

# Review of Chemical, Biological, and Epistemological Elements: Mamaq Tradition

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**Abstract:** Mamaq by the ancestors of the Sasak people was an activity of chewing betel nut, lime, betel leaf, and tobacco, and ending with shrinkage. Betel leaves contain glycosides, steroids, triterpenoids, flavonoids, tannins, and anthraquinones. These compounds contain antimicrobial activity that can fight *Staphylococcus aureus*, *Escherichia coli*, and *Candida albicans* fungi. Meanwhile, whiting is a strong base because it has a pH of 11-12.5. This is because in the mouth there is saliva which can maintain a pH of around 6.8. Saliva contains phosphate buffer solutions H<sub>2</sub>PO<sub>4</sub><sup>-</sup> and HPO<sub>4</sub><sup>2-</sup>. And gambir contains a component in the form of catechins which function as antioxidants and antibacterials. The purpose of this research is to study philosophical values, especially epistemology, which investigates the origin, and composition of methods and knowledge related to mamaq philosophy and natural science concepts, especially chemistry, and compounds, and what reactions occur in the mamaq process that has not been revealed. The study uses the library method. From the results of the study, it was concluded that in addition to the philosophy in the ingredients for mamaq it can also be described the chemical compounds contained in the ingredients for mamaq, starting from whiting, green betel leaf, gambier, and areca nut.

**Keywords:** Chemistry; Mamaq; Philosophy

## Introduction

Philosophy, based on the Big Indonesian Dictionary, is knowledge and investigation with a common sense regarding the nature of everything that exists, its causes, and laws. Philosophy is a theory that underlies metaphysics and epistemology which are branches of philosophy. Philosophy etymologically comes from the Greek word philosophia which consists of the words Philo which means love, and Sophia which means wisdom or wisdom (Elisa & Batubara, 2019). Philosophy means the love of wisdom (Culliford, 2021) explains that philosophy is a sincere desire for the real truth.

The philosophy of natural science is a deep thought to obtain the truth, meaning, purpose, and values of this science for human life. Science is a scientific science with the scope of matter and energy, both found in living and

non-living things, discussing more nature (nature science) such as physics, chemistry, and biology. IPA is also a collection of knowledge that is systematically arranged in its general use limited to natural phenomena. The development of science is not only marked by the existence of a collection of facts but also by the existence of a scientific method and a scientific attitude. In short science or science is a collection of knowledge related to how to find out and discuss nature through various activities or research carried out, humans try to be able to answer natural phenomena, get satisfaction in fulfilling life's needs, and at the same time protect the universe.

Philosophy provides answers to questions where chemistry was born from the desire of experts to obtain answers to questions about what and why the nature of matter exists in nature, each of which will produce facts and theoretical knowledge about the material. In

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philosophy, understand phenomena that occur through living things, such as humans, animals, and plants. Similarly, changes produce new substances and change their nature and shape. Most living things are composed of several chemical elements, these elements also exist in nature, these chemical elements react to form several organs in the body so that with an understanding of the philosophy of science, we can analyze the facts that happened, and think deeply to find out what happened.

Science learning can be developed to rely on the uniqueness and potential of an area such as local culture and traditions (Roche et al., 2020). Local wisdom is a characteristic (uniqueness) of an area that develops in a local environment from generation to generation (Darmadi, 2018). Pamenang, (2021) explain that local wisdom is original knowledge (indigenous science) that comes from the noble values of cultural traditions. Science learning is important to contain local wisdom-based concepts to prevent the loss of cultural and traditional characteristics in an area (Luriawati Naryatmojo, 2019). The mamaq habit used to be done by people who liked to snack, but for now this habit is only done by 3 elderly parents. The ancients believed that with betel nut, the teeth would be cared for, not easily porous, and not susceptible to disease in the teeth. Apart from that, ancient people also made the tradition of inang as a substitute for toothpaste. They believe that the ingredients used when chewing coriander are able to care their teeth. It is not surprising, then, that in remote areas there are still many parents and elders who still carry out the tradition of incubation.

Studies on the mamaq tradition have been carried out by previous researchers who mostly focused on the mamaq tradition as a form of traditional medicine for the Sasak people known as nyembeq (Yuslih & Yulien, 2021). In addition, the mamaq tradition is used as a variety of rituals (Janggo, 2021) such as making the body immune from sharp objects as well as rituals carried out before the construction of traditional houses in Bayan Village, North Lombok Regency as well as rituals before the circumcision ceremony begins so that children are not afraid. In addition, the mamaq tradition is also used for welcoming guests during the birthday event, as a symbol of brotherhood among humans.

The author realizes that the mamaq tradition has been extensively researched by previous researchers and is not something new. But as far as the search and reading of the author, many existing studies have focused on the benefits of the health sector, especially teeth and their spiritual value. Meanwhile, the study of philosophical values, especially epistemology, which investigates the origin, the composition of methods and knowledge to mamaq philosophy and natural science concepts, especially chemistry, regarding compounds and what reactions occur in the mamaq process has not yet been revealed, so that is what makes the writer

interested in doing this study. Therefore, this paper aims to show that in the mamaq tradition there is aarehiosophy and knowledge values in science learning, especially chemistry and chemical elements contained in mamaq materials.

## Method

This study is a literature study (library research). The data sources for this research are previous research articles published in journals with topics related to mamaq, the elements, and compounds contained in mamaq ingredients such as betel leaf, lime betel, and areca nut and their relation to the concept of chemical IPA about mixing reactions. ingredients for mamaq. This is the opinion (Janggo, 2021) that literature study research data is data that has a certain quality of meaning that is expected to find meaning in reality, events, social activities, perceptions, and thoughts that are put forward as the object of analysis or the main research discourse. That library research is not just a matter of reading and recording literature or books, but a series of activities related to methods of collecting library data, reading and recording and processing research materials.

## Result and Discussion

Some of the things described in this study are as follows:

### *Mamaq Traditions, Chemical Elements and Their Benefits*

Indonesia is a pluralistic country, which has various cultures and traditions in it. Ethnographically, Indonesia has various ethnic groups living in this region. The ethnic group is spread across various islands within the area called the Unitary State of the Republic of Indonesia (known with NKRI). Indonesia is the largest multicultural country in the world, which can be seen from the socio-cultural to geographical aspects of Indonesia which are so complex, diverse and broad. In addition, Indonesian society is heterogeneous with various ethnic groups, languages, religions, customs, and others (Ary & Busyairi, 2021).

This diversity of culture and customs is the wealth of the Indonesian nation. Like the traditions that still exist in society today. According to KBBI tradition is a custom that is passed down from generation to generation from ancestors to the next generation, and is still carried out in society. Mining is one of the traditions of the ancient community in maintaining healthy teeth by chewing herbal ingredients such as betel leaf, areca nut, gambier, whiting, and tobacco (Sudarmin et al., 2018).

In the Sasak tribe there are two forms of cultural heritage that are still being maintained today, namely

culture in the form of objects and non-objects. Cultural heritage in the form of objects such as ancient mosques, sacred tombs, traditional houses, kemaliq (a place that has been purified) and others, while cultural heritage in the form of intangibles such as the topat war tradition or puja wali, Lombok's special dance arts, the tradition of elopement, the tradition of smelling nyale, the preasan tradition which is also a custom of the Sasak tribe which aims to bring rain (Soewena et al., 2020).

One of the cultural heritages that still exists in the midst of the Sasak people to this day is the mamaq tradition. The term mamaq by the ancestors of the Sasak people is an activity of chewing areca nut, lime, betel leaf, tobacco, and ends with shrinkage. After removing the remnants of the ingredients used in mamaq, a fresh and pleasant feeling will arise on the teeth like after brushing your teeth. This is due to the natural properties contained in betel leaves which are antiseptic or toxic to germs. Because betel leaves were often used by our ancestors to clean teeth long before toothbrushes or toothpaste came along (Mustaqimah et al., 2018) Describes the process of mamaq or inang as follows:



Figure 1. Main Ingredients and Complementary Ingredients for Mamaq



Figure 2. Cutting of Areca Fruit



Figure 3. Laying lime, areca nut and gambier on betel leaves



Figure 4. Betel Leaf Folding Ready to Serve

The ingredients or elements of Mamaq are as follows:

a. Betel Lime/Calcium Hydroxide ( $\text{Ca}(\text{OH})_2$ )

One of the ingredients used for mamaq is lime or often called whiting. Betel lime has the chemical formula  $\text{Ca}(\text{OH})_2$  which is a strong base because it has a pH of 11-12.5. This is because in the mouth there is saliva which can maintain a pH of around 6.8. Saliva contains phosphate buffer solutions  $\text{H}_2\text{PO}_4^-$  and  $\text{HPO}_4^{2-}$ . When a strong base is added to a buffer solution, the reaction will occur:  $\text{Ca}(\text{OH})_2 (\text{s}) + \text{NaH}_2\text{PO}_4 (\text{aq}) \rightarrow \text{CaHPO}_4 (\text{s}) + \text{NaOH} (\text{aq}) + \text{H}_2\text{O}$ . The lime philosophy symbolizes good descent, a steadfast heart and is willing to sacrifice for the sake of others.

b. Green Betel Leaf (Piper betle, L)

The use of betel leaves in the mamaq process cannot be replaced with any leaves. Betel leaves contain glycosides, steroids, triterpenoids, flavonoids, tannins and anthraquinones. These compounds contain antimicrobial activity that can fight *Staphylococcus aureus*, *Escherichia coli* and *Candida albicans* fungi. These three bacteria are bacteria that cause various

diseases of the teeth and gums and cause an unpleasant odor in the mouth (Karbalaei et al., 2021). The essential oil of betel leaf contains 30% phenol and some of its derivatives. Kavikol is the most abundant component in the essential oil which gives betel a distinctive odor (Sharmeen et al., 2021). The betel leaf philosophy symbolizes humility and respect for others, because the betel tree needs support to live.

### c. Gambir (*Uncaria gambir*, Roxb) and Areca Nut

Gambir contains a component in the form of catechins which function as antioxidants and antibacterials, especially the growth of *Enterococcus faecalis* bacteria (Dewiyani & Sari, 2021). Whereas in areca nut the active alkaloid content in young arecoline compounds are arecoline ( $C_8H_{13}NO_2$ ), arecolidin, arekain, guvakolin, and isoguvasin. The areca nut philosophy symbolizes good offspring, because seen from the towering tree, and there is hope of getting good and successful offspring.

Gambir extract contains several components, namely catechin, catecutanic acid, quercetin, red catechu, gambir flouresin, ash, fat and wax. The main content of Gambir is flavonoids, catechins (up to 51%), tanning substances (22-50%) and a number of alkaloids and dihydro derivatives. Apart from catechins, gambier extract contains various other chemical compounds, namely 20-50% catechutanic acid, 20-3-% pyrokatechol, 1-3% fluorescence gambir, 3-5% red cateku, 2-4% quercetin, fixed oil. 1-2% and candles 1-2%.



**Figure 6.** Gambir

### *Philosophy of Science Education in a Chemical Perspective*

Chemistry is the science that studies the composition, structure and properties of substances or matter from the atomic to molecular scale as well as changes or transformations and interactions to form matter that is found every day. All matter is composed of atoms or subatomic components that make up atoms: protons, electrons, and neutrons. Atoms can be combined to produce more complex forms of matter such as ions, molecules or crystals. The structure of the world we live in everyday and the properties of the matter with which we interact are determined by the

properties of chemical substances and the interactions between them. Chemistry is also the science of matter and it changes, matter is anything that occupies space and has mass. All matter exists in three states: solid, liquid and gas. In essence, objects undergo a change in shape, as well as the composition of their particles into another form, resulting in a change in the location of the arrangement of the particles into another form, resulting in a change in the location of the arrangement which affects different properties from the original form or form.

The development of science in the 20<sup>th</sup> century was very rapid. In 1896 there were about 50,000 people who carried out the tradition of science and not more than 15,000 people who were responsible for the development of knowledge in the field of science. Sixty years later in the 20<sup>th</sup> century there were at least one million people working as science researchers. The total number including those working in industry, government and education cannot be determined accurately but more than two million people are involved in scientific research (Kruk et al., 2018). Around 1960, especially in English-speaking countries, the philosophy of science was dominated by the philosophy of physics. There is a lot of literature that discusses what might be the causes of chemistry being ignored and it could be true. One possibility is that the pre-1960s philosophers of science were interested in theoretical science. So that at that time physics and chemistry were unified as exact natural sciences with a focus on studying their logical structure. This meant a greater interest in law in the sense of mathematical equations expressing the relationships between quantities and axiomatic theory. In the 1990s chemical philosophy began to emerge in several European countries leading to international efforts, during which time six conference proceedings dedicated to chemical philosophy emerged (Dwivedi et al., 2022). In the 2000s more and more chemical philosophy appeared in world-class journals such as the Hyle International Society.

Chemical philosophy should enclose most of physical chemistry, chemical physics, and materials science. Chemistry can also be interpreted as the science of changes in matter, including changes that do not involve chemical reactions. Chemical philosophy has two main parts, the first is conceptual issues that arise in chemistry in terms of articulation and analysis. The two philosophies of science such as realism, reduction, explanation, confirmation, and modeling are in the context of chemistry.

### *Epistemology and Philosophy of Science Education*

Epistemology is the study of the origins, processes, and results of the formation of knowledge (El-Eqapy & Al asadi, 2020). The link between epistemology and education is that epistemology explains the origins,

processes, results of the formation and direction of the movement of knowledge, as well as the concept of being and existing in education. "The word epistemology is derived from the ancient Greek episteme meaning "knowledge" and the suffix-logy meaning "logical discourse" (derived from the Greek word logos meaning "discourse"). It is analogous to the German Wissenschaftslehre (literally, theory of science) which was introduced by philosophers Johann Fichte and Bernard Balzano in the late 18th century. The word first appeared in English in 1847 as a translation of the German in New York's Electric Magazine review of a philosophical novel by German author Jean Paul".

The epistemology of science includes sources, means, and procedures for using means to achieve knowledge (Boon & Van Baalen, 2019). The means referred to in epistemology are reason, intellect, experience, or a combination of reason and experience and institutions. Natural Science apart from being a rational and objective knowledge of the universe with all its contents. So actually the dimension of Natural Science is essentially a link between logical-material aspects that show a scientific attitude, curiosity, honesty, logic, criticality, and discipline through IPA. Ask what, why and how questions about the environment. Observing natural science objects using the five senses and simple tools, recording and presenting data from natural observations orally and in writing in a simple way. As well as describing the concept of science based on the results of observations (Juhansar, 2021).

*Mamaq Tradition and Ethnoscience*

Ethnoscience is an in-depth investigation or research that explores, explores, examines and then transforms original scientific knowledge that grows and develops in society into a form of scientific knowledge


that can be accounted (Fasasi, 2017), said that ethnoscience is knowledge that comes from norms, customs, culture, and beliefs that influence people's understanding and interpretation. So that ethnoscience can be interpreted in a system of knowledge and understanding that is typical of a society.

Ethnoscience can increase students' knowledge (cognition) about the surrounding environment, especially those related to culture as ancestral heritage. explained (Kartika, 2016) that the value of local wisdom contained in each culture differs depending on the uniqueness of each region in Indonesia. The mamaq tradition in the Sasak tribe of Lombok has been going on for generations. Habits that were originally discovered in ancient times then still exist today, although currently the enthusiasts themselves are decreasing. The background of one's reason for mamaq (bomb betel nut), is that at the time when betel nut cognition will appear, so that the person gets a fresh feeling and the body becomes healthy. Then continuously start chewing and gradually enjoy and eventually addicted. Then will look for that sensation again.

The chemical content in the herb mamaq is tannin which is a phenolic compound. The mechanism of action of phenol has the ability to inactivate microbial cell adhesion (molecules attached to host cells) found on the cell surface. One of the ingredients used for mamaq is lime or often called whitening. Lime water has the formula  $Ca(OH)_2$  which is a strong base because it has a pH of 11-12.5. This is because in the mouth there is saliva which can maintain a pH of around 6.8. Saliva contains phosphate buffer solutions  $H_2PO_4^-$  and  $HPO_4^{2-}$  (Bechir et al., 2021).

Based on a literature review from several journals, a reconstruction of "Mamak" was obtained.

**Table 1.** reconstruction into scientific science, the results of which are presented

Real science (Mamaq)	Scientific Science	Related IPA materials
The use of betel lime is not too much because it will taste bitter.	Betel Lime/Calcium Hydroxide $Ca(OH)_2$ , should not be used in excess because calcium oxide (CO) when dissolved in water if used in excessive amounts can cause several diseases such as canker sores and even severe ones, namely tongue cancer.	Elements, Compounds, and Mixtures
	Betel leaves contain glycosides, steroids, triterpenoids, flavonoids, tannins and anthraquinones. These compounds contain antimicrobial activity that can fight <i>Staphylococcus aureus</i> , <i>Escherichia coli</i> and <i>Candida albicans</i> fungi. The three bacteria are bacteria that cause various diseases of the teeth and gums and cause an unpleasant odor in the mouth	Organizational System of Living Things

Real science (Mamaq)	Scientific Science	Related IPA materials
Mixing gambier during mamaq is more delicious and delicious, but if it's too much, it's not sweet but bitter	Gambir has a bitter taste. That's because Gambir has chemicals contained in it, such as tanning substances and catechic acid. Gambir contains a component in the form of catechins which function as antioxidants and antibacterials, especially the growth of the <i>Enterococcus faecalis</i> bacteria (Dewiyani & Sari, 2021) However, if consumed in small quantities and for a long time it will turn sweet in the mouth. However, if consumed in excess, it will taste bitter	Chemicals in Life

*Mamaq Philosophy and IPA Concept*

Mamaq activities are usually carried out by elderly Sasak people, besides that mamaq activities are also carried out by a belian (a healer or shaman who is trusted by the Sasak people to heal sick people). Apart from that, mamaq activities are also often carried out by certain groups of people so that they are immune from various types of sharp weapons. The sorongserah event (a traditional Sasak wedding event) is also usually carried out by a singer (a singer). But in general mamaq activities are carried out to welcome guests who will visit the house as a symbol of brotherhood or friendship.

The purpose of the mamaq tradition is to warm the body, treat and strengthen teeth. In the treatment process there is what is known as "sembek" which is applying the results of mamaq called "pinyang" to the head, chest and toes. In addition, pinyang is smeared on the forehead which is used as a symbol that a child is legitimate to be the traditional child of the local community, as is done by the Bayan people of North Lombok Regency, also usually rubbed on the child who is about to be circumcised so they don't feel afraid, or newborns so that they are not disturbed by spirits or jinns and it is usually done by local merchants, besides that it is also often done during "nursing" events.

Whereas in other traditions in other areas, the wedding tradition in Java, betel is also used in the meeting of friends, namely the ceremony of meeting the bride and groom through the betel throwing tradition. Nyirih as a tradition has a physical (sekala) and non-physical (niskala) meaning between something that is expressed and something that is internal. Nyirih tradition also describes the integrity of human life between physical, mental and spiritual activities. Whereas in Bali, this ngingang is usually done by people who are old.

The meaning of mixing mamaq ingredients is not only just mixing the ingredients and then chewing, the betel philosophy is believed to symbolize humility (Sudarmin et al., 2018), giving and always honoring others. This meaning is estimated from the way the betel grows, which climbs on a tree trunk without damaging the stem or whatever the place where it grows. While the chalk symbolizes a heart that is pure white and sincere, but if circumstances force it, it will turn out to be more aggressive and angry and Gambir is a plant that is

found in Southeast Asia, the leaves are oblong or oval in shape and the surface is smooth (Mita et al., 2022). Gambir has a bitter taste symbolizing determination, this meaning is obtained from the yellowish color of Gambir leaves and requires a certain process to get the juice before eating and it is interpreted that if we aspire to something we must be patient in carrying out the process to achieve it. By eating a series of areca nut and lime, it is a symbol of the hope to be a human being who is always humble and calm like betel nut, has a clean heart, is sincere but aggressive like chalk. Honest, straight-hearted and earnest like a areca nut tree and if added gambir means patience and a firm heart like gambir. Everything has to be blended into one unit that fits right and has to be right to produce a delicious taste. By not using betel lime or gambier excessively so that it is not bitter.

**Conclusion**

Based on the writing that has been done, it can be concluded that apart from the philosophy in the ingredients for mamaq, the chemical compounds contained in the ingredients for mamaq can also be described, starting from whitening, green betel leaf, gambier and areca nut. The value of mamaq's philosophy is studied from an epistemological philosophical point of view, which investigates the origin, composition of methods and knowledge in relation to mamaq's philosophy and the concept of natural science, especially chemistry where material changes occur in it and can be studied in science learning by reconstructing the original science and scientific (ethnoscience).

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The lead author, Nora Listantia, contributed to building ideas, conducting research, and exploring data analysis. The second authors, Muhammad Sarjan contributed to guiding the research and writing of this article. All authors have approved the final published manuscript.

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**Conflicts of Interest**

The authors declare no conflict of interest.

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