

SPECIALPROJECT
STUDY OF LONG PEPPER HONEY BEER FORMULATION

BY
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ID: 5438020

Report FT4190

A Special Project submitted to the Faculty of Biotechnology, Assumption University
in partially fulfillment of the requirement for the degree of Bachelor of Science in
Biotechnology

2017

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Level of study: Bachelor degree of Science

Department: Food Technology

Faculty: Biotechnology

Academic year: 2017



_____ Advisor

(Dr. Churdchai Cheowtirakul)

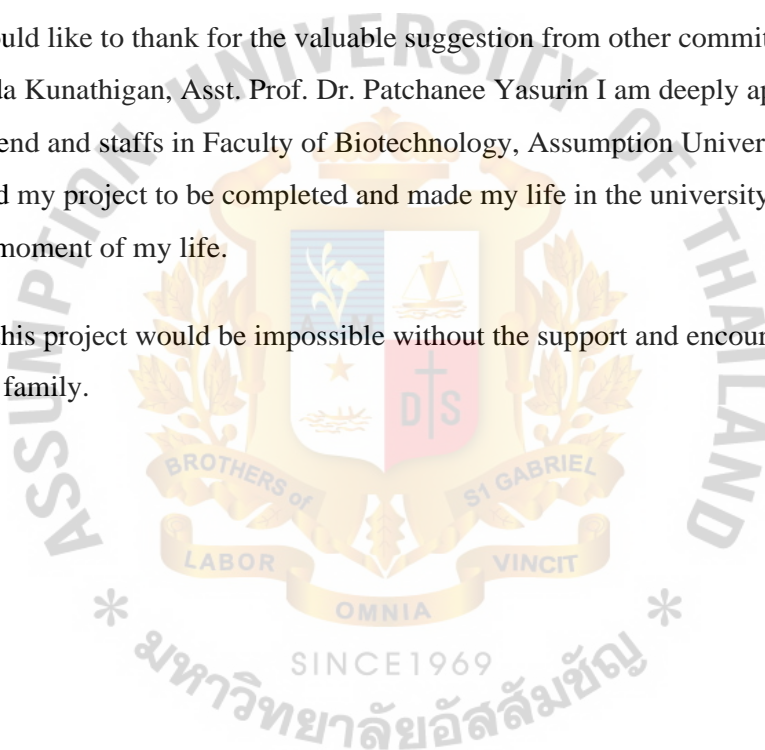
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I also would like to thank for the valuable suggestion from other committees, Dr.Viyada Kunathigan, Asst. Prof. Dr. Patchanee Yasurin I am deeply appreciated to my friend and staffs in Faculty of Biotechnology, Assumption University who supported my project to be completed and made my life in the university become the best moment of my life.

Finally, this project would be impossible without the support and encouragement from my family.



ABSTRACT

Study of Long Pepper Honey Beer formulations

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This project is to study the formulation of Long Pepper Honey Beer with best aroma and taste. Chemical and sensory evaluation were analyzed at the end. Long pepper or *Piper long, urn* is one of the most famous herb that can found only in the southern part of southern Asia, Especially in Thailand. Mostly of them have been used for medication and consumption as spice on various kind of food. But this study we will use as one of the main ingredient in the brewing process. The aroma and taste of long pepper will enhance the quality of our beer. We start the formulation by preparing 3 recipes. The amount of ingredients is varied as: Hops are varying in different amount(3.0g), long pepper preparing with grinding and also amount of long pepper (10g.,15.g.,20g.) are used in the brewing formula per 3.0liters of water. The sensory test has been done by random panelist to chosen the formula which have the best both in aroma and taste. From the sensory test the formula no.445 (6.0g. of hops, 15g. of grind long pepper) is the formula that obtained the best score for best aroma and taste. The sensory test was conducted by using the 9-point Hedonic rating, in all eight attributes. The result was: Foam stability (6.8 = 1.6 a), Color (7.02=1.52 a), Clarity (6.52+1248 a), Aroma (6.38=1.48b), Taste (6.48=1.5 ab), Bitterness (6.82=1.5 b), Alcohol content (6.82+1.53 a) and overall impression (7.28=1.33 b). The mean is greater than 7.00 which are good score for any product. The selected formula has pale green with 21.61* 4.3*26.8* on L*A*B scale, and3.8% of Alcohol, Total Solid is 6.0 Brix.

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INTRODUCTION

Recently, many people turned their attention to craft beer which not many people think about it in the past. At present, a lot of people concern about the health benefits especially the aspect of medical and nutritional property. The most common raw material used for making beer is malted barley and malted wheat. The four main ingredients for making beer are malt, hops, yeast and water. In this study, Long Pepper (Piper Longum) will be use as one of the flavor and aroma enhancing ingredient. The aim is to enhance the herbal aroma and health benefit of Long Pepper (Piper Longum) and Honey to our beer. The final beer should have good aroma and taste of Long pepper. Long pepper contains several important bioactive compounds which are useful in several health aspects. These active compounds are normally found in the leaves and seed, there are several summarized methodologies used in *the extraction of such bioactive compounds. Use of extract Long, pepper (Piper Longum) in folk medicine for the treatment of certain ailment was disputed. But recent findings have confirmed its efficacy (Kumar Sl, Kamboj J, Suman, Sharma S J Acupunct Meridian Stud. 2011 Jun.). This study is intended to explore the suitable formula to produce Long pepper (Piper Longum) honey beer with best aroma and taste of Pippali and honey enhancing the original beer flavor. The ratio of Long pepper, honey and hop, Long pepper and honey preparing method will be explored to obtain the most popular formula chosen by the panelist. The sensory and product acceptance will be done by panelists compose of both faculty members and panelist from outside of the campus. All the data and record will be noted in the result, discussion and appendix.

LITERATURE REVIEW

The use of spices and herbs in beers enchanted with hops has been known for a long time. The primitive beers of Sumerian and Egyptian were made with same type of early spice or flavoring material such as dates and herbs, Neolithic pottery was discovered on the island of Rheum and it contained a fermented beverage made with heather, meadow sweet, and royal fern. The fact that herbs and spices have a long history in beer making . should not be surprising. Beer made without hops (the original ale) tended to be a very sweet and cloying beverage. Even the early beers of the Middle Ages in Britain used a complex blend of herbs and spices to help balance some of the sweet malt notes with the specific aroma of herb and spices. While today's beers are almost exclusively brewed with hops, there are some modern versions of spiced beer crafted with heather, and other beers whose primary flavors are derived from herbs and spices. The use of herbs and spices in beer today is usually associated with the herbal ales of Belgium, the heather beer of Scotland, and the spicy, sometimes strong like the holiday ales of the United States. Belgian ales have long been known to require some spices in their brewing, including coriander, cumin, Curacao bitter orange peels, sweet orange peels, anise, ginger, cardamom, cinnamon, ginseng, vanilla, woodruff, and nutmeg.

I. BEER

The main ingredients in making beer:

1. Malt
2. Water
3. Hops
4. Yeast

1.1 Malt

Malt is being produced from grain and mostly barley. First of all, the barley from the fields is being thoroughly cleansed. The barley is ready for germination in warm and humid air lasting until the malt sprouts reach about the same length as the grain itself. During this process, valuable enzymes and malt sugar are being generated. For long durability, the grain is being dried over hot air on the called 'kiln'. The higher the kiln temperature the more malt sugar is converted into caramel. The more sugar is converted into caramel, the darker the malt and the brewed beer made out of it. The alcoholic content of beer only depends on the blend ratio of malt and water not on the color light or dark of the beer. Malted cereal grains are the meat and potatoes of beer. They provide the sugars that are fermented by the yeast to create alcohol and CO₂. They are the primary source of beer color and contribute significantly to flavor and mouth feel. The most common of the malted grains is barley malt. Others include wheat, rye, and oats. In addition to the malted gains, some un-malted cereal grains are used in brewing including corn, rice, wheat, rye, oats, and sorghum.

Malting is a process of controlled sprouting and kilning of the grains. The sprouting activate& enzyMes within the grain that begin to break down the hard, starchy insides into simpler carbohydrates, making them accessible to the brewer. Kilning gives the grains differing degrees of color and flavor. There are four categories of brewing malt. Base malts receive the least kilning. They are the lightest malts and make up the bulk of any beer recipe. Crystal or caramel malts are made by allowing enzymes in the grain to convert complex carbohydrates into simple sugars before kilning. Kilning then caramelizes the sugars in the grain. Crystal malts range in color from light to dark with correspondingly intense flavors. Toasted or kilned malts are drykilned to a range of colors and flavors. Roasted Malts are kilned at the highest temperatures until they are very dark brown or even black. (Christopher B. McIlroy, Aaron C. Bandremer, & Ken Takeda , 1999).

1.2 Water

For the beer production, it is of main importance that the brewing water is clean and free of impurities. In contrary to former times, the content of minerals (hardness) is not of crucial importance anymore since it is possible to balance its effects through natural composition alternatives of the malting and brewing process. More important is that the produced beer type is being attuned to the brewing water. Therefore, the brewing recipes are being defined for micro-brewery only after detailed and thorough water analysis. Their compliance is subject to permanent control. (Christopher B. Mcilroy, Aaron C. Bandremer, & Ken Takeda , 1999)

1.3 Hops

Besides the *convenient* flavor, the hops perform further important tasks during beer production. Due to its natural content of essential oils (as to be found in remedy herbs like chamomile and eucalyptus), the hops protect the beer against deterioration. Basically, one differentiates between aroma hops and bitter hops, the latter mainly being used due to its considerably lower price even though aroma hops is of higher quality•. Hops are the spice of beer. They provide bitterness to balance the sweetness of the malt, as well as flavors and aromas ranging from citrus and pine to earthy and spicy. Hops are the cone-like flower of a rapidly growing vine (a bine actually) in the cannabis family. Waxy yellow Lupulin glands hidden within the leaves of the flower contain the acids and essential oils that give hops their character. Bitterness comes from alpha acids that must be chemically altered through boiling in order to be utilized. Hop flavors and aromas come from essential oils that are easily dissolved into hot water, but are also highly volatile. Flavor and aroma hops must be added late in the boil or these properties will be lost with the steam. Hops more than any other brewing ingredient are subject to the phenomenon of terroir, as different growing regions produce hops with different flavor and aroma characteristics. The chief hop growing regions are the Northwestern US, Southern England, Germany, Czech Republic, and China. (Christopher B. McIlroy, Aaron C. Bandremer, & Ken Takeda , 1999).

1.4 Yeast

Yeast is the most important ingredient in beer brewing. It is a single-celled organism; a fungus (phylum Ascomycetes; class Hemiascomycetes; including 10 different families). Yeast is a living creature, metabolizing, reproducing, and living off the ingredients in the beer. It is responsible for the converting of sugar to alcohol and carbon dioxide in the fermentation stage. Yeast is also the final component that determines the flavor of the beer. There are thousands of varieties and strains of yeast. Even in the air, wild yeast is floating around ready to contaminate. Only cultivated strains of yeast should be utilized in the brewing of beer. If other yeast contaminates the beer, the results can be over carbonation, strange flavors, and all kinds of fermentation peculiarities. Therefore, picking the right yeast for the desired beer is an absolutely critical. The two main varieties of yeast used for beer brewing are top-fermenting yeast (*Saccharomyces cerevisiae*) and bottom-fermenting yeast (*Saccharomyces uvarum*). The names of both are descriptive of where the fermentation takes place. The top-fermenting yeast is similar to the yeast for baking bread. It is applied for making ales and stouts. The bottom-fermenting yeast is utilized for production of lagers and steam beer.

Top fermenting yeast is named as such because most strains exhibit the tendency to flocculate (gather) at the surface of the beer during the first few days of fermentation. After which the yeast settles to the bottom of the fermentor while a large percentage stay in dispersion. Top Fermenting yeast, 'Ale yeast', finds optimum performance in the temperature range of 55-75 deg F. Lower temperatures tend to inhibit fermentation, causing the yeast to become dormant. Bottom fermenting yeast, 'Lager yeast', is best suited for the temperature range 55-32 deg F. The process of fermentation takes substantially longer when using Lager yeast, this time is often referred to as 'Lagering'. Bottom fermenting yeast, as is expected, flocculates at the bottom of the vessel and spends most of its life-cycle in the sedimentary state. The main difference between the beers produced from either yeast variety is that top fermented beers bear a flowery and fruity taste. (Christopher B. Mcilroy, Aaron C. Bandremer, & Ken Takeda , 1999)



H. PROCESS OF MAKING BEER

The beer production for the commercial consists of 9 steps;

1. Grinding
2. Mashing
3. Lautering
4. Wort boiling
5. Cooling
6. Fermentation
7. Storage
8. Filtration
9. Filling

2.1 Grinding

The grinding is a coarse milling, even better a crushing of the relatively mellow malt grain. In doing so, it must be observed that the outer shell of the malt grain, the so called husk, remains nearly intact. In the lautering step, these husks serve as a natural filter layer.

2.2 Mashing

The word mashing originally derives from mixing. The beer production starts with mixing the grist of first step with warm brewing water. The water being applied for mashing-in is called main mash water in contrary to the so called second wort during lautering step. This grist-water-mixture is gradually being heated in the brew vessel. According to individual recipe, the temperature must be hold correspondingly long at each temperature step. During this so called rest, the starch contained in the malt grain is being converted into malt sugar and valuable amino acids develop from indigestible proteins.

2.3 Lautering

Lautering means the separation of the hazy mash particles from the clear liquid. This process can be compared to filtering coffee where the coffee grounds are being restrained and a clear fluid containing the dissolved coffee particles runs through the filter. The more water is being poured over the coffee grounds, the more exhaustive the diffusion where by the running off coffee becomes more and more watery. The lautering starts with the transfer of the entire mash into the tauter tun. The lauter tun is the second copper vessel in the brew house equipped with a false bottom with thin slits approximately 1.5 cm above the original bottom. Since the husks are heavier than the other mash particles, they depose at the false bottom thus forming a natural filter layer. The false bottom only serves as a support of this husk filter. The brewer calls the thereby almost clear running-off sugar water wort. As soon as the wort ran-off entirely, the solid mash particles remain within the lauter tun, called "spent grains". In the beginning, these spent grains still contain a fair amount of malt sugar being rinsed out with hot water. The water being applied for this purpose is called second wort and is being poured over the spent grains without destroying their layering. The lautering must be done very carefully because if the wort would run-off freely, the developing suction would contract the husk layer to almost impermeable extent_

2.4 Wort boiling

The entire run-off wort is being re-collected in the brew vessel and boiled together with the hops for at least one hour. The wort must be boiled until the desired sugar concentration is reached due to evaporating water. During boiling, also the composition of the wort changes whereby insoluble components like for example hops oils are being dissolved, others simply drop out or evaporate in form of solid components, the so called break. The sugar concentration of the wort after boiling is the well-known original extract. Since the original extract is converted into alcohol during fermentation, the later alcoholic content of the beer directly depends on the original extract. By the time enough water has evaporated, the wort with the whole hops will again be transferred to the Lauter tun. The decocted whole hops and the break remain on the false bottom whereas the wort runs-off at the bottom now bearing a distinctive taste of hops.

2.5 Cooling

The boiling hot wort must be cooled down to the starting temperature of the yeast. From this point of time, an extremely neat and clean operation is required because otherwise lactic acid bacteria instead of the yeast might start the fermentation of the wort. These lactic acid bacteria convert the sugar into lactic acid and not into alcohol like the yeast does. Thereby the beer turns sour and therefore becomes denaturated. Lactic acid bacteria are not harmful to humans in any way. For top fermentation, the wort is being cooled down to approximately at 15°C, for bottom fermentation to approximately at 5°C. These temperatures lie about 5°C below the optimum temperature of the respective yeast because fermentation ought to start slowly. For cooling down the wort to approximately 20°C it is possible to use cold tap water. During this process, the tap water heats up to approximately at 85°C and is available as hot water. In order to further cool down the wort, artificially cooled "ice water" of approx. 1°C is required.

2.6 Fermentation

The yeast converts the sugar of the wort into alcohol, CO₂ and heat. The wort turns into green beer. The fermentation performed slowly because otherwise big quantities of undesirable fermentation by-products accumulate besides higher alcohol is the main cause for headaches. In order to produce high-quality beer, appropriate cooling ensures a fermentation period of approx. 8-10 days. Since at this point sugar is converted into alcohol, the measured content of original extract continuously drops during fermentation. The accumulated CO₂ can freely escape from the open fermenter. Because CO₂ bubble escapes through the green beer, undesirable fermentation by-products negatively influencing the taste and digestibility of the beer are being washed out. Through fermentation, white foam builds up at the beer surface collapsing again at the end of the main fermentation.

2.7 Storage

The residual sugar ferments to alcohol and CO₂. For this purpose, the beer is being transferred from the open fermenter to the closed storage tank. The storage tank is being closed with a bunging apparatus. By the use of this bunging apparatus, the desired CO₂-content of the beer can be adjusted. Therefore, the now accumulating CO₂ remains in the beer. In order for the sugar to further ferment, the temperature ought to remain at approx. 5°C for a while. Afterwards, the beer is ready for slowly being cooled down to maturity temperature of 1°C. Under these temperatures, the green beer matures for several weeks. During this time, the beer almost completely purifies and finally reaches full maturity.

2.8 Filtration

The residual yeast is being filtered from the beer. For this purpose, the beer; storage tank is being pressed through a Kieselguhr-filter layer under pressure. hereby secreted yeast remains in the filter together with the Kieselguhr and can be disposed after termination of the filtration process. After filtration, the beer is being collected in the pressure tank and from there arrives at the filling facilities.

2.9 Filling

The filtered beer is being filled into bottles, In general, bottle filling is returnable bottles with swing stopper, so called Rick layer's bottles, are being used. First of all, the bottles must be manually cleaned with the aid of a bottle washing machine comparable to an industrial dishwasher. The bottles are being cleansed of yeast deposits and afterwards sterilized. Next, the bottles are manually being removed from the machine and placed on a table for filling. For filling purpose, the brew master applies hand operated isobarometric filler. Each bottle is separately being removed from the table. The brew master ensures a careful filling of the beer without the development of foam and tight closure of the bottles with a ceramic seal. Filled beer can be stored up to 6 — 12 weeks until consumption.



III. LONG PEPPER



Figure 1: Long pepper (*Piper longum*)

Property of Long Pepper or scientific name "*Piper longum*" are indigenous to North-eastern and Southern India and Sri Lanka, is a powerful stimulant for both the digestive and the respiratory systems and has been shown to have a rejuvenating effect on the lungs. Long pepper is also known and popular in parts of Africa, mostly in the Islamic regions of North and East Africa. It can be found in the complex spice mixtures of Morocco. It is an important ingredient in Ethiopia cuisine, where long pepper is usually found in the traditional meat stews (wat) together with black pepper, nut meg, cloves and turmeric. Berebere, a classical Ethiopian spice mixture, which resembles Indian masalas, is used to spice mutton dishes.

A scandent perennial aromatic shrub with jointed branches, the entire plant is pungent. The leaves are many and cordate, while the flowers grow on solitary spikes. The male

and female spikes are produced on different plants, and while the male spikes are slender with narrow bracts, the female ones are 1.3-2.5cm, with circular flat peltate bracts. The fruit, which is very small, is sunk inside the fleshy spike, and is blackish green and shining. Long pepper is the unripe spike of the plant. It is that part of the plant that is used in medicines. The root, which is thick and branched, is also medically important and is called modi or pippali-moolam. Long Pepper plays an important role in aiding the thermogenic response, i.e. the release of metabolic heat energy. This effect is the result of increased thyroid hormone level in the body and makes Pippali a typical Ayurvedic complementary component whose benefit is to increase the bioavailability and enhance absorption of the other active ingredients.

Long pepper, or piper longum, is a warm and aromatic pepper-like herb which scrapes toxic build up from cell walls, arteries and tissues to reduce excess body weight. Pippali enkindles the digestive fire to assimilate more nutrients. Purifies lungs to promote fuller breathing.

Piper longum grows well in sandy loamy soils, which are well drained. Soils with rich organic matter and good moisture holding capacity are good for its vigorous growth. As the plant likes a hot, moist climate, it can be grown in areas where there is heavy rain and relative humidity, as an under shrub in coconut and arecanut gardens on residual fertility.

3.1 Health benefit of Long pepper

Long pepper contains 1% volatile oil, resin, alkaloids Piperin and piperlonguminine, a waxy alkaloid N-isobutyl deca-trans-2-trans-4-dienamide and a terpenoid substance. The roots have piperine, piperlongumine or piperlonguminine, dihydro-stigmasterol, which have been the reason that it is popularly used in traditional practice to promote respiratory health. Some of the most well-known health benefits of Long pepper include:

International Journal of Pharmaceutical Sciences Review and Research ; chemistry and pharmacology of piper longum 1. Maitreyi Zaveri, Head and Assistant Professor, Dept. of Pharmacognosy, K.B. Institute of Pharmaceutical Education and Research, Gandhinagar, India. Archita Patel, Lecturer, Dept. of Pharmaceutical Chemistry, K.B. Institute of Pharmaceutical Education and Research, Gandhinagar, India. Amit Khandhar, Sr.Scientist, Analytical research laboratory, Zydus Cadila Ltd., Ahmedabad, India. Samir Patel, Sr. Lecturer, Dept. of Pharmaceutical Chemistry, Ramanbhai Patel College of Pharmacy College, Changa, India.

3.1.1 Diabetes

Diabetes is the leading cause of concern for individuals around the world. Thankfully, long pepper has been found to reduce blood glucose levels in diabetic patients and prevent other complications associated with the disorder.

3.1.2 Liver ailments

Due to our dependency on processed foods, our internal organs, including the liver, tend to become weak, and more and more people are now suffering from liver ailments. Long pepper, known to possess liver-protective functions, may help the body manage liver toxicity, and may also prevent jaundice.

3.1.3 Bacterial infections

In a developing country like India, where lack of sanitation and cleanliness forms an important reason for many bacterial infections, long pepper could be beneficial as a simple home remedy. It is thought that the root and the fruit may possess anti-amoebic activity.

3.1.4 Weight loss

The world is getting obsessed about weight loss today, and many people are foolishly turning to picking up "healthy" foods from supermarket shelves. Long pepper, on the other hand, is a wonderful herb that is believed to promote weight loss and have minimal or no side effects on the body. It is *known* to *reduce* body fat and discard the stagnant fatty toxins from the body, thereby preventing obesity. Some researches also suggest that long pepper may-help improve the flow of oxygen into the body, prevent major lung disorders, support skeletal function and improve bone strength, improve skin health and slow down ageing. Apart from these specific health benefits, long pepper is also believed to help patients suffering from the following health problems: Stroke, Fever, Stomach ache, Asthma, Toothache, Headache, Epilepsy, Cough, Cholera, Indigestion, Menstrual problems, Diarrhea, Bronchitis and Coma.

IV. Honey



Honey is a sweet liquid made by bees using nectar from flowers. Bees first convert the nectar into honey by a process of regurgitation and evaporation, then store it as a primary food source in wax honeycombs inside the beehive. Honey can then be harvested from the hives for human consumption. Honey is graded by color, with the clear, golden amber honey often at a higher retail price than darker varieties. Honey flavor will vary based on the types of flower from which the nectar was harvested. Both raw and pasteurized forms of honey are available. Raw honey is removed from the hive and bottled directly, and as such will contain trace amounts of yeast, wax and pollen. Consuming local raw honey is believed to help with seasonal allergies due to repeated exposure to the pollen in the area. Pasteurized honey has been heated and processed to remove impurities.

10 Benefits of Honey

1. Honey Contains Some Nutrients

Honey is a sweet, thick liquid made by honeybees. The bees swarm their environment and collect the sugar-rich nectar of flowers. Then inside the beehive, they repeatedly consume, digest and regurgitate ("vomit") the nectar. The end product is honey, a liquid that is supposed to serve as stored food for the bees. The smell, color and taste depend on the types of flowers the bees visit. Nutritionally, 1 tablespoon of honey (21 grams) contains 64 calories and 17 grams of sugar, including fructose, glucose, maltose and sucrose. It contains virtually no fiber, fat or protein.

2. High-Quality Honey is Rich in Antioxidants

High-quality honey contains many important antioxidants. These includes phenols, enzymes and compounds like flavonoids and organic acids. Scientists believe that it is the combination of these compounds that gives honey its antioxidant power. Interestingly, two studies have shown that buckwheat honey increases the antioxidant value of the blood. Antioxidants have been linked to reduced risk of heart attacks, strokes and some types of cancer. They may also promote eye health.

3. Honey is "Less Bad" Than Sugar for Diabetics

The evidence on honey and diabetes is mixed. On one hand, it *can* help with some risk factors that are common in diabetics. For example, it lowers LDL cholesterol, triglycerides and inflammation, and raises HDL (the "good") cholesterol. However, some studies have found that it can also increase blood sugar levels, just not as much as refined sugar. So, white honey may be "less bad" than refined sugar for diabetics, it is still something that diabetics should only consume with caution. In fact, diabetics may do best minimizing all high-carb foods.

4. The Antioxidants in it Can Help Lower Blood Pressure

Blood pressure is an important risk factor for heart disease, and honey may help lower it. This is because it contains antioxidant compounds that have been linked to blood pressure lowering effects. Studies in both rats and humans have shown modest reductions in blood pressure from consuming honey.

S. Honey Also Helps to Improve Cholesterol

Having high LDL cholesterol levels is an important risk factor for heart disease. It plays a major role in atherosclerosis, the fatty buildup in the arteries that can lead to heart attacks and strokes. Interestingly, several studies have shown that honey can improve your cholesterol levels. It reduces total and LDL cholesterol, while significantly raising HDL (the "good") cholesterol. For example, one study in 55 patients compared honey to table sugar. It found that it caused a 5.8% reduction in LDL and a 3.3% increase in HDL.

6. Honey Can Lower Triglycerides

Elevated blood triglycerides are another major risk factor for heart disease. They are also a key sign of insulin resistance, a major driver of type 2 diabetes. Triglyceride levels tend to increase on a diet that is high in sugar and refined carbs. Interestingly, multiple studies have linked regular honey consumption with lower triglyceride levels, especially when it is used to replace sugar. For example, one study that compared honey and sugar found 11-19% lower triglyceride levels in the honey group.

7. The Antioxidants in it are Linked to Other Beneficial Effects on Heart Health

Again, honey is a rich source of phenols and other antioxidant compounds. Many of these have been linked to a reduced risk of heart disease. They may help the arteries in the heart dilate, increasing blood flow to the heart. They may also help prevent the formation of blood clots, which can lead to heart attacks and strokes. Furthermore, one study in rats showed that honey protected the heart from oxidative stress. All this being said, there is no long-term human study available on honey and heart health, so take this with a grain of salt.

8. Honey Promotes Burn and Wound Healing

Applying honey to the skin has been used to heal wounds and burns since ancient Egypt, and is still being used today. In one review from 2015, 26 studies on honey and wound care were evaluated. This review found that it is most effective at healing partial thickness burns and wounds that have become infected after surgery. It is also an.

effective treatment for diabetic foot ulcers, which are very serious complications and can lead to amputation. One study reported a 43.3% success rate with honey as a wound treatment. In another study, topical honey healed a whopping 97% of patients being treated for their diabetic ulcers. Researchers believe that its healing powers come from its antibacterial and anti-inflammatory effects, as well as its ability to nourish the surrounding tissue.

What's more, it can help treat other skin conditions, including psoriasis, hemorrhoids and herpes lesions.

9. Honey Can Help Suppress Coughs in Children

Coughing is a common problem for children with upper respiratory infections. It can affect sleep and quality of life, for both the children and their parents. However, mainstream medications for cough are not always effective and can have side effects. Interestingly, honey may be a better choice. The evidence shows that it is very effective. One study found that it worked even better than two common cough medications. Another study found that it reduced cough symptoms and improved sleep even more than cough medication. Nevertheless, it should never be given to children under 1 year of age, due to the risk for botulism.

10. It's Delicious, But Still High in Calories and Sugar

Honey is a delicious, healthier alternative to sugar. Make sure to choose a high-quality brand, because some of the lower-quality ones may be adulterated with syrup. Keep in mind that it should only be consumed in moderation, as it is still high in calories and sugar. The benefits of honey are most pronounced when it is replacing another unhealthier sweetener. At the end of the day, honey is simply a "less bad" sweetener than sugar and high-fructose corn syrup.

MATERIALS AND METIJD

I. MATERIALS

1.1 Raw-materials

- Dry yeast (*saccharomyces cerevisiae*)
- Bitter hop (Galena)
- Aroma hop (Cascade)
- Malt Extract
- Water (Tap water)
- Long pepper (*Piper Longum*)
- Honey (Royal Project Chirtlada)

1.2 Lab analysis equipment

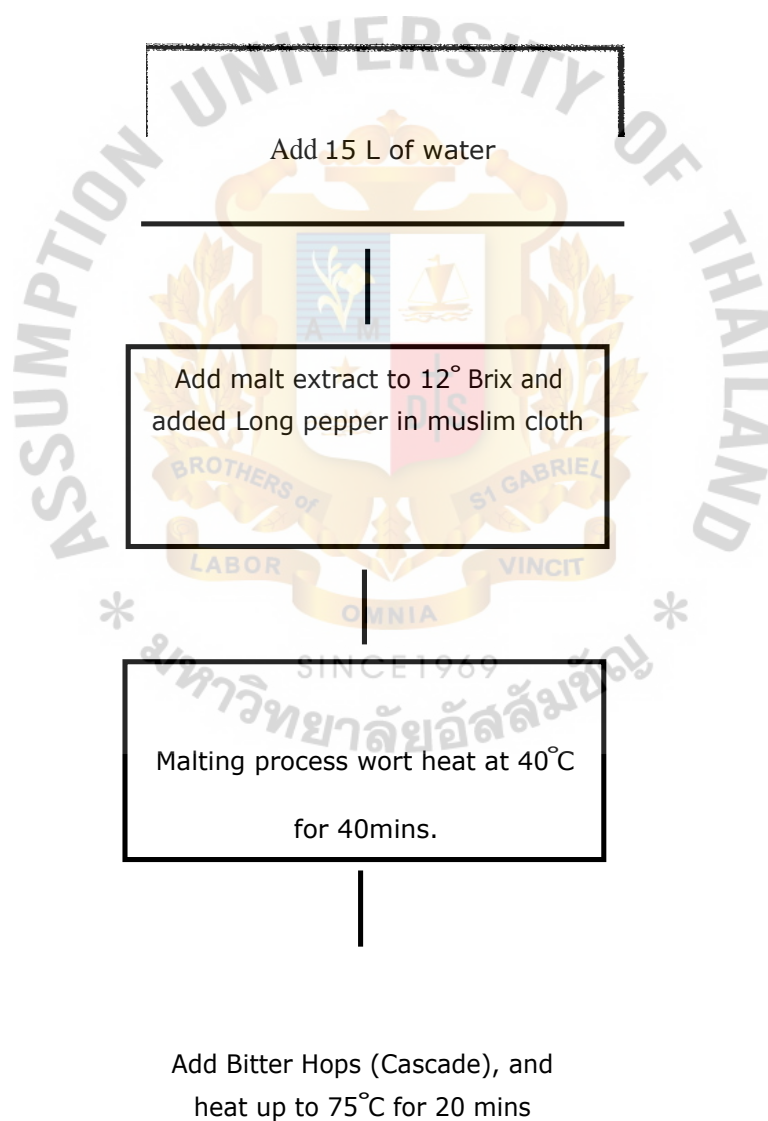
- pH meter
- Ebullio meter
- Thermometer
- Balance
- Refractometer (0-32° Brix)
- Filtration equipment
- Distilled water
- Liquid Carbon-dioxide
- 95% ethanol
- Phenolphthalein
- NaOH



H. METHOD

1. Brewing process that have to use all treatment

Figure 2: Brewing process for making Long Pepper (Piper Longum) Honey beer



Add aroma Hops (Galena) and stop heating

Add the wort into sterile tank, cool down to room temp, then add yeast into tank.

Add Honey directly

Check vigorously, close the tank, leave at room temp, and let the fermentation begin.

Figure 3: The 3 figure shows various type of Long Pepper (Piper Longum)



Matured dry Long pepper



Green mature long pepper



Red mature long pepper

2. Method for lemongrass beer formulation

The experiment has been separated into 6 formulas by varying the amount of long pepper, honey, hops, and long pepper preparing methods. Then, the best 3 formulas were selected by sensory test using 9-point hedonic scale. The experiment was conducted by 30 people.

Formula	Amount of Long Pepper(dry)	Hops(Aroma) (g)	Honey (g)	Hop (bitter) (g)
1	Matured dry Long pepper(grind) 10g	3	50	3
2	Matured dry Long pepper(grind) 15g	3	50	3
3	Mature dry long pepper(Grind) 20g	3	50	3

Table 1: The above table shown three formula used for the formulation of Long Pepper Honey Beer

3. Sensory test to obtain the better Long Pepper Honey beer

From this experiment 3 formulas were used. The sensory test has been repeated more specific by using 9-point hedonic scale. Foam stability, color, clarity, aroma, bitterness, alcohol content, and overall impression are used as indicators

4. Consumer acceptance

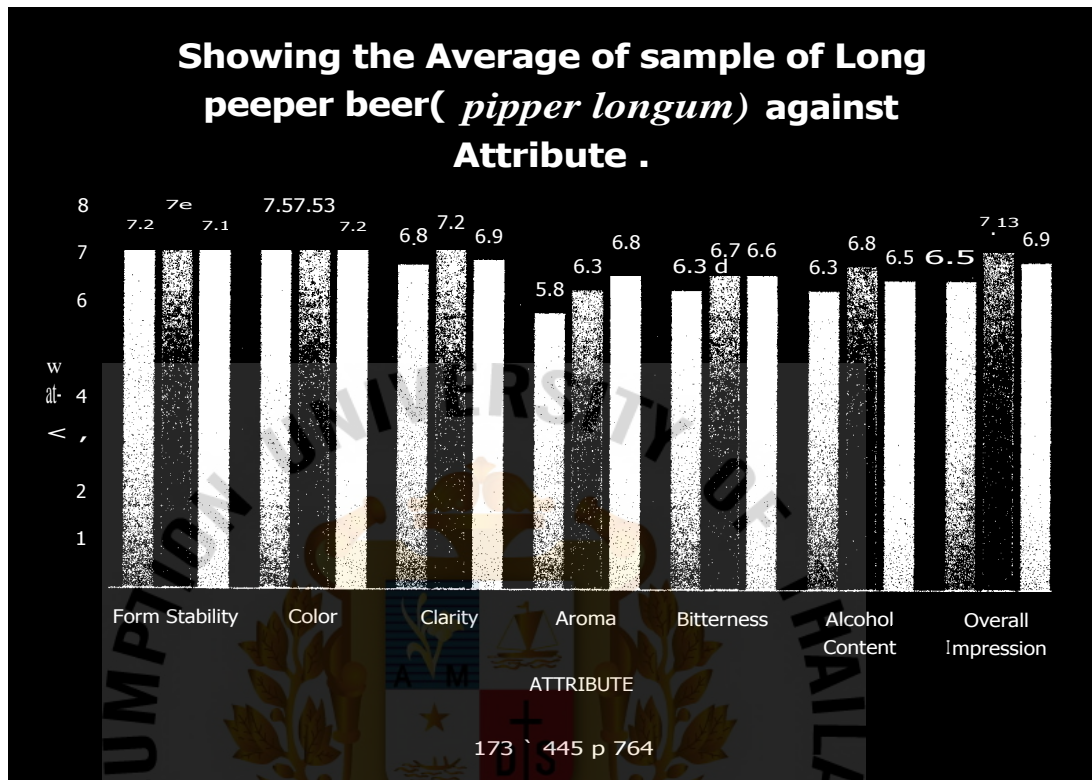
The final selected formula will be preparing and evaluated for consumer acceptance by 50 panelists.

RESULT AND DISCUSSION

1. Result for the experiments for Long pepper honey beer formulation

According to table 1, the sample were varied in the amount of long pepper and methods to prepare long pepper to extract of long pepper taste and its aroma. Moreover, this study was divided into grind also varied the amount of aroma and bitter hop to harmonize with flavor, if the formulation contains too much aroma and bitter hop, it will contribute to a strong hop aroma and taste and conceal the long pepper aroma and taste. So, this experiment was studied to find out the appropriate formulation for making long pepper honey beer.

Figure3: The sensory test for all attribute of 3 formulations



From the result the formulation 445 show the highest score by overall impression test of 30 consumers both faculty members and member from out of campus. The result from sample number 173,445 and 764 are produced by using grind Long pepper in brewing which provided taste and aroma of Long pepper in the beer.

Furthermore, the best sample no. 445 which have the highest score have been used for analyze for their pH, Brix, alcohol content, color analysis, acidity and the results have shown in figure2.

Sample no. 445	Analysis result
pH	6.0
Color analysis	L*21.61, a*4.334, b*26.878
Alcohol content	3.8% alc.

2. Study the best formulation on the sensory test of Long Pepper Honey beer. The best sensory test samples have been repeated and tested by using 9-point hedonic scale. The result was shown in table2

		Average	
Attribute	Sample no. 173	Sample no. 445	Sample no. 764
Form Stability	7.2 ^{ab}	7.4 ^b	7.1 ^{ab}
Color	7.5 ^{ab}	7.53 ^{a-}	7.2 ^b
Clarity	6.8 ^a	7.2 ^{1'}	6.9 ^(1/)
Aroma	5.8 ^{6a}	6.3 ^b	6.8 ^{C'}
Bitterness	6.3 ^{ab}	6.7 ^{1'}	6.6 ^{1'}
Alcohol Content	6.3 ["]	6.8 ⁶	6.5 ^c
Overall Impression	6.5 ^{ab}	7.13 ⁶	6.9 ^{e-}

Remark: a b means with superscripts in the column and those without a common superscript were significantly different $\alpha=0.05$ As the result, the formula that gives the best score are the formula sample no 445 which using 15g. of grind and 6g of both aroma and bitter hops. They show the best score in Form stability, Color, Clarity, Aroma, beer taste, bitterness, alcohol and overall liking 7.4, 7.53, 7.2, 6.3, 6.7, 6.8, and 7.13 respectively. Formula number 445 which show the highest score have been chosen to test for consumer acceptance test including 9-point hedonic scale of foam stability, which are color, clarity, Aroma, bitterness, alcohol content, overall impression by 50

consumers. The questionnaire is including their general information, their drinking behavior and their attitude on their need towards the developed product.

Table3 It shows the analysis of 3 formulas which are pH, Alcohol content and Color Analysis.

Sample	173(10%)	445(15%)	764(20%)
pH	4.41	4.40	4.34
Alcohol content	3.4	3.6	3.2
Color	L*21.34 a*4.30 b*28.70	L*21.15 a*4.48 b*28.54	L*21.78 a*4.34 b*20.23

3. Consumer acceptance

Part I. General information of consumer for final product acceptance test

Figure 5: The percentage of consumer usually drink beer.

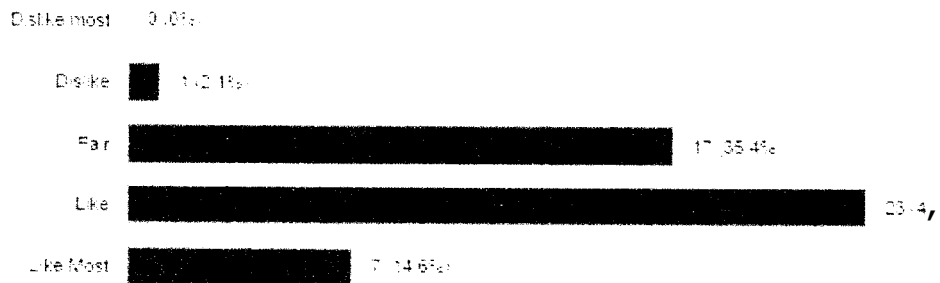
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INDIVIDUAL

Do you drink beer?



How much do you like to drink beer?



Please tell the brand you usually drink.



What is your Factor consider affecting you buying?

Price [REDACTED] 5 16 25-

Taste		31-40.9%
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Date: [REDACTED] 10-32-79

Promotion 3 5 16..

E F. 11111111111111111111111111111111 "

How much you usually spend per time?

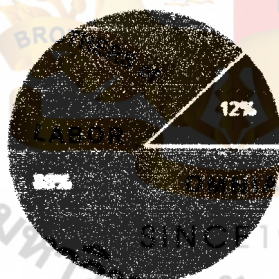


Where do yo usually drink?

Hre 11111111111111111111/11111111111

14 25

Do you prefer this Product ong Pepper Honey Beer?

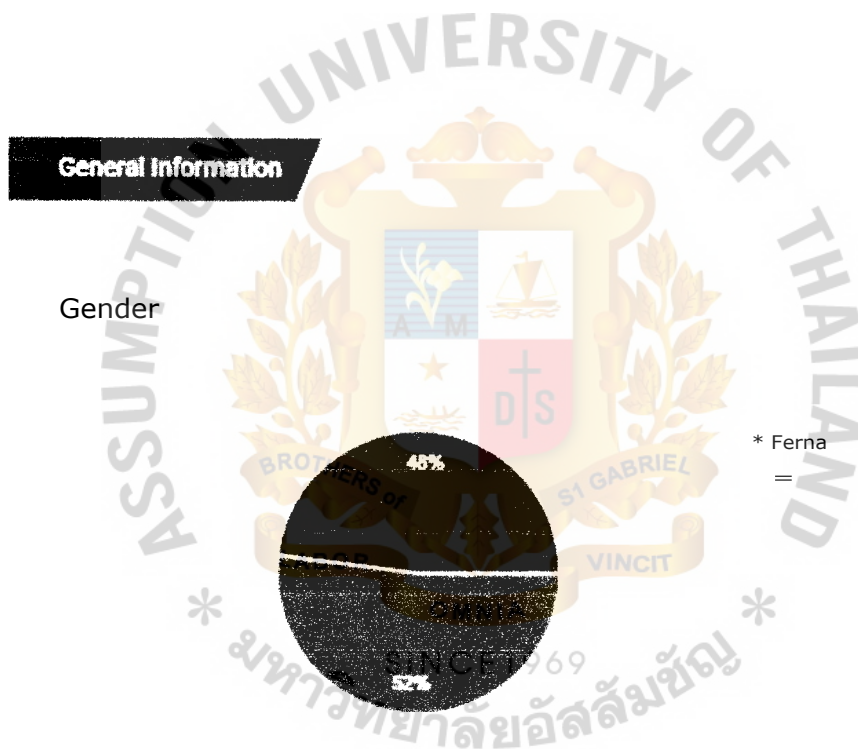


Do you think what price is most suitable to be in market per 1 bottle(750ml)?

ratq [redacted] 20-40.8%

caht [redacted]

[redacted] 5,10.2%



Age

c [REDACTED] 6/12/2016

years, 3c [REDACTED] le 32

[REDACTED] 12/24/51

-S5 Cc [REDACTED] 7/14/51

Income

[illegible]

c3'1

Table 3 : Mean score of each attribute and overall impression done by consumer

Attribute	Average
Form stability	6.8
Color	7.02
Clarity	6.52
Aroma	6,38
Bitterness	6.48
Alcohol content	6.82
Overall Impression	7.28



From the result, majority of the consumer drinking beer. Most of them were women and would prefer to drink the local beer like Leo, Chang and Singha respectively according to prices taste and promotion; the age group was between 20 years — 30 years old. 40.8% of consumers would buy this beer and the price should be lower than 100 baht per bottle of 750ml while 49% of the consumer will prefer to buy from 100-150 baht would be appropriate for this beer. Regarding the 9-point Hedonic rating, overall impression obtained a mean greater than 6.7 which are moderately good score for the product.

CONCLUSION

From the result of this experiment and sensory test analysis the formula sample no. 455(6g. of hops, 15g. of grind long pepper) have been chosen as the best formula with best aroma and taste, which score according to the 9-point Hedonic rating, all the eight attributes. The result was, Foam stability (6.8 ± 1.6 a), Color (7.01 ± 1.52 a), Clarity (6.52 ± 1.48 a), Aroma (6.38 ± 1.48 b), Taste (6.48 ± 1.5 ab), Bitterness (6.82 ± 1.5 b), Alcohol content (6.82 ± 1.53 a) and overall impression (7.28 ± 1.33 b). The mean is greater than 6.7 which are good score for all product. The selected formula has pale green with $21.61^* 4.3^* 26.8^*$ on L*A*B scale, 3.8% of Ale., Sugar Brix of 6.0. And given alter taste with pleasant aroma of long pepper. From the result we conclude that the formula sample no.445 (6.0g. of hops, 15g. of grind long pepper) can be used for making good quality of long pepper honey beer.

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APPENDIX A

Analysis Methods

1. Alcohol determination by using Ebulliometer

An Ebulliometer is an instrument used for determination of the alcohol content of water-alcohol solutions by determining the difference in boiling points between pure water and the solution. Based on the comparison, the percentage alcohol (v/v) can be determined by referring to tables or using the calculating dial.

Procedure

Determine the boiling point of water

1. Fill the lamp with 95% reagent alcohol.
2. Rinse the boiler and pour through the opening "A" 20 ml pure water measured with the sample vial to the mark "Eau".
3. Place the thermometer in position by inserting into the opening "A".
4. Light the alcohol burner and place it under "B".
5. When the thermometer reading becomes stable, read the temperature.
6. This is the temperature reading for water to be used for further calculation.

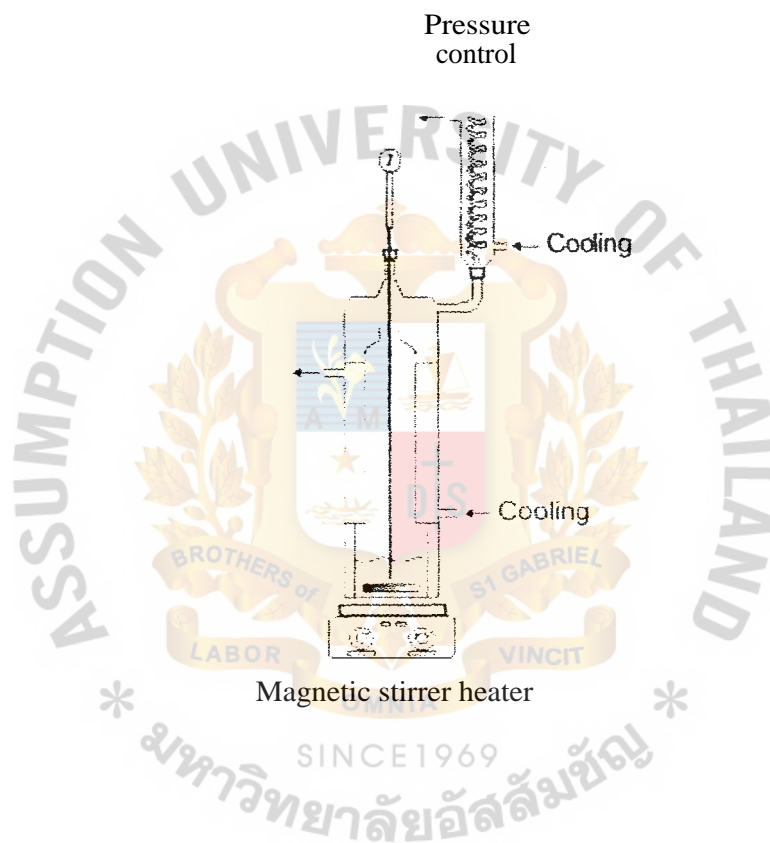
Using the Ebulliometer

1. Opening the stopcock, "F", empty the boiler, rinse it with some beer to be tested pour out again and blow through upper tube "C" to clear away the condensed steam.
2. Pour into boiler 50 mL of sample, using the sample measure, and filling up to the mark "VIN"
3. Place the thermometer in "A", fill the condenser "D-E" with cold water, and heat as previously discussed.

4. The mercury will rise and stabilize; wait until the mercury is motionless to take the reading.

Determination alcohol concentration

1. On the calculation dial, setting the zero on boiling point of water, find the corresponding % alcohol for the boiling point of the sample.



C741⁰₂₄.Ar

/qv* I *rnra*

sutra-

44.

414/4

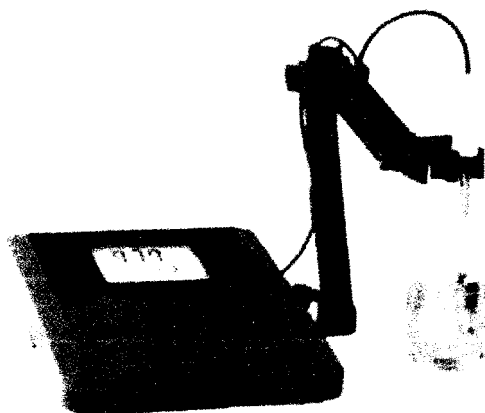
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Labatxorm□DmardurSatorgars

[Faint handwritten notes and markings are visible.]

2. pH Determination by using a pH meter

1. switch on the power supply at the plug point
2. switch on the meter (press the "power" key)
3. rinse the electrode with distilled water
4. select using the mode button the desired measurement mode
5. calibrate the meter using at least 2 buffers and record value when the meter indicates "ready"
6. carry out the measurement by dipping the electrode in the sample
7. rinse the electrode with distilled water and store in electrode storage solution after use
8. switch off the meter by pressing the "power"



3. Acid determination by titration method

1. Put the sample into a conical flask
2. Add 2-3 drops of Phenolphthalein indicator
3. Fill the burette with 0.1N NaOH
4. Titrate until the color turn into pink

Formula for finding percent Total acidity

$$M_{\text{acid}} \times V_{\text{acid}} = M_{\text{base}} \times V_{\text{base}}$$

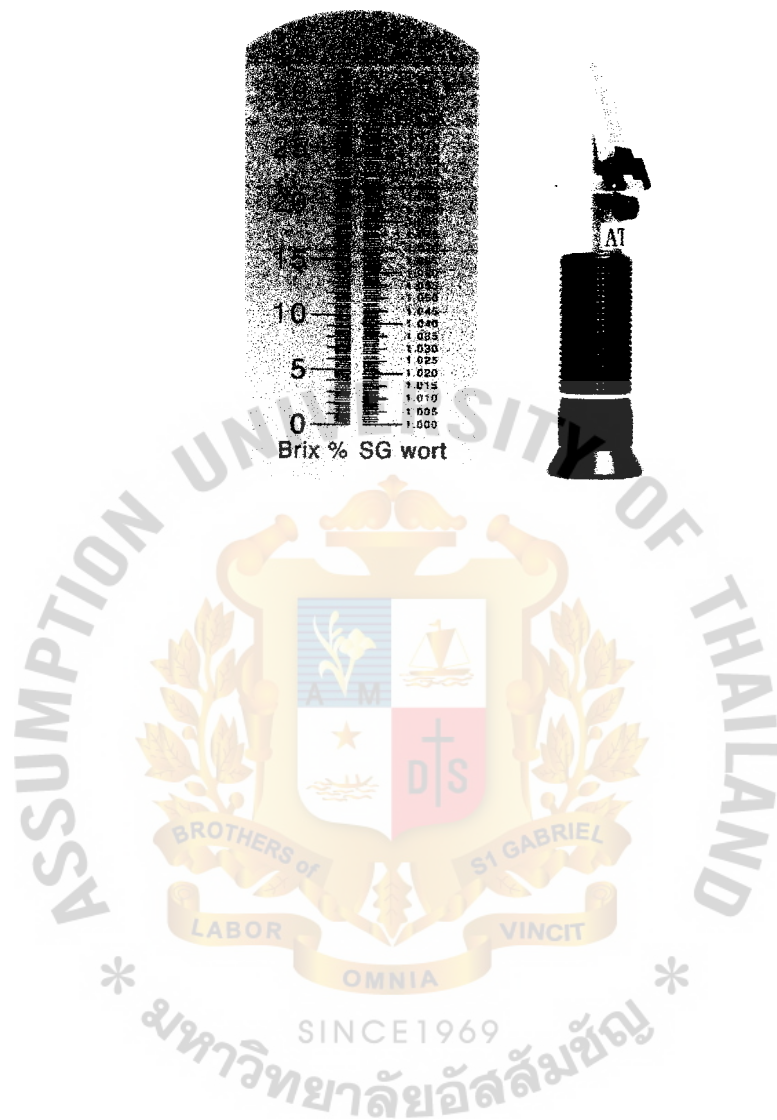
M_{acid} = Molarity of the acid

V_{acid} = Volume of the acid

M_{base} = Molarity of the base

V_{base} = Volume of the base

4. °Brix measurement Using Sugar refractometer sugar °brix 0-32%



Long Pepper Beer Consumer Testing

I'm a student from faculty of School of Biotechnology, Assumption University. I'm doing this survey as my special project for my Bachelor's degree to learn about consumer behavior attitudes and needs toward the developed product with the goal to determine the consumer acceptance of the developed product, in order to improve it from your participation will be further used to complete my project.

Please kindly complete the question below and kindly give your opinion on the form based on your opinion. Your personal data will be kept confidential.

Thank you for your participation.

Consumer's Reaction

1. Do you drink beer? (Yes/No)?

- ☐ Yes ☐ No

2. How much do like to drink beer? (1-5)

- Dislike most (1), ☐ Like (2), ☐ Fair (3), ☐ Like most (4), ☐ Dislike most (5)

3. How often you drink beer?

- ☐ Every day ☐ 4 times a week ☐ 3-4 times a week ☐ Once a week ☐ Less than once a month ☐ Never

Where do you usually drink? (At home/Bar/Club/Other)

- ☐ Home ☐ Bar ☐ Club ☐ Other

5. Please tell thE brand you v.:rally dini

Ric youx Lam: coos der of *s. yot

0 kite ris-, 0 Tale .T.ri-A 0 Eno& alitim.tvliz.1

PIWEtiOD tIZ^e 0 Brand royalty R;ltiWifFrtii4.--itti
theVVVSAWLArk.....A.AaV,

7. Howmach you usually sped pa- una.e: A Z""Eti7:151M7S: I au ir.n.i.thla?

(5.1 I I 100-3M Bait (Inv) O1:-.5-30C E ht [-.1111)

U Mon than 500 Rant Nil)

