

The Process of Making Balinese Loloh Cemcem Drinks as Biology Learning Materials on the Topic of Natural Ingredients and Active Compounds in Plants

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Abstract: Cemcem leaves (*Alstonia scholaris* (L.)) are the basic ingredient in making the traditional herbal drink loloh cemcem. Loloh cemcem has good bioactive ingredients to increase endurance and traditional medicine to prevent and treat various diseases. This study used an exploratory qualitative approach, which aims to explain the process of making the traditional herbal drink loloh cemcem which is useful for biology learning material on the topic of natural ingredients and active compounds in plants and explores the value of local wisdom in the manufacturing process. The data source in this study used purposive sampling with two loloh drink producers cemcem located in Penglipuran Traditional Village, Bangli Regency, Bali Province. The data in this study were obtained through interview techniques, observation, documentation, and literature study. The results showed that the process of making loloh cemcem drink was divided into three phases, first processing cemcem leaves, young coconut, palm sugar, tamarind, and red chili, the second is to pack the loloh into an airtight bottle and the third to put the loloh in the refrigerator. The value of local wisdom in making loloh is that the materials used are 100% still natural, and the manufacturing process is traditional. Generally, parents are the producers of loloh; there is cooperation in making loloh, and public knowledge about the efficacy of loloh cemcem is a legacy from the ancestors of the Balinese people.

Keywords: Loloh Cemcem, Ethnoscience, (*Alstonia scholaris* (L.)), Biology Learning.

INTRODUCTION

Loloh is a traditional herbal drink produced and consumed exclusively in Bali and has properties to prevent and treat various diseases. Loloh drinks come from various types of certain plants that are often used by humans to maintain a healthy body and are used among others as a medium for the treatment of several diseases (Joubert et al., 2008; Volpato & Godinez, n.d.). One of the advantages of traditional herbal drinks is that they do not contain harmful chemicals if consumed for a long time. Each region can have a wealth of information on traditional

medicine passed down from generation to generation from their ancestors.

Traditional herbal drinks are part of the local wisdom of a multicultural society (Whitmore, 1997); one area with a rich culture and its relation to herbal medicine is Bali. In the findings of research conducted about twenty years ago, the Balinese have used more than 490 plant species for medicinal purposes (Sujarwo, 2015). The use of plants as ingredients for making traditional herbal medicines is quite high, considering the number of flora in Bali recorded in several studies is as many as 1768 species

(Girmansyah et al., 2013). The Balinese have used various plants for medicinal purposes since ancient times, so today's people only continue this tradition. Among the herbal medicinal products made from Balinese plants is the loloh cencem drink, this drink is commonly consumed by the community to treat various diseases (Liu et al., 2013).

The availability of ingredients for making Loloh Cencem cannot be separated from the role of the community in protecting and preserving the forest and the surrounding environment. Balinese people adhere to the concept of Tri Hita Karana (Three basic concepts to get happiness), which is a concept of forming good relationships with God (Parahyangan), the environment (Palemahan), and fellow human beings (Pawongan) (Roth & Sedana, 2015). The integration of religious and cultural values forms harmony in Balinese society.

Several studies have shown an increase in the use of herbal medicines, especially those derived from plants (Rates, 2001), especially those derived from tropical plants in the forests of the Pacific Rim. This shows that plants in the tropics are rich in biodiversity.

The parts of the plant that are used as medicine by the Balinese people include leaves, fruit, sap, rhizomes, bark, stems, flowers, and seeds. In Balinese society, traditional medicine is mostly practiced by some members of the community rather than

treatment using chemicals for certain diseases (Neame, 1964; Poonam & Singh, 2009; Rates, 2001).

Several previous studies have explained the loloh cencem drink from an ethnobotanical and economic perspective (Pebiana et al., n.d.; Sujarwo, n.d.). However, no one has utilized the results of this research as learning material in Biology material at school. Therefore, the potential in studying loloh cencem drink can be used as Biology learning material, especially regarding natural ingredients and active compounds in the loloh cencem drink. This research aims to explore how to make the traditional herbal drink loloh cencem, so that it can be utilized optimally for scientific materials for Biology learning materials in schools.

METHOD

This research is in the Penglipuran traditional village area, Bangli District, Bangli Regency, Bali Province. Penglipuran Village was chosen as the research location because the main producer of loloh cencem drink is in Penglipuran Village. Astronomically this area is located at 08 08 30' – 08 32 07' South Latitude and 115 13 43' – 115 27 24' East Longitude. Rainfall varies yearly by around 1200-3700 mm, and the average annual temperature is 23-33 degrees Celsius (Sujarwo, 2015).

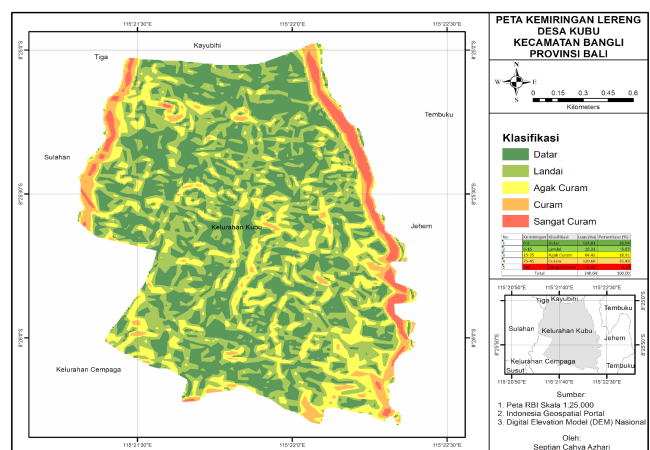
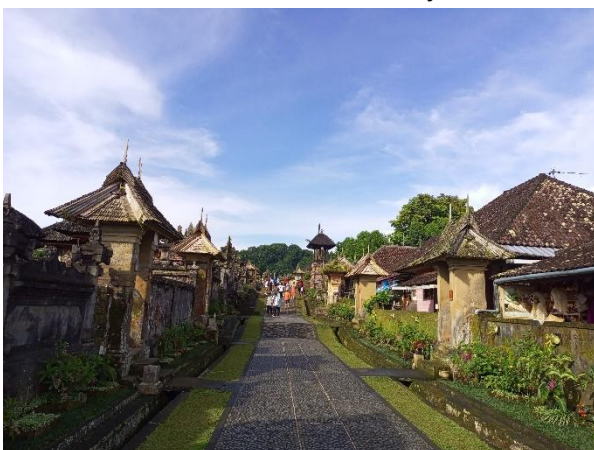


Figure 1. Penglipuran Village and Slope Map of Kumbu Village, Bangli Regency

This study uses an exploratory qualitative approach to explain the process of making the traditional herbal drink loloh cemcem. The data source in this study used purposive sampling with two loloh cemcem drink producers in Penglipuran Traditional Village, Bangli Regency, Bali Province. The data in this study were obtained through interviews, observation, documentation, and literature studies.

This research used an in-depth interview method. The research was conducted in December 2022 in Penglipuran Traditional Village, Bangli District, Bangli




Regency, Bali Province. Information about making loloh cemcem was obtained through interviews with the owner of the loloh cemcem business in the Penglipuran traditional village. Before the interviews, informants were asked for approval to serve as a researcher's code of ethics. Data collection was carried out in November 2022, and two key informants explained the process of making loloh cemcem.

RESULTS AND DISCUSSION

The first finding in this research is that the ingredients and tools used in making loloh cemcem include cemcem leaves, palm sugar, young coconut, smoothing machine, clay barrels, tamarin, chili and mineral water. The description of each ingredient and tool is

described in Table 1. Furthermore, Table 2 presents data in the form of information about the original knowledge of loloh cemcem obtained directly by the research subjects as well as a scientific description of each of the original knowledge.

Table 1. Tools and materials for making loloh cemcem

No.	Ingredients and tool	Description
1	 <p>Cemcem leaves</p>	Cemcem leaves as a basic ingredient for making loloh cemcem drink.
2	 <p>Palm sugar</p>	Palm sugar gives a distinctive sweet taste to loloh cemcem.
3	 <p>Young coconuts</p>	Only young coconut meat is an additional ingredient in the loloh cemcem drink.



No.	Ingredients and tool	Description
4	 Blender machine	Blender machine works to smooth cemcem leaves.
5	 Clay barrels	The clay barrels is a traditional container to hold filtered cemcem leaf water.
6	Tamarind	Tamarind is used to give a sour taste to the loloh cemcem drink.
7	Red chili pepper	Red chilies are used to give a warm taste to the loloh cemcem drink.
8	Mineral water	Mineral water dissolves the cemcem leaves and all the compositions used.

Table 2. The results of the reconstruction of public knowledge into scientific knowledge

No.	Research focus	Subject research explanation	Scientific Description
1	The meaning of loloh cemcem	Loloh cemcem drink is a traditional drink made from cemcem leaves and a mixture of other traditional ingredients such as young coconut meat, palm sugar, tamarind, and red chilies.	Loloh cemcem is a traditional drink from the Province of Bali made from cemcem leaves (<i>Alstonia scholaris</i> (L.)). The cemcem leaves used in making loloh cemcem contain various active substances such as flavonoids, polyphenols, and vitamin C (Sujarwo, 2015). In addition, there are also other chemical compounds contained in cemcem leaves such as tannins, saponins, and alkaloids. These chemical compounds have health benefits, such as boosting the immune system, reducing inflammation, and helping digestion.
2	The process of making Loloh Cemcem drink	The process of making the loloh cemcem drink starts with crushing the cemcem leaves, then filtering the water and the dregs, adding the water, and young coconut meat, palm sugar, tamarind, and red chilies to the cemcem leaf water.	Natural compounds from cemcem leaves and the content of palm sugar, tamarind, water and young coconut meat, and red chilies have good ingredients for the health of the human body (Pebiana et al., 2020).
3	Selection of raw materials loloh cemcem	Cemcem leaves, young coconut water, young coconut meat. Tamarind and red chili.	Young coconut contains bioactive compounds such as amino acids, electrolytes, potassium, sodium, and magnesium minerals. In addition, young coconut also contains vitamin C, folate, and

No.	Research focus	Subject research	explanation	Scientific Description
				<p>several antioxidant compounds such as ascorbic acid and catechins (Subagio, 2010).</p> <p>Tamarind contains bioactive compounds such as citric acid, ascorbic acid, malic acid, and flavonoids. These compounds benefit health by boosting the immune system and helping digestion (Husain et al., 2022).</p> <p>Red chilies contain a bioactive compound called capsaicin, giving red chilies a spicy taste. Capsaicin has health benefits, such as helping to increase metabolism, relieve pain, and increase endorphins in the body (Lestari, 2021).</p>
4	The process of crushing cecem leaves	The crushing of cecem leaves uses a blender machine, the goal is to get cecem leaf juice.		<p>The process of destroying cecem leaves is carried out so that the bioactive compounds contained in cecem leaves can be released and dissolved in water. Crushed cecem leaves have a larger surface area making it easier for the bioactive compounds to be released and mixed with the cooking water. In addition, the crushing process also helps speed up the process of extracting the bioactive compounds in the cecem leaves so that the time needed to boil the cecem leaves becomes more efficient.</p>
5	The process of mixing cecem leaves, young coconut, tamarind and red chili	The cecem leaves that have been filtered are then put into the boiling water of palm sugar, tamarind, and red chilies. Cover, and add meat and young coconut water.		<p>Mixing cecem leaves, palm sugar, tamarind, red chili, and young coconut produces a chemical and physical reaction. These compounds interact and form a homogeneous mixture with a pleasant and balanced taste. Cecem leaves, and red chilies give a unique and spicy taste to loloh cecem, while young coconut gives a sweet and fresh taste. Tamarind, aside from giving a sour taste to loloh cecem, can also bind other compounds in the mixture to produce a stable and not easily changed mixture.</p>
6	Products Loloh Cecem	Loloh cecem is a traditional herbal drink developed in Penglipuran Village, Bangli Regency, Bali Province. In general, people consume this drink to strengthen their immune system.		<p>The ingredients in the plants used for making Loloh Cecem have properties for treating stomach ulcers, diarrhea, hypertension, aphthous stomatitis (sprue), and other minor health problems (Sujarwo, 2015).</p>

1. Ethnoscience Study on the Process of Making Loloh Cecem as Biology Learning Material on the Topic of Natural Ingredients and Active Compounds in Plants

Ethnoscience studies can be a way to study the process of making loloh cecem as biology learning material on the topic of

natural ingredients and active compounds in plants. *Ethnoscience* is a scientific discipline that studies local wisdom, knowledge, and traditional practices related to natural resources and the environment, including plant knowledge (Arfianawati, 2016).

Based on Ethnoscience studies, learning can begin by understanding cultural

aspects and local wisdom related to making loloh cemcem, such as the materials used, processing methods, and the community's role in preserving cultural heritage. Furthermore, learning can be continued by studying the composition and active compound content of each ingredient used in loloh cemcem, such as cemcem leaves, young coconut, tamarind, palm sugar, and red chilies.

In biology lessons at high school, by studying the process of making loloh cemcem, students can learn about the active compounds in plants and their benefits for human health. For example, cemcem leaves contain flavonoids, saponins, and tannins with antioxidant, anti-inflammatory and anti-diabetic activities. Students can also learn about bioactive compounds in young coconuts, such as lauric acid and caprylic acid, which have antibacterial, antifungal, and antiviral properties. Meanwhile, the tamarind used in the loloh cemcem drink has antioxidant and anti-inflammatory properties.

Students who study the process of making loloh cemcem through an ethnocentric approach will understand the importance of using natural resources wisely and sustainably and respecting local wisdom in protecting cultural heritage. In addition, students can also learn about the properties and benefits of natural ingredients in plants, so they can increase awareness of the importance of protecting the environment and sustainably using natural resources. Furthermore, there are several stages in making the traditional loloh cemcem drink, including the following:

The first step is to wash the cemcem leaves with running water until clean. This process aims to remove dirt on the surface of the cemcem leaves, which can cause the loloh cemcem drink to spoil quickly.

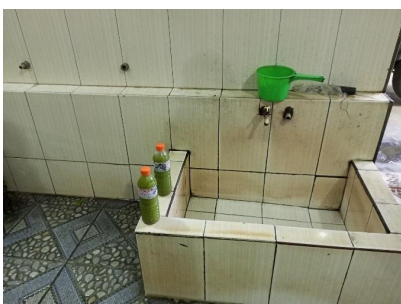


Figure 3. Place to wash cemcem leaves

The Balinese believe cemcem leaves have strong medicinal value (Singh and Lal, 2008). This belief is recorded in ancient medical records such as Ayurveda in India and Taru Pramana in Bali (Worsley, 1972; Hobart, 1990). The Balinese also mix the making of loloh cemcem with palm sugar, salt, and coconut (*Cocos nucifera*), which has become the culture of the Balinese people.



Figure 4. The process of slicing cemcem leaves

After washing the cemcem leaves, they are drained using a basket so that the washing water does not get stuck in the leaves. The next process after the cemcem leaves are drained is crushing the cemcem leaves using a blender machine.



Figure 5. Blender Machine

The process of crushing cemcem leaves takes about 10-15 minutes. The ratio between the amount of water and cemcem leaves is 5:5.

Furthermore, cemcem leaves mashed using a blender machine are put into a plastic gallon. At this stage, other compositions such as palm sugar, tamarind, red chili and young coconut are added and stirred until completely mixed.



Figure 6. Loloh drink cemcem

Before the loloh cemcem drink is put into the bottle for packaging, it is necessary to filter it so that the dregs from the cemcem leaves do not get into the bottle. Furthermore, after the loloh cemcem is packed into bottles, it must be immediately put into the freezer to prevent the loloh cemcem drink from spoiling quickly.

2. The Value of Local Wisdom in the Process of Making Loloh Cemcem

Making the loloh cemcem drink involves several local wisdom values that the Balinese still maintain. Based on the results of the interviews, there are five forms of local wisdom in the process of making loloh cemcem drinks, including:

- a. Making the herbal drink loloh cemcem uses natural ingredients such as cemcem leaves, young coconuts, tamarind, palm sugar, and red chilies.
- b. The processing of the loloh cemcem drink is carried out traditionally, from the collection of the ingredients to the mixing and processing. This has been done for generations by the ancestors.
- c. In general, the loloh cemcem drink is made by parents or ancestors in Bali, which is then passed on to the next generation.
- d. The value of gotong royong, the making of the loloh cemcem drink, is often done together by the family or the traditional indigenous community.

- e. The community has known the various benefits of cemcem leaves for the prevention and cure of disease for a long time. This was obtained from ancestral information passed on to the next generation.

CONCLUSIONS AND SUGGESTIONS

The loloh cemcem drink contains many bioactive compounds useful for strengthening the body's immunity; it can also prevent and treat several diseases. This is because loloh cemcem contains flavonoids, saponins, and tannins, which have antioxidant, anti-inflammatory, and anti-diabetic activities. In addition, natural ingredients in loloh cemcem, such as cemcem leaves, young coconut, tamarind, and red chilies can be used in a sustainable manner and have local wisdom values that are important to protect.

In studying biology, ethnoscience studies can be an effective way to learn about natural ingredients and bioactive compounds in plants and understand the value of local wisdom and traditional practices related to natural resources. Through this approach, students can increase awareness of the importance of protecting the environment and sustainably using natural resources and understand the health benefits of natural ingredients in plants.

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