FORMULATION OF MEDICINAL TOOTHPASTE FROM JATROPHA CARCUS LATEX

UMMI HAJIRA BINTI KHAIRUDDIN

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Faculty of Chemical Engineering & Natural Resources
University Malaysia Pahang

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ABSTRACT

Since many centuries,latex of Jatropha carcus Linn as a plant that cure many illness such as toothache bleeding gum due to antimicrobial activity. **The objective of this research are** to formulate the medicinal toothpaste using latex of Jatropha Carcus, to test antibacterial activity of this medicinal toothpaste and to determine the stability studies of toothpaste formulation. The genus name jatropha derives from the Greek word jatro's(doctor) and trophe'(food),which implies medicinal Formulation of medicinal toothpaste from jatropha is the research for improvement dental health products . This toothpaste is invented to defuse which illness due to toothache. Eventhough the latex has been used traditionally as a plant medicament, scientific investigation including toxicological studies was very limited Typical toothpaste formulation contain several components such as abrasive, humectant, surfactant, binder, sweetener, preservatives, water and active ingredients For method analysis, In vitro method is a suitable method to observe the antimicrobial activities before and after stability test. Evaluation of antimicrobial activity and the stability study of the formulation toothpaste can certainly have promising result. Various weight of active ingredients are been tested which is used five increasing amount of J.curcas Latex (312 µg, 625 µg, 1250 µg, 2500 µg, 5000 µg). Zone of inhibition of antimicrobial test is increasing when the amount of active ingredient(J.carcus latex) is increasing. Its shown that latex of jatropha has potential in antimicrobial activity.This formulation is expected to be commercially more viable and effective alternative without significant compromise on the teeth cleaning effect. Therefore the result of this study would be possible reference of toothpaste formulation in Malaysia open markets to reduce oral bacteria toothpaste.

ABSTRAK

Sejak berkurun lamanya, lateks dari jarak carcus Linn sebagai tanaman yang menyembuhkan banyak penyakit seperti sakit gigi dan gusi berdarah kerana dipercayai mempunyai aktiviti antimikrob. Tujuan dari penelitian ini adalah untuk merumuskan ubat gigi ubat menggunakan lateks dari jarak Carcus, untuk menguji aktiviti antibakteria ubat gigi ini dan untuk menentukan kajian kestabilan formulasi Jatropha nama merupakan genus berasal dari (doktor) dan jatro dari bahasa Yunani dan trophe ' yang membawa maksud (makanan) Formulasi ubat gigi dari lateks jarak adalah kajian untuk meningkatkan kualiti produk kesihatan gigi. Pasta gigi ini dicipta untuk meredakan sakit gigi. Walaupun lateks telah digunakan secara tradisional sebagai , kajian ilmiah namun kajian toksikologi adalah sangat terbatas. Formulasi khas ini mengandungi beberapa komponen seperti , pelembap, pengikat surfaktan,, pemanis, pengawet, air dan bahan aktif Analisis formulasi ini memlalui kaedah In vitro merupakan kaedah yang sesuai untuk mengamati aktiviti antimikrob sebelum dan sesudah ujian kestabilan. Penilaian aktiviti antimikrob dan kajian kestabilan formulasi ubat gigi pasti bisa mendapatkan hasil yang menjanjikan. Berberapa berat lateks jarak (bahan aktif) ini digunakan (312 mg, 625 mg, 1250 mg, 2500 mg, 5000 mg). Zon penghambatan uji antimikrob meningkat ketika jumlah bahan aktif (J.carcus lateks) meningkat. Ini menunjukkan bahawa lateks dari pokok jarak mempunyai potensi dalam formulasi. Aktiviti antimikrob ini diharapkan dapat di komersil dan berkesan tanpa kompromi dan signifikan terhadap kesan membersihkan gigi. Oleh kerana itu hasil kajian ini akan menjadi acuan kemungkinan formulasi ubat gigi di pasaran terbuka Malaysia untuk mengurangkan sakit gigi yang di sebabkan bakteria oral.

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CHAPTER 1

INTRODUCTION

1.1 Background of study

Jatropha curcas, (Euphorbiaceace) is ashrub, which is widely used in tropical area, especially in Tropical region of the world . . All parts of *Jatropha curcas* plant (seeds, leaves, latex, bark, root, etc) have been used in traditional medicine and for veterinary purposes for a long time. Other than Jatropha curcas,there a many spesies of Jatropha such *as Jatropha glandulifera, Jatropha tanjorensis , Jatropha multifida, Jatropha podagrica ,* and *Jatropha intergerrima* (Oudula et a.l,2005) In rural area Jatropha plant cover 4 main aspect in rural development such as promotion of women (local soap production),poverty reduction (protecting crops and selling seeds, oil and soap); erosion control (planting hedges), and energy supply for the household and stationary engines in the rural area.(Henning, & Rothkreuz,2004)

For medicinal propose, toothpaste can be mixed with jatropha latex to produce medicinal toothpaste. Jatropha latex or sap is a trasparent liquid which comes out of cut leaves or branches, has medicinal effect. (Reinhard K and Henning,2009). Jatropha latex contain tannins and saponin,wax and resin. In tropical africa and Southheast the latex is used to be efficacious in treating scabies, eczema and ringworm. *Jatropha curcas* latex had been used by folklore as a cure for toothache, as a mouth rinse to treat bleeding gums, treat gum inflammation, strengthen the gums, soothe a baby's inflamed tongue and many more. The latex is used as anti-inflammation by massaging the latex on the traumatic area. (De Feo V,

1989). According to Ganesan in his research paper, young stem or latex of Jatropha Carcus latex used as toothbrush, and to treat mouth ulcer. In The Philippines and Indonesia, a little latex on absorbent cotton is used to cure a toothache. The latex is used as anti-inflammation by massaging the latex on the traumatic area. J.curcas latex exhibited antibacterial activity against *Staphylococcus aures*.(Siregar & Kristani, 2007). *Staphylococcus aures* It is a spherical bacterium, frequently part of the skin flora found in the nose and on skin.

Formulation of medicinal toothpaste from jatropha is the research for improvement dental health products . This toothpaste is invent to defuse which illness due to toothache. Therefore, this formulation is done by mixing the compound of toothpaste with the jatropha latex. Formulation is mixing the compound or subtances prepared as per a formula. Several formula is made for a particular application and normally are hyperactive than its individual component when it used alone. However, the compund that mixing is do not react in other to get mixtured with desired charactheristics. It done by measuring liquid by volume and solid by weight.

Toothpaste is paste or gel dentifrice that can be used with toothbursh to clean and maintain the aesthetics and health of teeth. It also used to remove dental plague and food from teeth. The purpose of oral hygiene using toothpaste is to reduce oral bacterial flora. Mouth bacteria have been linked to plaque, tooth decay and toothache. According to little Oxford English Dictionary Plaque 1 (a sticky deposit forms on teeth and which bacteria grow quickly)has been linked to gingivitis, periodontaldisease, or dental carries. Previous studies have shown that dental plaque can be controlled by physical removal of plaque, use of antimicrobial toothpastes and mouthwashes(Trop J and Pharm R.,2009*).* Tooth brushing with toothpaste is the most widely practiced form of oral hygiene in most countries (Pannuti *et al*.,2003). Twice daily brushing has significantly declined dental caries. Dental plaque is a biofilm on the tooth surface that plays an important role in the development of caries and periodontal diseases (Moran and Addy.,1998). While the mechanical removal of plaque on caries per se is equivocal, the maintenance of an effective plaque control is

the key element of any attempt to prevent and control periondontal diseases (Jenkins and Addy.,1990). As an consequences, toothpaste provide an ideal vehicle for chemical adjuncts. A wide range of chemicals, mainly antimicrobial agents, have been added to toothpaste in order to produce direct inhibitory effect on bacterial formation (Fine *et al*.,2006).

1.2 Problem Statement

There are a lot herbal and natural toothpaste in Malaysia market itself using active ingredient such as neem, sea cucumber, brush wood,aleo vera, and many more.Research regarding formulation of medicinal toothpaste using jatropha latex has never been done. Eventhough the latex has been used traditionally as a plant medicament, scientific investigation including toxicological studies was very limited. Besides, this formulation also improve the hygenity of using Jatropha Carcus latex as dental cure since it being use traditionally

1.3 Objective

1) To formulate the medicinal toothpaste using latex of Jatropha Carcus.
2) To test antmicrobial activity of this medicinal toothpaste.
3) To determine the stability studies of toothpaste formulation.

1.4 Spoce of Study

Raw material used in this study is the latex of Jatropha Carcus. By knowing the objectives of this study, a formulation of medicinal toothpaste from Jatropha Carcus latex will be done with various weight of the latex. There a several range of weight of latex is being prepared. .A test of antimicrobial activities is determine by In vitro method. The toothpaste formulation a filled in a appropiate tube and subjected to stabilities studies by storing at room temperature and normal athmospheric condition for two months and evaluated for antimicrobial activity . Optimization of the weight of the active ingredient will be determined in order to produce the effective toothpaste formulation. This project will leverage the research strength and create revenues. This aim of this invention is to extend Malaysian export market in the pharmaceutical and dentifrice manufacturing sectors.

1.5 Rational and Significance

Formulation of medicinal toothpaste from Jatropha latex is a new research study.Since Jatropha latex has medicinal properties, so this product has highly market patern in toothpaste formulation industries. Before this product can be marketed, several test should be done such as industrial and clinical test.

CHAPTER 2

LITERATURE REVIEW

2.1 Jatropha carcus

Jatropha curcas L (Euphorbiaceae) is a multipurpose plant widely distributed in the wild or semi-cultivated in Central and South America, Africa. India and South East Asia (Cano LM.,1986; Cano et al.,1585). It is commonly known as "Barbados nut", "Black vomit nut", "Curcas bean", "Kukui haole", "Physic nut", "Purgeer boontjie" and "Purging nut tree" (Perry ., 1980) and can grow up to 6 m and life span can reach more than 50 years. The genus name jatropha derives from the Greek word jatro's(doctor) and trophe'(food),which implies medecinal. The genus Jatropha belongs to tribe Joannesieae in the Euphorbiaceae family and contain approximately 170 known species. uses.(Ashwani and Sharma.,2008). This plant can resist at drought season and the plantation is widely culvatived in tropic fence, because it is not browsed by animal. All part of Jatropha(seed,leaves and bark) have been in traditional medicine and for vaterinary purpose for a long time (Ashwani & Sharma.,2008).

There are some compund in Jatropha carcus that has been found are reported to treat tumor such as Curcacycline A. The seed of Jatropha carcus are toxic to humans and many animal. Chemical isolated from different parts of the plant have been presented in Table 1 (Ashwani & Sharma.,2008). The chemical compositon that reported in this paper is Curcacycline A, a cyclic octapeptide Curcain (a protease).

The previous phytochemical screening of Jatropha carcus latex releaved the presence of saponin,steroid, tannins, alkaloids and flavornoids which is secondary metabolite exert the antimicrobial activities of J.carcus(Igbinosa *et. al*.,2009).

Previous research claim tannins can form irrevesible complexes with prolinerich protien(Shimada.,2006) result from zone inhibition of cell protien. Tanins in herbs can treat intestinal disorder such as diarrhea and dysentery (Dharmananda.,2003). These obeservation review the J.carcus has a herbal cure remedies.

Table 1 – Chemicals isolated from different parts of the plant

Various parts	Chemical composition	References
Aerial parts	Organic acids (o and p-coumaric acid, p-OH-benzoic acid, protocatechuic acid, resorsilic acid, saponins and tannins	Hemalatha and Radhakrishnaiah (1993)
Stembark	β-Amyrin, β-sitosterol and taraxerol	Mitra et al. (1970)
Leaves	Cyclic triterpenes stigmasterol, stigmast-5-en-3β, 7 β-diol, stigmast-5-en-3β,7α-diol, cholest-5-en-3β,7β-diol, cholest-5-en-3fl,7α-diol, campesterol, β-sitosterol, 7-keto-β-sitosterol as well as the β-D-glucoside of β-sitosterol. Flavonoids apigenin, vitexin, isovitexin	Mitra et al. (1970), Khafagy et al. (1977), Hufford and Oguntimein (1987)
	Leaves also contain the dimer of a triterpene alcohol ($C_{63}H_{117}O_9$) and two flavonoidal glycosides	Khafagy et al. (1977)
Latex	Curcacycline A, a cyclic octapeptide Curcain (a protease)	Van den Berg et al. (1995) Nath and Dutta (1991)
Seeds	Curcin, a lectin Phorbolesters Esterases (JEA) and Lipase (JEB)	Stirpe et al. (1976) Adolf et al. (1984), Makkar et al. (1997) Staubmann et al. (1999)
Kernal and press cake	Phytates, saponins and a trypsine inhibitor	Aregheore et al. (1997), Makkar and Becker (1997), Wink et al. (1997)
Roots	β-Sitosterol and its β-D-glucoside, marmesin, propacin, the curculathyranes A and B and the curcusones A–D. diterpenoids jatrophol and jatropholone A and B, the coumarin tomentin, the coumarino-lignan jatrophin as well as taraxerol	Naengchomnong et al. (1986, 1994)

Figure 2: Chemical isolated from differents parts of the plant.

(Ashwani & Sharma.,2008)

2.2 Jatropha Latex Properties

In this research, Jatropha carcus latex used as raw material that has been added in toothpaste formulation. *Jatropha curcas*, a multipurpose, drought resistant, perennial plant belonging to Euphorbiaceae family is gaining a lot of importance in medicinal uses Jatropha latex has medicinal effect, the latex contain tannins and saponin, wax and resin. Tanins has diverse biological activities ranging from toxicity to normal mimicry, and may play role in protecting plant from herbivory disease(Ann E. Hagerman, 2000). Saponins, known as ginsenosides, are the principal bioactive ingredients (Kim et al., 2005).

The plant is antibiotic, insecticidal and used for toothache and as blood purifier. The stem latex of Jatropha is formerly used by rular dweller ,herbalist and some people in urban area to stop bleeding from nose, gum and skin. In tropical to Africa and Southheast Asia the latex is used as a hemostatic and wound dressing and is said to be efficacious intreating scabies and ringworm(Siregar and Kristani, 2007). The latex is used to dress sores, ulcers and inflamed tongues (3). In Perti and Indonesia, the latex is applied to treat external wounds (13;14) and the latex also latex is applied to bee and wasp stings. (8)Base on Fazwini, fresh latex was put into the cavity of dental caries. To consider the possible use in dentistry, many experiments should be completed and the safety level should be determined. In this formulation, Jatropha latex is been tested as active ingredients to prevent the microbial activity before and after several period. The method that should been done to test antimicrobial activity is In vitro method.

2.3 Properties of Toothpaste

Toothpaste is a most typical oral care product to reduce oral becteria flora or to prevent periodontal desease. ingredient Toothpaste is a paste that been used to clean the teeth. Toothpaste is classified as drugs not cosmetics (Okpalugo et al.,2009). Drugs contain an ingredient to achive the effect of consumer desire such as antibecterial.ingredients (J Okpalugo et al., 2009). In this research, Jatropha carcus latex can be added in this.

Toothpaste is multicomponents-mixtures of different inorganic and organic compunds (Konig & Walldorf.,1989). Thus there a some properties to formulate toothpaste such as abrasive,surfactant,humectants, moisturizing components and solvents, water, sweetening agents,flavours, preservatives, thickening agents, dye and special ingredient known as active ingredien.

Abrasive also called as polishing agents Cleaning and polishing (function) Solid, insoluble particles . It has potential for fluoride interaction It. used in dentistry for abrading, grinding, polishing Remove debris & residual strain from teeth. There are types and examples of Abrasives Phosphates help the product to leave the teeth looking white and feeling clean such as Dicalcium phosphate dihydrate Calcium pyrophosphate Carbonates.

Function of surfactant to produce foam and aid in the removal of debris Emulsifies flavoring agents Characteristics: It may react with other toothpaste components High level may cause mucosal irritation. Sodium Lauryl Sulfate Sodium N-Lauryl Sarcosinate and Sodium Dodecyl Benzene Sulfonate PEG examples for type of surfactant.

Function of Preservative to prevent the growth of micro-organisms in toothpastes.It also should non-irritating, compatible with other ingredients, and it should be used in combination for example Sodium benzoate, Methylparaben, and Propylparaben.

Binder provide consistency, shape, and keep the solid phase properly suspended in the liquid phase to prevent separation of the liquid phase out of the toothpaste. They also provide body to the dentifrice, especially after extrusion from the tube onto the toothbrush. A binder or thickener can prevent the toothpaste from drying out. They control the viscosity and contribute to give the toothpaste a creamy consistency. Types and examples of Binders is Natural Polymers ,Carboxymethyl Cellulose (CMC) ,Carrageenans, Xanthan Gum, Synthetic Polymers, and Others

Humectant used in toothpaste to prevent loss of water and subsequent hardening of the product upon exposure to air. Characteristics of this properties affect taste perception. Thus, proper usage level produce a clear translucent toothpaste. Examples of humectant compound in toothpaste formulation is Glycerine, Sorbitol, Polyethylene Glycol, Xylitol, and Propylene Glycol

All this properties is combine is very low concentration of each properties. toothpaste formulation due to medicinal effect and its function as active ingredient. All of this components should be well mix to formulate a toothpaste and several test have to be done to make sure the stability of the toothpaste product and it antimicrobial activity. Anti-bacterial or active ingredients agent is a main component in toothpaste formulation that take action to treat and prevent toothache. Most of conventional toothpaste used triclosan as anti-bacterial agent in toothpaste product.(Sheri *et al*.,1996). But in this research, Jatropha latex is being used as active ingredient and make this formulation more natural and environmental friendly.

Former investigation reported the anti-parasitic activity of the sap and crushed leaves of J.curcas .Several studies have confirmed the antimicrobial efficacy of different Jatropha Species.(lgbinosa *et al*., 2009). Pharmacologically, the latex has been shown to possess significant cicatrizant activity (wound healing) attributed to its content of proteolytic enzymes (Villkgas et al.,1997). The sap has also demonstrated antimicrobial activity by inhibiting the growth of Candida albicans and Staphylococcus aureus (Robineau.,1991).

According to Pharmacutical buliten 24,October 29,2008 abrasives that found in toothpaste function as polisihing agent aiding the physical brushing during application. Abrasive also participate secondarily in the building of toothpaste rheology. In this formulation Calcium Carbonate is using as abrasive. Humectants and binding agents are important ingredients for maintaining the consistency of toothpaste. They are combined with preservatives to form complex mixtures referred to as humectant systems, which fulfill three purposes, providing a vehicle to which the other ingredients can be incorporated, keeping moisture in the toothpaste, and preventing the growth of microorganisms (JADA, 2001). Sweeteners impart a pleasant initial flavor and aftertaste and binders used to control or modify toothpaste rheology, viscosity, yield value and thixotropy. Besides, there are no fluoride content in this formulation. Jatropha carcus latex function as active ingredients will be mix into the formulation at several weight.

Several studies have confirmed the efficacy of different Jatropha latex when it used traditionaly; however, there is insufficient information regarding the antimicrobial activities of *Jatropha .curcas* latex for toothpaste formulation instead of other herbs such as neem, aleo vera , papermint, brush wood and ect. The addition of antimicrobial agents to toothpaste has been suggested as one possible method to improve the efficacy of mechanical tooth cleaning procedures (Moran *et al*.; 1988,Fine *et al*., 2006). aiding the control of dental plaque and preventing dental caries and periondontal diseases (White *et al*.,2006.;Ozaki et al.,2006). When these substances are added to oral products, they kill microorganisms by disrupting their cell walls and inhibiting their enzymatic activity. There are diverse type of mouth bacteria such as *Neisseria Staphylococcus, S. Pnuemoniae, Porphyromas gingivalis, Diphtheriod, Fusobacteria* and *Haemophilus*. Some of this bacteria is usefull and some other not. (Okpalugo et al., 2009). Although *C. albicans* is the major pathogen in oral candidosis, infections with Candida species other than *C. albicans,suchas C. krusei, C. glabrata* and *C. dubliniensis* have been increasingly described both in compromised and non-compromised hosts. (Yigit et al., 2008). Tannis prevent bacterial aggregation, slow multiplication and release endotoxins (Ozaki et al.,2006.;Bou-Chaera et al.;2005,Herrera et al.,2003).

A good Qualities of Dentifrices is Bactericidal & Bacteriostatic, Economical, Non- toxic Properly sweetened & flavored Give fresh & clean sensation Its also Remove food strains & foreign particles Clean teeth. Some studies(Fatima et al.,2000; Mullaly et al.,1995)have advise the consumers to avoid all bacteria that make antibacterial claim unless there are herb is being used in the formulation, but consumer make a final decision either the claim is good or not.

CHAPTER 3

METHODOLOGY

3.1 Materials and ingredients.

The raw material in this experiment is Jatropha carcus latex, with various weight will be mixed into toothpaste formulation. The weight of every each ingredients was decided by review previous study formulation of medicinal toothpaste. The combination of percentage by weight of all the ingredients of this is 100% which means sum of quantity of toothpaste will formulate 100ml of toothpaste formulation. The ingredients of this formulation can be devide into 4 phase which is phase A, Phase B, Phase C, and Phase D. All the chemical is shown in Table 3. .

Table 3: Toothpaste Formulation Ingredients

Phase A		
Ingredients	**Quantity used (w%)**	**Properties**
Sorbitol 70%	38.50	Humectant
Xantham gum	1.00	Binder
Soduim lauryl sulphate	1.80	Surfactant
Glycerin	4.82	Humectant
Phase B		
Sodium sacharin	0.10	sweeteners
Sodium Benzoate	0.76	Preservatives
Phase C		
Calcium Carbonate	50.00	Abrasive
Water	1.52	Diluent
Phase D		
J.carcus Latex	various weight	Active Ingredients
Menthol	1.50	Flavoring Agent

3.2 Apparatus.

3.2.1 Hot plate

Figure 3.1: Hot plate

Hot plate is being used to heat the several mixing compund that being dedive into four phase, Phase A, Phase B, Phase C and Phase D. The mixture temperature is control around 40 to 50ºC.

3.2.2 Mixer

Figure 3.2: Mixer

This formulation is done by using mixer. In this experiment, the ingredients are mix according to their phase. The mixing is done in 100ml beaker for each formulation and it mixed until homogenus.

3.2.3 Incubator

Figure 3.3: Incubator.

During in vitro method, nutrien agar plates were prepared by pouring 20 ml of nutrien in sterile petri dishes for antibacterical assay. Sterile petri discs is used to inoculate the formulation on the toothpaste and incubator is used to controlled temperature for the cultivation of bacteria. bacteria is obtain from oral swab by using lawn culture technique. The sterile petri discs are incubate at 37 ^{o}C for 24 hours and the observation is record for next three days.During this observation, the zone of inhibtion of microorganisme in petri discs is also measured.

3.2.4 Viscometer

Figure 3.4: Viscometer

Viscometer is a instrumend that being used to measured the viscosity of toothpaste formulation. In general, the toothpaste remains stationary and an spindle moves through it. The drag caused by relative motion of the toothpaste and a surface is a measure of the viscosity.

3.3 Experimental Procedure

3.3.1 Collection of Jatropha Latex

Latex of Jartropha carcus Linn is collect from Taman Pertaninan at Semambu, Kuantan, Pahang. Crude fresh latex was obtained by cutting the green stem of Jatropha carcus plant. The fresh latex is collect into 10 ml glass vials and a few drop of 95% ethanol (very few amount) has to be added to prevent browning and oxidation(Osoniyi & Onajobi.,2003). The milky white solution of Jatropha carcus latex was stored at -20ºC until being used. This plant material used as active ingredients to prevent microbial activities in toothpaste compound.

Figure 3.5: Latex collection