

# The Influences of Concentration Calcium Hydroxide ( $\text{Ca}(\text{OH})_2$ ) and Immersion Time Upon the Various Chips Quality

**Rahmi Mudia Alti \***

Aircraft Electricity University  
Nurtanio, Bandung, 40174  
rahmimudia68@gmail.com

\*Corresponding author

**Ike Yuni Wulandari**

Electrical Engineering, University  
Nurtanio,  
Bandung, 40174  
ikeyunipp@gmail.com

**Yoana Nurul Asri**

Avionika, Nurtanio University,  
Bandung, 40174  
ynurulasri@gmail.com

**Intan Cynara Valentina Putri**

Accounting, Nurtanio University,  
Bandung, 40174  
intancynara@gmail.com

Submitted: 2022-11-28; Accepted: 2023-02-23; Published: 2023-06-25

**Abstract**— This research used the method of descriptive content analysis study. The analysis was done on any kind of scientific articles concerning to the usage of  $\text{Ca}(\text{OH})_2$ .  $\text{Ca}(\text{OH})_2$  has used widely in any kind of liveness, such as the preservative on coconut sap and the eggs of purebred chicken, the preventer of browning on flour, the controller of rotten the base of the stem on the plants, as the alternative of the substance of mordant on textile ingredient, as the mixture of hampering the development to colony *P. capsica* diameter, as the mixture for treatment Orf traditionally, as the substance which helps in the process of separating weight metal waste industry.  $\text{Ca}(\text{OH})_2$  is also used for the process of immersion to reduce the cyanide content inside cassava leaf, as the Thickener in increasing bio grease performance environmentally.  $\text{Ca}(\text{OH})_2$  is the ingredient added to the processing of production on various chips in the stage of ingredient immersion. The addition of  $\text{Ca}(\text{OH})_2$  has the purpose to repair chips' texture based on consumer wants. Ion calcium is by  $\text{Ca}(\text{OH})_2$  having the reaction with the carboxyl group by pectin which is from tubers or fruits which are used as the main ingredient of chips. The Calcium hydroxide produced the gas  $\text{CO}_2$  which can form the pores in the chip surface, which had a good impact to have a texture crunchy chip produced. Another fixing of the texture, the addition of  $\text{Ca}(\text{OH})_2$  has also the purpose to prevent the browning reaction until the appearance of chips becomes better. The effect of browning is going to appear because there is a reaction between the saccharides with the protein or amino acid. On some variously of chips ingredient, the function of  $\text{Ca}(\text{OH})_2$  can omit the mucus, dissolve the mucus stuck, omit the itchy sensation, and simplify the process of development of chips when it is fried. The usage of concentration and the immersion time of  $\text{Ca}(\text{OH})_2$  can turn into differences in every main ingredient for chips. It is occurred because the differences of tubers kind or fruit used, the natural water contains which was had to

tubers/fruits, the method/the technique of immersion, and the temperature of immersion.

**Keywords**—  $\text{Ca}(\text{OH})_2$ , Chips, Concentration, Betel Lime, Texture.

## I. INTRODUCTION

In Indonesia, Betel Lime has been used widely to many kinds of purposes, such as the preservative on coconut sap (Suntoro et al., 2016). The addition of betel lime influenced to the very real toward the sugar content reduction in coconut sap. The bacterial *Saccharomyces calbergensis* which it is from natural by coconut sap, be able to solve the sucrose on coconut sap to become sugar reduction that is glucose and fructose by using invertase enzyme or fructoforanosidase enzyme. Betel lime  $\text{Ca}(\text{OH})_2$  is the characteristics that are able to destroy the microbial cell wall, the more addition of betel lime  $\text{Ca}(\text{OH})_2$  the more produce broken bacteria of *Saccharomyces* until the sugar reduction producing decreasing.

The betel is the ingredient of preservative caused by the form of calcium hydroxide who has the characteristics of disinfectant clot the protein and nucleic acid and destroy the microbial cell wall (Suntoro et al., 2016).

The next usage is the preventer of *browning* on flour (Amin et al., 2022), The usage of  $\text{Ca}(\text{OH})_2$  can stay the colour, Ca ion will be easy to do the absorption processing (absorption event) in ingredient tissue until it can maintain the colour where it is cause by the effect of ion Ca. The Utilization of third is as the controller ingredient to prevent the rotten of the base of the stem (Kusvianti & Prijono, 2014), With using the extract mixture of areca nut + gambier + betel + Betel lime 0.005% and 0.01%; and areca nut 0.04% as *in vitro* is effective enough to prevent the development of coloni *P. capsica* diametre

The another using is as the alternative mordant on textile material (Hendrika & Novrita, 2020). Beside that, Ca(OH)<sub>2</sub> is used for the micture of treatment *Orf* traditionally (Fahrizi, 2019) because the betel lime has the charateristics which can burn (*cauterisasi*) scab. The betel lime is also used for separating the weight metal (Cu(II) and Zn(II)) in the same time from the waste industry water. (Benalia et al., 2022) And as the nature preservative of broiler chicken eggs which is combined to the usage of having coconut oil and roselle Ca(OH)<sub>2</sub> which is dissolved in the water is going to ionized to form ion OH<sup>-</sup> that has the base of characteristics and is able to neutralize acid, this is very important in caring the freshness of purebred chicken (Rahmawati et al., 2014).

The another research stated that the use of calcium hydroxide with essential oil as the medicine of intracanal giving the effect of good antimicrobe and able to become the promising candidate to use on treatment (Cosan et al., 2022). The bettel lime is also used in the process of nixtamalization of cornstarch by fixing the characteristics of physicochemistry from cornstarch (Zakiyah, 2022),

In the process of immersion to reduce the cyanide content in cassava leaves, Ca(OH)<sub>2</sub> has the function to soften the cassava leave tissue and issue linamarin by the cassava leaves to reduce the cyanide acid through the immersion processing (Sari et al., 2022). On vegetable oil, Ca(OH)<sub>2</sub> is used as *Thickener* in increasing the performance of bio grease easily environmentally. Ca(OH)<sub>2</sub> can give the good soluble toward the corrosion because it can form emulsion water on oil. The soap of calcium has the ability to hold the accumulation of much enough water inside the stable emulsion to the surface of metal will stay wet by oil and be able to prevent the cause of rust. (Mariana Mariana et al., 2022).

Another benefit from Ca(OH)<sub>2</sub> is as the additional ingredient inside the chips production

The chips is one of the snack where it is very familiar to society Indonesian. The chips can be used as the main dish or as the food guidance of rice. Its taste crunchy makes the chips as the favourite snack by children to adults. There are some variety of chips found easily in Indonesia, such as Cassava chips, Potato Chips, purple sweet potato, taro, rambak chip, and others. Eventhough, they look so simple and easy, to produce chruncy chips, it is not like what it looks.

There are some cases facing on during the chips production of processing, such as; aroma, and the taste of chips doest not fulfil the tounge, the size is too small and easily broken, and the taste is not crunchy when it was chewed. To produce the good chips, the producer must pay much attention to the chips production process in order that the chips is going to have the taste, texture, and the colour based on consumen needs (Siregar et al., 2015).

The chips which has the good crunch is the component for first to be evaluated by consumen. When it is bited tasting crunch, delicious, uneasily destroyed, hardless, and not too soft are the characteristics of chips who was seeked for by consumen.

The texture is the first quality of parameter, after the smell, *taste* and the colour. The texture is the impression pressure which can be taste by the mouth ( in the time of bited, chewed, and swallowed processing) then touched by using fingers. The another factor such as appearance and *packaging* of chips is also the component which the consume can give the evaluation (Rosida et al., 2019).

Betel lime is a material that is widely used by manufacturers to increase the crispiness of chips (Irmayanti & Irhami, 2022). The betel lime was used when the immersion with concentration and time immersion which depened on any various chip produced. This research was shown *review* the use of betel lime on any various chips for having the information about the usage, the reaction of betel lime, concentration, and the optimal immersion until it can be done for first references for UKM especially who is going to use the betel lime for the chips production process

## II. METHODOLOGY

This research was used the method of *descriptive content analysis study*. The analysis described the primary content based by the information group has. The information is from proceedings, book material, national journal accreditation and international journal scopus index reputation. Data and information would be handed in, analyzed, and summarized until succeed getting recommendation as literature study.

This reseach was done to give the general review of using betel lime ((CaOH)<sub>2</sub>) especially on chips. The use of them include the differences of the concentration and the immersion time on any various chips.

## III. RESULT AND DISCUSSION

### A. The structure of betel lime chemical

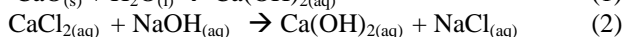
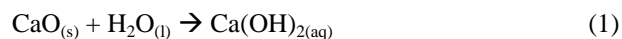
The betel lime has the formulation of chemical Ca(OH)<sub>2</sub>. Ca(OH)<sub>2</sub> is the strong electrolyte which is from strong base. This strong Electrolyte ionized to perfect inside the water to be the compiler ions itself, those are ion Ca<sup>2+</sup> dan ion OH<sup>-</sup>. The calcium hydroxide is the white powder that has no smell with the formulation of chemical Ca(OH)<sub>2</sub> and the weight of molecule 74,09. Chemically, it was known as strong base (ph around 12,5 – 12,8). The calcium hydroxide has the activities antimicrobial with dissociating to become calcium and hydroxyl ions. The ions are the most reactive anions with some biomolecule (Cosan et al., 2022).

The main effect of calcium hydroxide was connected by the acts of these ions, which increased the pH. The situation of base detoxified to bacterial lipopolysaccharide by omitting fatty acid esterification and change the chemical of conformation. The impact was the integration of bacterial cytoplasmic membrane became broken. (Ba-Hattab et al., 2016).

The Calcium hydroxide has the antibacterial characteristics. The total of product has formulated with the treatment of different therapeutic, which the effect depended on tissue when the calcium hydroxide was

used. The effect of hydroxyl ion on bacteria cell is the destructor of bacterial cytoplasmic membrane, denatured protein, and destroyed Bacterial DNA (Nishanthi & Ravindran, 2020).

The betel lime has another name that is: *slaked lime*, *hydrated lime*, *lime hydrate* is the solvent which was got by the reaction between alkaline oxide (CaO) with the water or the reaction between the solvent CaCl<sub>2</sub> with NaOH which could be explained with the reaction of 1 and 2.



### B. The use of betel lime in variousity of Chips

On chips, Betel lime was used as the ingredient of additional to immersing processing before it was done the frying process. The immersion is the step that has the primary rule to determine the food product quality of the chips which was produced. The concentration of betel lime that is used by having the time of immersion to create the best chips which can be seen on table 1.

Table 1. The concentration of betel lime and the ideal immersion time in variousity of chips

The various of Chips	The betel lime concentration used	The of immersion time
Pineapple (Asiah & Handayani, 2018)	0,5%	30 Minutes
Cassava (Rahmawati & Maryani, 2022)	0.5 %	30 hours
Kepok Banana (Musa paradisiaca) formatypica (Dwiani & Rahman, 2021)	1%	10 Minutes
Silk Taro (Colocasia esculenta) (Ratrina Katsum et al., 2020)	15%	15 Minutes
Taro sticky (Colocasia esculenta) (Wahyuni, 2012)	20%	15 Minutes
Rambak skin (Rasyid, 2019)	2%	2 days
wak banana hump (Irmayanti & Irhami, 2022)	2.5 %	Impacted to not real
Durian Seed (Effendi Siregar & Nurminah, 2015).	0.5 %	4 Hours
Papaya (Yunus et al., 2017)	0.15 %	15 Minutes
Corn Tortilla (Lawalata et al., 2017)	4 %	30 Minutes

By the table 1 can be seen that there is various of immersion time with the concentration of betel lime which had differences to produce the quality product of chips, especially by the side of crunch. The longest of immersion times was on cassava chip for 30 hours and rambak chips for 2 days, meanwhile kapok banana

needed only immersion time to the shortest of 10 minutes.

The concentration of lowest betel lime was on kapok banana chips as 1% and papaya chips as 0.15%. The concentration of highest betel lime was used to the sticky taro as 20%. There were some factors that influenced the differences of betel lime concentration and the immersion time, those are: The various of tubers or fruit used. (Mandei et al., 2017), The natural water contain that tubers/fruit has (Asiah & Handayani, 2018), The method or the technique (Yunus et al., 2017) The thickness of ingredient used (Rasyid, 2019), and the temperature of immersion (Lawalata et al., 2017).

### C. The relationship of betel lime chemical characteristic with the crunch of chips

Ca(OH)<sub>2</sub> is the strong electrolyte which is easy ionized to the water in form of ion Ca<sup>2+</sup> and OH<sup>-</sup>. Calcium ions was reacted to the group of carboxyl from the pectin which was came by tubers or fruit that was used as the main ingredient of chips. The pectin in Greek, *pectos*, which had the mean of thick and dense. Total structure and composition pectin chemical had the differ to every plants. (Nafisa, 2019).

The pectin could be found inside the main of cell wall plants, especially between the cellulose and the hemicellulose. It was roled as the adhesive between cell wall. It is the group of carbohydrates/polysaccharides which was soluble in water. Pectin compounds is the polymer from acid D-galacturonic which is connected to the tight of α-(1,4)- glucoside. The Galacturonic acid is the derivative of galactose (Chayati, 2014).

The pectin was also be able to contain the group of acetyl which was tighted on atom C-3 or C-2 from galacturonic anhydrous acid, meanwhile the metals such as calcium, natrium, or ammonium tighted to the group of its carboxyl. The structure of acid chemistry D-galacturonate and pectin was showed on figure 1.

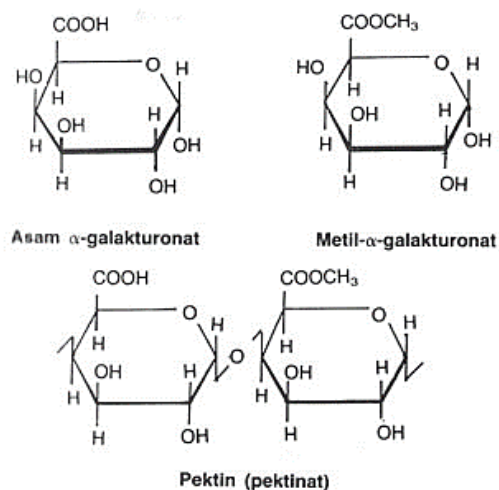


Figure 1. The structure of acid chemical D-galacturonate and pectin

The pectin was used as the functional component on food industry because the ability to form the watery gel and stabilized on protein. It was also used as the material ingredient in paper industry and textile, and then using for thickener in rubber industry (Rahmi & Satibi, 2014). The pectin was the complex of anionic polysaccharides which could be placed in primary and intercellular cell walls on high level plants. The arrangement of pectin molecule chains can be seen on figure 2.

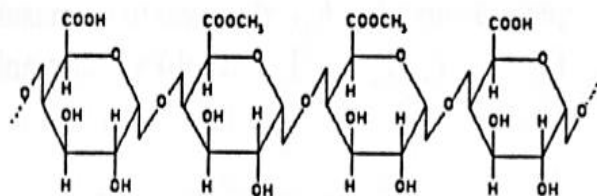


Figure 2. The arrangement of the pectin metal molecule chains such as calcium sodium, or ammonium tighting by its carboxyl group.

The immersion in calcium hydroxide could increase the chips crunch which was already fried. It was caused because the calcium hydroxide produced CO<sub>2</sub> gas which could form the pores on chips surface, where had the good effect to crunch the texture of chips produced (Irmayanti & Irhami, 2022).

Beside that, Ca(OH)<sub>2</sub> had the role in hampering to *browning* reaction non enzymatic which was caused by ion calcium and amino acid. The reaction of *browning* non enzymatic generally occurred when the comestibles of processing. The effect of *browning* would appear because there was the reaction between saccharides with protein or *amino acid*. (Wahyuni, 2012).

The process of immersion on rambak chips by the water of betel lime for 2 days gave the effect to help to enlight the chip's appearance, decreased the stench, and helped to crisp rambak. The process of immersion time gave effect to the quality of chips which was produced. (Rasyid, 2019).

On Sticky taro chips, found that the higher percentage and the longtime of immersion of betel lime in the solvent so the water content in ingredient tissue would become lower. The limit of water content which was trapped inside the ingredient tissue made the sticky chips resulted having more of good quality (Wahyuni, 2012). The solvent of betel lime solved the mucus and omitted the sensation of itch in taro until it would influence the taste of sticky taro chips, however, the solvent of betel lime did not leave the taste of betel by the product (Wahyuni, 2012).

On Kapok banana chips, the concentration treatment and the immersion of betel lime resulted in the effect which differed to real toward the quality of chemical (water content, ash, fat, and seng/Zn) and organoleptic (taste, color, aroma, and texture) on kapok banana chips (Dwiani & Rahman, 2021). On *tortilla* chips, the use of calcium purposed to pull out the part of Lembaga and

pericarp from the seeds of corn enlightened the color and hardened the texture (Lawalata et al., 2017)

On the silk taro chips, the concentration of the betel lime solvent Ca(OH)<sub>2</sub> impacted real toward the water content and impacted not real toward the value of ash content and the test of organoleptic color, the taste, and the crunch of silk taro chips. The immersion time impacted real toward the water content and impacted to not real toward the ash content and the test of organoleptic color, taste, and crunch of silk taro chips. The interaction of the solvent of betel lime concentration Ca(OH)<sub>2</sub> and the immersion time influenced not real toward the water content, ash content and the test of *organoleptic* colour, the taste and the crunch on silk taro chips.

The immersion time of the solvent of betel lime on papaya could dissolve the mucus and omit the sensation of itchy on papaya, until the more the solvent of mucus would influence the taste on papaya chips but it would not leave the taste of betel on products (Yunus et al., 2017). The Immersion in water lime of processing to the seed of durian chips could decrease gum or mucus, made them durable, and prevented by the cause of colour or browning. (Siregar et al., 2015) The more high concentration of betel lime, So that water content, fat content, protein content, value of color organoleptic, value of taste organoleptic, and value of texture organoleptic got the more increasing.

The results of the research showed that the concentration of betel lime impacted to the real is (P $\geq$ 0,05) toward the water content and the fibre content of wak banana hump chips, impacted to very real (P $\leq$ 0,01) toward the ash content of wak banana hump chips. The immersion time which was not impacted to the not real is (P $\geq$ 0,05) toward the ash content wak banana hump chips. The interaction of betel lime and the immersion time (KL) which were not impacted into real is (P $\geq$ 0,05) toward ash content, impacted into real is (P $\leq$ 0,05) water content and the content of wak banana-hump-fibre chips (Irmayanti & Irhami, 2022).

#### IV. CONCLUSION

Betel lime Ca(OH)<sub>2</sub> has been used as an additional to the process of soaking various chips. By giving the betel lime has given an impact on the texture and the appearance (color) of the chips which are produced. For the best quality of the chips, there are differences between using a whitening soaking of betel lime and the time of soaking. On the chips of pineapple, the concentration and the best time of immersion is 0.5 % for 30 minutes, for the chips of cassava is 0.5% for 30 hours, for the chips of kapok banana is 1% for 10 minutes, for the chips of silk taro is 15% for 15 minutes, to the chips of sticky taro is 20% for 15 minutes, to the chips of ramshackle skin is 2% for 2 days, to the chips of durian seeds is 0.5% for 4 hours, to the chips of papaya is 0.15% for 15 minutes, to the chips of corn tortillas was 4% for 30 minutes. There were some factors which have influenced the differences, that as the various tubers or

the using fruit, The natural water contained belonged to tubers/fruits. The ways/The immersion technique, and the immersion of temperature. The next research was expected to be able to summarize the various other chips which were also used for Betel Lime as the additional ingredient.

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