIT	-	Near-infrared transmittance

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LIST OF SYMBOLS

Min	-	Minutes
G	-	Grams
°C	-	Degree Celsius
%	-	Percentage
w. b %	-	Moisture percentage
kg	-	kilogram
max	-	maximum
min	-	minimum
mg/kg	-	myasthenia gravis per kilogram
mg/dog	-	myasthenia gravis per dog
kcal/gram	-	kilocalories per gram
Nm	-	Nanometre
Mm	-	Megametre
MHz	-	Megahertz
GHz	-	Gigahertz
°F	-	Ferenheit
ME/kg.	-	Metabolizable energy per kilogram

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CHAPTER 1
INTRODUCTION

In this chapter, the outline and intent of the research will be discussed. In this chapter, the contains for research background, problem statement, objectives, scopes of research, significant of the research and organization of report will be discussed.

1.1 Research Background

This research is about "Recycle Food Waste into Animal Food (Dog)" via critical review. In Malaysia, about 1.64 kg of food waste (FW) per day is generated which consist of unconsumed food waste excluded leftover food such as expired bread, rotten fruits and eggs are generated (Jereme et al., 2016). The amount of food waste is continuously generated every year and summing up at the landfills. However, according to (Theses and Abd Razak, 2017), there are several alternatives can be taken to reduce the amount of food waste. In such, the recycling of food waste into animal food is one of the alternatives to reduce food waste to go to the landfills.

Interestingly, food waste can be beneficial to animal by remanufacturing them into animal food. Animal food also known as comestibles. For example, (Jonathan Rivin, Zen Miller and Olivia Matel, 2014) stated that there is a need to use alternative sources of feed ingredients such as food waste for growing the livestock feed to save more cost. According to (Murugesan et al., 2021), food waste can be recycled into new value-added products such as compost, biogas and animal feed. Hence, that food waste has the potential to be remanufactured into dog food.

This research therefore focuses on identifying potential to be remanufactured into

dog food. However, some considerations need to be taken to produce the dog food in this research. One important element in production of animal food is the additional substances such as binder and stabilizer as well for dog food production. Dog food can be in the form of dry, wet, semi-moist as well snack. Manufacturing processes using machines and equipment including drying oven, electric oven, crusher machine, high speed blender, electronic scale and dog-boned mould to produce the dog food will be developed in this research. At the end of this research, dog food samples will be produced and tested to the dogs.

1.2 Problem Statement

Hundreds of billions of kg of animal bone waste are produced each year, which is either rendered or disposed to prevent environmental issues (Kermavnar, Shannon and O'Sullivan, 2021). For instance, chicken bone waste is unavoidable waste which sum up each day in landfill as it is unable to consume by human. In today's developed world, the 'premiumization' of pet meals is the major driver of pet food development (Alexander et al., 2020). Most of dog food manufacturers are expanding focus which shift to produce higher-priced products with higher-priced ingredients for domestic and breed dogs. However, the stray dogs are left behind. As a result, stray dogs will eat almost any kind of waste including edible and non- edible produced by human to survive. The most important diet of a stray dog is smell of the item. For that reason, they are easily attracted to open food waste and when in desperate, they will often eat plastic containers or chicken bone waste that smell like food. The problem when stray dogs eat ground chicken bone waste is it may result in diseases and injuries such as diarrhea, vomiting, choking, constipation, mouth injuries and rectal bleeding which may lead death to them. According to Animal Welfare Board of India (AWBI) in consultation with RWA or Municipal Corporation, stray dogs have the right to be fed well by citizens. However, there is still lack of research in producing food for stray dogs. Therefore, an alternative to remanufacture chicken bone waste into good quality of stray dog food based on standard will be carried out in this research which could save them from starving, diseases and injuries. The opportunity to produce stray dog food from chicken bone waste is potentially high as chicken bone waste is summing up each day from various sources. Thus, the manufacturing process to remanufacture stray dog food from chicken bone

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waste should be developed in this research. The knowledges on dog food are required.

1.3 Objectives

The purpose of this research is to accomplish two main objectives as follow;

i. Propose the sequence of manufacturing processes to produce stray dog food from chicken bone waste.

ii. Produce dog food sample from chicken bone waste using controlled parameters based on animal food manufacturing standard adopted from regulation of American Association of Feed Control Officials (AAFCO).

1.4 Scopes

The scopes of research are as follows;

i. This research focus is to conduct a critical review of recycle food waste into animal food (dog) as to produce stray dog food.

ii. The product to be produced is for stray dogs or street dogs. However, the product can be fed to domestic and breed dog but strictly cannot be fed to other animals apart from dog.

iii. There are various types of food waste, however, for this research, the intention isto produce stray dog food by remanufacturing the chicken bone waste with additional of food additives including binders and stabilliser.

iv. The dog food could be dried-based, wet-based and semi moist-based. However, the intention for this research to produce dry-based stray dog food product in the form of biscuit treats.

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v. The equipment and machine that will be used in the production of the dog food including drying oven, electric oven, crusher machine, high speed blender, electronic scale and dog-boned mould.

i. The dog food will be produced based on animal food manufacturing standard adopted from regulation of American Association of Feed Control Officials (AAFCO) using controlled process parameters.

1.5 Significant of the Research

The significant of the research are as follows;

ii. This research focus is to conduct a critical review of recycle food waste into animal food will help to reduce food waste contribution to landfills in Malaysia.

iii. Opportunity to gain new knowledge behind the experimental research by producing dog food from potential food waste using required machines and equipment.

iv. Generate new idea by developing proper sequence of manufacturing processes to produce the dog food.

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v. Ability to give relevant information for better understanding of food waste to be remanufactured into dog food using proper method.

vi. The findings of this study contribute further recommendations for people to start separating food waste to be recycle as dog food.

1.6 Organizational of the Report

The organization of report of this thesis is based on Universiti Teknikal Malaysia Melaka (UTeM)'s thesis format which is based on publication of this research. Each of chapter consists of introduction, review of literatures, methods, outcomes of discussion and conclusions. The arrangement of report starts with chapter 1, follow by chapter 2,3,4 and 5.

Chapter 1 consists of problems that commenced with this research and the research objectives were clearly described in this chapter. The significance of this research and the scope of the study were also properly elaborated. Chapter 2 provides an overall review of the literature on the previous studies on the areas relating to the title of this thesis. In addition, within the chapter the study distance identified from previous studies was also clarified. Chapter 3 describes the research methodology for the planning, testing and data assortment of materials used in this analysis. Chapter 4 presents the postulated outcome, theory, or study of the research. The findings and analysis for dog analyzed and explained within this chapter via critical review. In addition, the findings were also addressed in this chapter and contribute to the purpose of this report. Chapter 5 presents the overall conclusions of the study as a whole and gives future recommendations, including the improvement of this study in the future.

1.7 Summary

As for the summary, chapter 1 consists of background of study, problem statement, objectives, scopes, significant of study, organization of report and summary. As for chapter 2 is discussion about the literature review related to the study. Chapter 3 is about research methodology while chapter 4 is about findings, analysis and discussion of the study. Finally, chapter 5 is about the recommendations and conclusions on the results.

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