

INTEGRATION INDIGENOUS KNOWLEDGE AND ISLAMIC VALUE IN UTILIZING INVERTEBRATES IN THE MAJALENGKA, WEST JAVA COMMUNITY

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Abstract

This research aimed to determine the integration of indigenous knowledge and Islamic values in the Majalengka community in utilizing invertebrates and to explore the practice of indigenous knowledge in utilizing invertebrates, especially snails (*Achatina fulica*) and Javanese grasshopper (*Valanga nigricornis*) in the health and food sector. This research was conducted in Sukaraja village, Jatiwangi, Majalengka district. This research was used a qualitative approach method of direct observation. Data was collected through observation, interviews, documentation and literature study, then the data were analyzed descriptively. The results show that indigenous knowledge based on Islamic values implemented by the Majalengka indigenous community could increase community empowerment in various fields, namely health, economics, and social. The people of Majalengka use the snail (*Achatina fulica*) as a natural medicine for toothaches and the wound healing. While the Javanese grasshopper (*Valanga nigricornis*) as a traditional food of the community is believed to have a lot of protein content which is very good for the human body, especially for the growth of children. Further studies need to be conducted regarding the use of animals by the community based on sustainable conservation and further studies have to also be done to analyze of the presence of any bioactive compounds in invertebrate species used in traditional medicine in the research area.

Keywords: *Indigenous knowledge, Islamic values, invertebrates, Achatina fulica, Valanga nigricornis*

Introduction

Indonesia is a mega-biodiversity country, with 6,000 inhabited islands, Indonesia has 47 different natural ecosystems rich in variety of endemic plant and animal species with the total known species is about 1.46 million. Privileges Indonesia, which has ethnic diversity culture with different cultural and social backgrounds unique helps in conservation Indonesian Biodiversity. Currently Indonesia's biodiversity conservation is moderate focused on the potential role of indigenous knowledge in manage the environment. In a cultural group, local knowledge will be passed down from generation to generation by word of mouth. Culture in this society can also be in the form of local wisdom in the form of beliefs, customs, and special rules where local wisdom has characteristics, namely based on experience, tested after centuries of use, and can be adapted to today's culture, integrated with the daily practices of society and institutions that are usually carried out by individuals or communities are dynamic and are closely related to the belief system (Wana et al., 2016).

Local wisdom is a concept of knowledge, paradigm and way of life in the form of local wisdom that comes from social action (Fajarini, 2014) which is reflected in the behavior and values of a nation. Therefore, national values, such as harmony and cooperation, can be used to respond to any environmental changes without losing national identity (Nuruddin, 2016).

Indonesia is a tropical country where many species of snails are found, one of which is *Achatina fulica* or often referred to as the land snail. The snail mucus has been tested on experimental wound surgical animals and has been shown to increase the speed of skin

regeneration. Snail mucus contains acharan sulfate. Acharan sulfate is a glycosaminoglycan which in the proliferative phase will form a complex that plays an important role in wound healing (Yusuf et al., 2018).

In society, snail meat and its slime are very useful and have been trusted for generations in treating various diseases such as toothaches, skin diseases, and various other disorders. Snail mucus also plays a role in the wound healing process and the proliferation of fibroblast cells. Snail mucus has been known to have antibacterial activity against *Escherichia coli* and *Streptococcus* bacteria (Ristiawati & Kristanty, 2019). Traditional medicine is a hereditary heritage from ancestors that is deeply rooted in the nation's culture, therefore both in its ingredients and in its use as traditional medicine is still based on experience passed down from generation to generation both orally and in writing (Atun et al., 2020). One of them is the community in Sukaraja village, Majalengka district who uses a species of snail (*Achatina fulica*) as an alternative medicine for toothache. The use of snails (*Achatina fulica*) as a toothache medicine is based on the views of the people of the village of Sukaraja, Majalengka, some believe that snails, especially in the mucus part, can heal, some choose over the counter medicine and some also choose to go to the doctor.

On the other hand, one of the invertebrates that important for human is Insects. Insects are a group that dominates the earth with the number of species of almost 80% of the total number of living things on earth. These insects are dominated by the orders Orthoptera (crickets/grasshoppers) 13%, Coleoptera (bits) 31%, Lepidoptera (butterflies) 18%, Hymenoptera (bees/wasps) 14%, and other orders about 23% (Kuntadi et al., 2018). Insects have many roles in human life. Grasshoppers and crickets are insects that are commonly consumed throughout the world. 4-5 ounces of raw grasshoppers contain 14-28 grams of protein. Grasshoppers are rich in calcium and iron and have a neutral taste. Frying grasshoppers is the most popular way to enjoy grasshoppers. This method needs to be widely disseminated so that the use of grasshoppers can be used optimally (Meilin & Nasamsir, 2016). Halal food is essentially food that is obtained and processed in the right way by religion. Haram food is food that is prohibited by Islamic law to eat. Every food that is prohibited by the Shari'a has a danger (Nukraheni et al., 2019).

Based on the previous explanation, it is essential to integrate of indigenous knowledge and Islamic values in utilizing invertebrates. So that, this research needed. This research aimed to determine the integration of indigenous knowledge and Islamic values in the Majalengka community in utilizing invertebrates and to explore the practice of indigenous knowledge in utilizing invertebrates, especially snails (*Achatina fulica*) and Javanese grasshopper (*Valanga nigricornis*) in the health and food sector.

Method

This research was conducted in Sukaraja village, Jatiwangi, Majalengka district, from October until November 2021. The research was used a qualitative approach in the form of interviews and direct observation. Data were collected through observation, interviews, documentation, and literature study, then the data were analyzed descriptively. The researcher conducted interviews by asking several sources regarding several matters relating to the use of snail (*Achatina fulica*) as a toothache medicine and the use of Javanese grasshopper (*Valanga nigricornis*) as traditional food. Furthermore, observations were made by observing the process of processing snails and grasshoppers until they could finally be consumed properly, then recording them. The data obtained through interviews were analyzed descriptively and linked to other relevant sources such as national and international journals.

Result and Discussion

Snail (*Achatina fulica*) & Javanese grasshopper (*Valanga nigricornis*)

Snails are soft animals (*Mollusca*) that belong to the class of Gastropods. Gastro means stomach and pods mean legs, therefore the snail's stomach is useful as a leg, so snails are also called belly-legged animals. In more detail, this belly-legged animal belongs to the genus *Achatina*. Usually, Gastropods are slimy and are animals that rarely move because most of the Gastropods have hard shells and slow motion. Most gastropod shells are made of calcium carbonate which is coated on the outside with periostracum and horny substance. Some of the gastropods are specialized in climbing, swimming, and digging (Safa'ah et al., 2018). Gastropods are generally found on sandy, rocky and muddy substrates (Wahyuni et al., 2017).

The snail (*Achatina fulica*) is an invertebrate animal that has a soft body and belongs to the class Gastropods. Snail has a large, pointed shell with brown color and has a line pattern, solid with a pyramid shape or like a cone with a spiral pattern in the form of coils like screws and a rounded shell base. The shell of an adult snail is about 10 cm to 12 cm long, about 4 to 5 cm wide, and weighs between 100 and 120 g. The shell functions as a house, apart from being a snail's shell, it also functions to defend itself from enemies and to minimize evaporation of its body (Leu et al., 2021). Snail use the lower body (stomach) to walk, and snails breathe using the lungs. Snail can live on land, in freshwater, and in seawater. The lifespan of a snail can reach 10 years, with an average lifespan of about 5 to 7 years. The scientific classification of the snail (*Achatina fulica*) is as follows:

Kingdom	: Animalia
Phylum	: Mollusca
Class	: Gastropods
Ordo	: Stylommatophora
Family	: Achatinidae
Genus	: Achatina
Species	: <i>Achatina fulica</i>
Author	: Bowdich, 1822

Snails move by using the lower part of the abdomen which is used as an extended leg that is below the body in the form of sequential contraction movements. In the body of the snail, mucus glands are found which function to secrete mucus when walking the snail which is secreted by granules that are in the body of the snail and are located on the outer surface (Santana et al., 2012).

Generally, snails are tropical animals that appear when the rainy season comes. In addition to his soft body shape. Snails also have many benefits. One of them lies in the snail slime. Snail mucus has many functions including healing scratches or wounds, skin care, and gingivitis. Because the protein in snail mucus is a protein that has an important biological function, besides being used to prevent evaporation, and assists smooth movements, it is also needed to protect the body from mechanical injuries. Snail (*Achatina fulica*) is one of the traditional medicines from animal ingredients that can be used to heal new wounds. The antibacterial factor in Ahasin can work by attacking or inhibiting the formation of common parts of bacterial strains such as the cytoplasmic membrane and peptidoglycan layer, so the fraction from the separation of snail mucus can be used as an antimicrobial (Sulisetyowati & Oktriani, 2015).

Snail slime is used by the community for alternative healing of toothaches and minor injuries. In the body wall, snail mucus is produced along with lymph substances. In the snail's body, the mucus that flows has the activity of eradicating bacteria and foreign objects. The content of snail mucus is an analgesic, antiseptic, and antimicrobial peptide (Ahasin).

Achasin works by inhibiting the formation or attacking common parts of bacterial strains such as the peptidoglycan layer and the cytoplasmic membrane. The peptidoglycan layer is a layer that forms the cell wall, where the cell wall in bacteria has a very important role to withstand osmotic pressure from the outside. In snail slime, chain protein has important biological functions, including as a bacterial protein-binding receptor (enzyme). The chasing protein will bind to the protein (enzyme) found in bacteria and will interfere with the activity of the enzyme so that when an infection occurs, the bacteria that will carry out the replication process will fail to separate because this process can be prevented by the chain protein, the septum is not formed and separates into daughter cells (Damayanti et al., 2020). Toothache is a condition when pain occurs in or around the jaw and teeth. The causes of toothache include the result of the protozoan *Entamoeba gingivitis* which is a parasite on human teeth and gums, lack of protein for a long time, the rest of the food substrate, and the presence of *streptococcus*.

In the community, snail meat and its slime are very useful and have been trusted for generations to treat various diseases such as toothaches, skin diseases, and various other disorders. Snail mucus also plays a role in the wound healing process and the proliferation of fibroblast cells. Snail mucus is known to have antibacterial activity against *Escherichia coli* and *Streptococcus mutans* bacteria. There are antimicrobial peptides that can affect the ultra-viability of gram-positive and gram-negative bacteria. Snail mucus contains substances such as beta agglutinins (antibodies) stored in plasma (serum), chain protein, glycoconjugates, and acharan sulfate which function in the wound healing process by helping the blood clotting process and fibroblast cell proliferation (Oroh et al., 2015). For a long time, snail mucus has been believed to contain certain nutrients that can treat wounds. The important content found in snail slime is a glycosaminoglycan which binds compounds from the copper peptide. Achan protein in snail (*Achatina fulica*) has an important biological function, namely as a protein binding receptor or bacterial enzyme (Putra, 2015).

Snails with large shells have a pyramid shape like a cone with a spiral and a round base of the shell. Adult snail shells weigh from 100 grams to 120 grams. Snail shells have a function as a house, minimize body evaporation, and as a tool to protect themselves from predators. The composition of the snail shell is mostly lime, this lime is what causes the snail shell to have a hard texture (Citraning et al., 2021).

Table 1. Nutritional content of snail meat (*Achatina fulica*)

No.	Component	Amount (gram)
1.	Protein	0,1
2.	Calcium	2,37 x 10 ⁻³
3.	Fat	0,01

Source: (Sagita et al., 2011)

Toothache medicine in the shop, one of which is used by the general public, namely mefenamic acid which when consumed gradually can cause side effects such as allergic reactions to the skin and intestines. In the Qur'an: "*O people of faith, eat of the good sustenance we have given you and be grateful to Allah if it is indeed Him you worship. Verily Allah only forbids you carrion, blood, pork, and animals that (when slaughtered) are called (names) other than Allah...*" (Q.S. 2: 172-173). In this case, it is clear that snails are not included in something that is considered haram (Pramintasari & Fatmawati, 2017).

In the Qur'an, it is stated: "*... and make lawful for them ath-thoyyibaat (everything good) and forbid for them al-khobaaits (everything that is bad)...*" (Q.S. 7:157). According to Ibn Kathir in his famous Tafsir book, *al-Khobaaits*, what is bad is anything that can harm the body. So of course it must be studied about the content of ingredients in the snails that are considered toxic and harmful to the health of the human body. If it turns out to be harmful to humans, then it is

forbidden. This relates to the meaning of *ath-thoyyibaat* and *al-khobaaits* because even though the food is lawful and those who consume it feel that the food is considered disgusting, then the item is classified as unlawful for that person. And vice versa, if the food is haram and those who consume it feel that the item is not considered disgusting, and in an emergency (as medicine) then the food is classified as halal for that person (Al-Fatih, 2017). However, according to expert explanations, the content of materials that are considered toxic in the snails can be eliminated with good handling and processing.

In a research result at the Bogor Agricultural Institute, it was stated that the mucus produced by glands in the snail's body wall, as well as the lymph that flows in the snail's body, has clotting activity and extermination of bacteria and foreign objects, and the functions in wound closure. According to Otsuka (1991) in (Huda & Marhamah, 2016) in snail mucus, there is an anti-bacterial in the form of Achasin Protein which works to attack or inhibit the formation of common parts of bacteria such as the peptidoglycan layer and cytoplasmic membrane. The protein contained in snail slime (*Achantina fulica*) is about 12 grams per 100 grams of meat. The amino acid content of snails is quite prominent, in 100 grams of dried snail meat, among others, consists of 4.62 grams of leucine, 4.88 grams of arginine, 5.98 grams of aspartic acid, and 8.16 grams of glutamic acid. In addition, there is 1% fat, 1% carbohydrate hydrate, 237 mg calcium, 78 mg phosphorus, 1.7 mg Fe, and complex B vitamins, especially vitamin B2. The higher the concentration of snail mucus, the greater the ability of the snail slime (*Achantina fulica*) to inhibit the growth of *Salmonella typhosa* bacteria (Huda & Marhamah, 2016).

The Javanese grasshopper (*Valanga nigricornis*) belongs to the class Insecta with the female body size being larger than the male, measuring 45-55 mm in males and 15-75 mm in females. One of the species of Orthoptera has an additional tool in the form of a pair of short antennae, a pair of pacet eyes, enlarged forelegs femur, short overture, and has a three-segmented Tarsis. Javanese grasshopper has straight and slightly hard forewings with web-like hind wings. The order Orthoptera is divided into two sub-orders which include Caelifera which includes grasshoppers and Ensifera which includes katydids and crickets (Van et al., 2019).

The Javanese grasshopper (*Valanga nigricornis*) is active in the morning and eats both wild and cultivated plants (Riona et al., 2019). Javanese grasshopper is one of the pests on rice plants in rice fields if the population cannot be controlled (Prakoso, 2017). Therefore, farmers often spray excessive pesticides to avoid pests. But as a result, the population of the Javanese grasshopper (*Valanga nigricornis*) disappeared. In addition to rice fields, grasshoppers have been insects that dominate pest attacks on acacia and teak plantations in Lampung Province (Yustia et al., 2017). The classification of the Javanese grasshopper (*Valanga nigricornis*) is as follows:

Kingdom	: Animalia
Phylum	: Arthropoda
Class	: Insecta
Ordo	: Orthoptera
Family	: Acrididae
Genus	: Valanga
Species	: <i>Valanga nigricornis</i>
Author	: Burmeister, 1838

The processing of the Javanese grasshopper (*Valanga nigricornis*) by frying has become a habit that is also practiced by the people of Gunung Kidul, Yogyakarta, and the people of East Indonesia, namely Papua. Apart from being a side dish, fried Javanese grasshopper (*Valanga nigricornis*) can be a source of additional income for the community (Girsang, 2018).

Consuming insects is not a new thing for the world and the people of Indonesia. Eating insects is known as entomophagy. The Javanese grasshopper (*Valanga nigricornis*) is one of the

most common insects in Indonesia. Javanese grasshopper (*Valanga nigricornis*) contains protein that is very good for the growth of children. Grasshoppers are one of the alternative foods that can be consumed because of their abundance and abundance in nature. Grasshoppers are known to contain many nutrients with details of protein as much as 654.2g/kg, fat 83.0 g/kg, and kirin 87.3 g/kg. The amino acids contained in grasshoppers are the main types of amino acids lysine, methionine, and cysteine (Asthami et al., 2016).

The development of processed Javanese grasshopper has produced products in the form of grasshopper flour and grasshopper instant noodles. The Javanese grasshopper (*Valanga nigricornis*) is an easy source of protein to grow in the tropics. In addition to easy-to-digest protein, grasshoppers are also rich in nutrients such as minerals and unsaturated fatty acids. One serving of locust cream soup (200 mL) can meet the energy adequacy of 9.3%; 15.2% protein; 3.2% fat; carbohydrates 10.4%; and omega 6 2.5% in elderly men. Meanwhile, the elderly women meet the energy adequacy rate of 10.8%; 16.7% protein; 3.6% fat; carbohydrates 12.4%; and omega 6 3.2%. One serving of grasshopper cream soup fulfills the nutritional adequacy level of omega 3 in elderly men at 9.4%, and women at 13.6% (Mulyasari & Palupi, 2021).

Besides being useful for the elderly, grasshopper flour can also be used as an additional ingredient for making instant noodles. This instant noodle product will be very popular with the public if it is managed very well because Indonesia is included in the second-largest noodle consumer country in the world (Asthami et al., 2016).

The water content in raw grasshoppers is 67.70%. The highest water content is found in boiled grasshoppers. In fried grasshoppers decreased significantly. The process of frying using high temperatures can reduce fat content and damage minerals and vitamins. The fat bound to the fried grasshoppers comes from the contribution of oil and spices attached to the frying process (Wijaya et al., 2019). Raw grasshoppers have high protein as much as 23.18%. The decrease in protein content in boiled grasshoppers was due to heating at a certain temperature. Boiling can reduce protein levels because processing using temperature will cause protein denaturation so that coagulation occurs and reduces its solubility (Sundari et al., 2015). Protein levels in fried grasshoppers showed a decrease due to the heating process. Heating causes proteins that have reactive groups to bind to other components such as sugar which will cause the Maillard reaction (Irawati et al., 2016). The protein value of grasshoppers is much higher than that of tiger prawns (Girsang, 2018).

In the Shari'a, grasshoppers are one of the animals that are given specific laws regarding their halalness for consumption, even though they have become carrion. It is stated in the hadith: "*It is lawful for you two carcasses and two types of blood, two carcasses, namely the carcass of grasshoppers and fish, and two types of blood, namely the spleen and liver.*" (HR. Baihaqi). Even in various narrations, it is explained that the Messenger of Allah and his Companions underwent seven wars armed with eating grasshoppers. This is like the hadith narrated from the companion of Abdullah bin Abi Aufa: "*We fought with the Messenger of Allah in seven battles by eating grasshoppers.*" (HR. Muslim). Based on the clear argument above, there is no doubt that grasshoppers are halal animals for consumption, even the law of consuming grasshoppers has become a consensus among scholars (ijma').

Snail (*Achatina fulica*) as A Natural Medicine

The results of research on the use of snail (*Achatina fulica*) as a toothache medicine using Javanese grasshopper (*Valanga nigricornis*) as traditional food were carried out in Sukaraja village, Jatiwangi sub-district, Majalengka district. In general, the livelihoods of the Sukaraja people are in agriculture as farmers and in the industry as tile factory workers and garment workers. The life of the people is sufficient, this can be seen from the livelihoods of the

Table 3. Morphological characteristics on snails (*Achatina fulica*) observed

No.	Characteristics	Result
1.	Eye spots	There are eye spots
2.	Species color	Brown with yellowish stripes
3.	Umbo	There is an umbo around the apex at the end of the shell

The method of treatment begins with preparing tools and materials. The tools used are cotton and pliers. The material used slime snail (*Achatina fulica*). After that, take an adult snail (*Achatina fulica*), then break the apex (back end) of the snail using a hard object, usually using a hammer or stone. Once solved, then the snail will issue a clear liquid, namely mucus where the mucus is believed by the public to be used as medicine. Then the mucus is dripped into the cotton as needed. After dripping onto a cotton swab, it is then affixed to the aching tooth while pressing it for 5 minutes. After that, remove the cotton that has been dripped with snail mucus. Then wait for the results. According to Mr. Parta, the snail mucus is clear in color and feels cold when placed on the tooth or the part of the tooth that hurts.

**Figure 3.** (A) Tools and materials (B) Process of toothache treatment

Javanese grasshopper (*Valanga nigricornis*) as A Traditional Food

Observations were made on November 2021, by interviewing one of the residents in Sukaraja Village, Majalengka Regency at 16.00 WIB to know the utilization of the Javanese grasshopper (*Valanga nigricornis*) in the surrounding community. The people of Sukaraja village use the Javanese grasshopper (*Valanga nigricornis*) as a side dish or eaten at leisure, not as a mandatory meal. Javanese grasshoppers are consumed by the community as a side dish and additional protein as a substitute for tempeh.

**Figure 4.** The interview process with residents

Javanese grasshopper (*Valanga nigricornis*) has a brownish yellow color and some are green with dark brown markings, especially on the wings. The Javanese grasshopper (*Valanga nigricornis*) is found in almost all terrestrial ecosystems. Processing of Javanese grasshopper (*Valanga nigricornis*) as a traditional food is done by frying. The process of frying Javanese grasshopper (*Valanga nigricornis*) was carried out by the people in Sukaraja Village, namely first catching grasshoppers in the fields. Then boil the water until it boils and put the grasshopper into the boiling water until it dies. After the Javanese grasshopper (*Valanga nigricornis*) is completely dead, remove the grasshopper from the boiling water and clean its wings. Then, while cleaning the grasshopper wings, boil the new water until it boils. After

that, add water with spices such as garlic, onion, tamarind, sugar, salt, and flavoring. After the water boils, put the grasshopper into the water until the spices absorb into the grasshopper's body. Then heat the cooking oil and fry the grasshoppers gradually in full oil until dry. Next, fried grasshoppers are ready to eat.



Figure 5. (A) Morphology of *Valanga nigricornis*, (B) Product of fried Javanese grasshopper

Since 1960, residents of Sukaraja Village have been consuming Javanese grasshopper (*Valanga nigricornis*) as an alternative side dish using dry frying. Residents still Javanese grasshopper (*Valanga nigricornis*) to this day. However, residents find it difficult to find Javanese grasshopper (*Valanga nigricornis*) in the fields due to excessive use of pesticides so that no grasshopper eggs survive. The community does not yet have the awareness to cultivate the Javanese grasshopper (*Valanga nigricornis*).

The consumption of fried Javanese grasshopper (*Valanga nigricornis*) in Sukaraja Village is not only among the elderly but even among children aged 4 years also like a fried Javanese grasshopper (*Valanga nigricornis*). According to children from Sukaraja Village, they like fried Javanese grasshopper (*Valanga nigricornis*) because of their sweet and sour taste and they make fried grasshoppers as snacks. The price of the Javanese grasshopper (*Valanga nigricornis*) per small plastic package is sold at Rp. 3,000.00.

Conclusion

Indigenous knowledge based on Islamic values implemented by the Majalengka indigenous community could increase community empowerment in various fields, especially health, economics, and social. The people of Majalengka use the snail (*Achatina fulica*) as a natural medicine for toothaches and the wound healing. While the Javanese grasshopper (*Valanga nigricornis*) as a traditional food of the community is believed to have a lot of protein content which is very good for the human body, especially for the growth of children. Further studies need to be conducted regarding the use of animals by the community based on sustainable conservation and further studies have to also be done to analyze of the presence of any bioactive compounds in invertebrate species used in traditional medicine in the research area.

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