CHAPTER II

LITERATURE REVIEW

2.1 Ingredients Review

2.1.1 *Rossella*

Figure 2.1 *Rosella*

Rosella or also known as roselle, (Hibiscus sabdariffa L.) is a tropical subshrub with red or green inflated edible calyces. The types can be distinguished by three different colour groups: green, red and dark red. Calyces of the red and dark red coloured type are extracted and sweetened to produce a refreshing drink while calyces and leaves of the green type are used for making vegetable stew (Babalola et al., 2001).

The calyces are rich in anthocyanin, ascorbic acid and hibiscus acid. It is water soluble with brilliant and attractive red colour and with sour and agreeable acidic taste which aid digestion (Norhaizan et al., 2010). Color is one of the most important quality attributes affecting the consumer's acceptance of food since it gives the first impression of food quality. Many convenience foods such as confectionery products, gelatin desserts, snacks, cake, pudding, ice cream and beverages would be colorless, and would thus appear undesirable without the inclusion of colorants). The flowers of Hibiscus sabdariffa are rich in anthocyanins. The anthocyanins are responsible for the red color, while the acid taste is due to the presence of some organic acids. Sepals' acidity may also

contribute to their color variation. In this respect, *rosella* calyces appear to be good and promising sources of water-soluble red colorants that could be utilized as natural food colorants (Azza et al., 2011).

The other health benefits of this plant include diuretic and choloratic properties, intestinal antiseptic and mild laxative actions. It also used in treating heart and nerve disorder, high blood pressure and calcified arteries (Azza et al., 2011). In addition, Norhaizan et al (2010) Noted that roselle can prevent cancer, lower blood pressure and improve the digestive system in humans. Its calyx extract has also been used as an effective treatment for patients with kidney stones due to its uricosuric effect, roselle extract can also perform as an antioxidant.

2.1.2 *Secang*

Figure 2.2 *Secang*

Secang (Caesalpinia sappan L,) often found in Indonesia. Empirically, *Secang* known for its value as medicine and often used for traditional herbal drink (Febriyenti et al., 2018). Made et al (2019) explained that the often part of *Secang* is its stem that contain secondary metabolite. *Secang* used as natural coloring, due to its pigment that resulting red colors. *Secang* has chemical content of flavonoids, brazilin, alkaloids, saponins, tannins, phenyl propane, and terpenoids, that can be used for antioxidant, antibacterial, antiinflammation, anticancer, lipid peroxidation.

2.1.3 Red Ginger

Figure 2.3 Red Ginger

Ginger (*Zingiber officinale Rosc*.), is one of the most important and oldest spices a well-known plant in the Nusantara archipelago, consumed as a delicacy, food preservation, medicine, or spice. Its highest value is given by the pungent and aromatic essential oils produced throughout the plant, especially the rhizomes. The essential oils are responsible for the aroma while the non-volatile components are responsible for the pungency with gingerol the most pungent component in fresh ginger (Ahmad et al., 2014). *Zingiber officinale* has three varieties based on size and color of rhizome, *i.e. Z. officinale var. officinale* (big white ginger or giant ginger, *badak or gajah), Z. officinalevar. Amarum* (small white ginger, *emprit*), *and Z. officinalevar. rubrum* (small red ginger, *merah orberem*). These three varieties may partly be deferred from their essential oil contents and are used for different purposes. The essential oil content of the big white ginger is the lowest compared with the other varieties. The big white ginger is usually used for fresh (green) ginger products, food, and beverages, while the other gingers are mostly used for medicinal purposes (Ahmad et al., 2014).

The usage of Red Ginger instead of white Ginger, came from its phenol and flavonoid content. According to Ganiyu et al (2012), the phenol content of the red ginger (95.34 mg/100 g) was significantly ($P < 0.05$) higher than that of the white ginger (61.89 mg/100 g). Also, the flavonoid content of the ginger extracts indicated that red ginger (53.67

mg/100 g) had significantly (P< 0.05) higher flavonoid content than white ginger (34.55 mg/100 g). In addition, Ganiyu et al (2012) noted that Phenolic compounds can protect the human body from free radicals, whose formation is associated with the normal natural metabolism of aerobic cells. It has been shown that besides gingerols and shogaols, red ginger is loaded with anthocyanin and tannin in its root bark. Also, the flavonoid content of red ginger is significantly higher than that of white ginger. The antiradical activity of flavonoids and phenols is principally based on the structural relationship between different parts of their chemical structure. Natural polyphenols can remove free radicals, chelate metal catalysts, activating antioxidant enzymes, reducing alpha-tocopherol radicals, and inhibiting oxidases.

2.1.4 Mace

Nutmeg (*Myristica fragrans Houtt*) is one of Indonesian popular spices. Flesh, nutmeg and mace are three distinct parts of nutmeg. Mace and seed of nutmeg used in medicine and food and used as a standard food seasoning in Netherlands. In Manado (North Sulawesi), seed and mace of nutmeg are also used as a seasoning in some foods Manado, but it is also used in some types of cookies. Nutmeg flesh made into sweets and syrup, while flesh of young harvested (6-7 months) nutmeg distilled into essential oils (Jan et al., 2014).

Jan et al (2014) mentioned that seed extract has the highest ability to reduce ferric (82,33 mg GAE/g extract) compared to flesh and mace extract. This means that each gram of seed extract has ferric ion reducing ability equivalent to 82.33 mg of gallic acid. The reducing ability influenced by contained phenolic and terpenoids compounds. Otherwise, reduction power of mace extract is 56.31 mg GAE/g extract. Although differences in antioxidant activity, flavour and aroma are important aspect to considered on commercial purposes herbal jelly. Charles et al (2024) explained that nutmeg and mace share essentially the same

volatiles, yet at the same time, mace also has a subtly different aroma profile.

2.1.5 Cinnamon

Cinnamon has been used as a spice and as traditional herbal medicine for centuries. In addition to its culinary uses, cinnamon has been employed as a stomachic and carminative for gastrointestinal complaints as well as other ailments and is still used for these conditions in many countries (Joerg et al., 2010). In addition, Pasupuleti et al (2014) mentioned that beside being an antioxidant, anti-inflammatory, antidiabetic, antimicrobial, anticancer, lipid-lowering, and cardiovascular-disease-lowering compound, cinnamon has also been reported to have activities against neurological disorders, such as Parkinson's and Alzheimer's diseases.

Cinnamon is mainly used in the aroma and essence industries due to its fragrance, which can be incorporated into different varieties of foodstuffs, perfumes, and medicinal products (Pasupuleti et al., 2014). Through the studies that done by Macini et al (1998), the results suggest that the cinnamon extracts can be used as food antioxidant together with the improvement of food palatability.

2.1.6 Cloves

Cloves is unopened flower bud growing on a tree belonging to the family *Myrtaceae* Which is same as that of guavas. Cloves (*Syzygium aromaticum, Eugenia aromaticum* or *Eugenia caryophyllata*) are the aromatic dried flower buds. It is the common product in the spice rack around the world. It poses intense fragrance and burning taste. It has deep brown color, powerful fragrant odor, which is warm, pungent, strongly sweet and slightly astringent (Parle et al., 2011). In addition, Parle et al (2011) mentioned that cloves scores over 10 million at U.S. Department of Agriculture for comparing antioxidant activity.

2.1.7 Glycerine

Figure 2.4 Glycerine

Glycerine is a thick and gelatinous liquid, may be obtained by fermenting sugar or can also be synthesized by chemical process. Glycerine extensively employed in cosmetic and herbal industry (Padmawar et al., 2018). Sadat et al (2018) stated that glycerin as a byproduct of the transesterification reaction is one of the most valuable substances that can be widely used in the pharmaceutical industry. Based on Eyiz et al's (2019) paper, extraction of all phytochemicals namely phenolics, flavonoids, anthocyanins, proanthocya nidins and ascorbic acid, were significantly affected by the glycerol concentration. The higher the glycerol concentration resulted in the higher content of phytochemicals extracted. On the other hand, liquid–solid ratio had a significant effect on phenolics, flavonoids, proanthocyanidins and ascorbic acid content of the extract. Experiment done by Kowalska (2021) showed that 30.5% and 12.5% glycerol solutions were the optimal solvents for the extraction of polyphenolic compounds, flavonoids and chlorophyl from peppermint leaves and nettle leaves, respectively.

Based EFSA Journal (2017), glycerol (E 422) as a food additive is identical to a compound which is a normal constituent in the body (an endogenous compound) and is a regular component of the diet. The

panel concluded that there is no safety concern regarding the use of glycerol (E 422) as a food additive according to Annex II and III (Part 1, 2, 3, 4 and 5) for the general population at the refined exposure assessment for the reported uses of glycerol as food additive.

2.1.8 Konjac powder

Konjac powder is the purified material of the edible konyaku, which is a common food in Japan. Processing it into jelly is one of the most popular ways. Herawati et al (2022) explained that jelly is a food product with a chewy and soft texture, so widely used as a dessert ingredient and a mixture in drinks. Jelly could be produced from konjac or glucomannan flour that is formulated with other additives to give the desired texture. as explained by Nishinari (2000), a konjac gel has been a popular food as it has a unique texture, and KGM is a dietary fiber and believed to be good for health.

2.2 Product Review

Utilizing roselle, *secang*, and Indonesian spices herbal konjac Jelly is one of few ways to help Indonesian *Jamu* to keeping up with modern world. Bringing the soul of *Jamu* by using Indonesian traditional and easy to find ingredients as the based ingredients, this herbal jelly also maintains its benefits especially on antioxidant activities related.

Using ingredients, process and solvent that pay attention to antioxidant levels, resulted advantages to this product. In addition of nutritional value, this product aims for commercial success. Due to this, the sensory of this product is evaluated and alternated using nutritional focused or authentic ingredients for jamu, the usage of market based, or popular ingredients is used to help commerce this product. Adapting to Rajayanake et al (2017), that noted “It is most appropriate to have ready to serve drink without any further preparation like boiling / dissolving or adding sugar, salt etc., having energy, healing effect

and refreshing effect for Task oriented individuals (TOI) like hikers, soldiers and archaeologists engaged in increased physical activities in extreme environments for longer working times", Compact Konjac jelly is chosen as this herbal drink form.

2.3 Process Review

The main processes are divided into two processes: Extraction and jelly making processes. All the processes are antioxidant level based processed. These actions are done in order to achieve high antioxidant level herbal jelly drinks. Arif et al (2023) explained that he aqueous solubility of a drug for an oral formulation is very important, because it has a strong influence on the drug's bioavailability. The drug molecules could be absorbed after dissolving in gastrointestinal fluid. Therefore, developing a strategy to increase the solubility of a drug is necessary for the formulation of a poorly water-soluble drug, especially for oral antioxidant drug formulations. Respected that, adding glycerine and physical treatment are the solutions that are taken to increase water solubility.

2.3.1 Extraction

Extraction process is done by sous vide. The French word "sous vide" is used in the sense of "under vacuum" and is defined as a cooking technique applied to raw or half-cooked food (Schellekens, 1996). Doniec et al (2022) explained that the sous vide technique in the case of polyphenolic acids mostly increased their concentration with the exceptions of gallic acid, p-Coumaric acid and ferulic acid. Hydrothermal treatment contributes to the release of polyphenolic compounds contained in the apoplasm and vacuoles and those bound to plant cell wall components. In the case of traditional boiling in water, the released polyphenolic compounds are washed into the aqueous medium through direct contact between the plant material and the water, resulting in a high percentage of their loss. In the case of steam cooking, the acids can be oxidised, while the sous-vide technique, due to the use of vacuum

packaging, protects the bioactive compounds from oxidation and leaching into the medium, and is thus the most effective treatment for most of the analysed polyphenolic acids among the techniques used. Based on the capability of sous vide process to maintain the antioxidant and nutritional value, make sous vide is the perfect approach to make high antioxidant extraction.

2.3.2 Heating

Due to the need of maintaining antioxidant level, the temperature of jelly making is very volatile. Chaaban et al (2016) noted that temperature influences the stability of flavonoids and their bio logical activity. This involved in jelly making process which is done by mixing extract with Konjac powder at low temperature until all the jelly powder diluted over low heat to maintain the antioxidant level.