

Identification of the Potential of Taro (*Araceae*) as a Source of Animal Feed in the Central Mahakam Region

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Abstract. *The Central Mahakam region is a peat swamp ecosystem with cascade lakes in East Kutai, West Kutai, and Kutai Kartanegara. The region has abundant potential for taro plants (Araceae). The community uses taro only for food and is not used as a feed ingredient. This research aims to identify the types and potential of taro for use as animal feed. Observations were conducted in two villages in the Central Mahakam region: Batuq and Tuana Tuha Villages, Muara Muntai District, Kutai Kartanegara Regency. Taro samples will be taken based on habitat and then subjected to proximate analysis to determine chemical content. The method used in this research was exploratory. The results of identifying the types of taro in Batuq Village showed four types of taro, while there were two types in Tuana Tuha Village. The taro-growing habitat for the Colocasia sp species is terrestrial/semi-terrestrial, while the Xanthosoma sagittifolium species grows terrestrially. The part of taro that can be used as food is in the form of leaves. The chemical content of taro leaves (Colocasia esculenta) dry weight is 90.39%, crude protein is 4.62%, Ash is 4.51%, crude fat is 1.01%, and crude fiber is 3.86%. The Xanthosoma sagittifolium type contains 90.52% dry weight, 4.47% crude protein, 4.39% ash, 1.06% crude fat, and 3.56% crude fiber. There are six types of taro found in the Central Mahakam region, and they have the potential to be an alternative food source based on their chemical content.*

Keywords: *Feed, Mahakam, Nutrient, Ruminant, Taro*

INTRODUCTION

The central Mahakam region is traversed mainly by rivers, so peatlands and wetlands will often be found, which adds to the biodiversity of the East Kalimantan area. Kalimantan forests have a high level of plant diversity, with around 150 tree species growing in one hectare (Rukmana & Hikmat, 2015). Apart from trees, there are various types of orchids, palms, wood, durian, and taro, some of which are endangered due to land clearing and several forest fires. The utilization of plant diversity in East Kalimantan is still limited to traditional knowledge, so cultivation has yet to be carried out, for example, for the taro family. Various kinds of taro are easy to find in areas along rivers where use is limited to the tubers as alternative food. This type of taro can be used for food, ornamental plants, medicine, animal feed, and traditional ceremonial materials (Sinaga et al., 2017). The government protects several species of the taro family because they are almost extinct. Most taro plants that are found are only left to grow wild by farmers and have yet to be cultivated.

It is estimated that there are 297 taro species in Kalimantan (Marchni & Mukarlina, 2017). Forest fires and land conversion impact the taro family's survival in the wild (Widiyanti & Mukarlina, 2017). Information regarding the use of taro still needs to be improved, so people are not interested in cultivating it. More information on cultivation still needs to be provided, so research is needed on the potential of taro in terms of food, feed, and other factors by identifying the types and mapping the distribution of taro types found in the East Kalimantan area. This research aims to identify taro types and chemical quality in Central Mahakam as an alternative feed ingredient.

LITERATURE REVIEW

The *Araceae* or the taro family are tropical plants distributed in Southeast Asian countries, America, and Papua New Guinea (Asih et al., 2015). Taro is grouped into three genera: *Colocasia*, *Xanthosoma*, and *Alocasia*. The types commonly consumed by the public are taro (genus *Colocasia*) and Keladi (genus *Xanthosoma*) (Asih & Kurniawan, 2019). Indonesia has 25% of the *Araceae* family spread throughout its territory, which means there are around 31 genera of *Araceae* consisting of around 105-110 genera with 2500-3700 species throughout the world (Asih et al., 2015). Taro tubers are a food ingredient that has relatively good nutritional value. The 11 macronutrient and micronutrient components contained in taro tubers include protein, carbohydrates, fat,

crude fiber, phosphorus, calcium, iron, thiamine, riboflavin, niacin, and vitamin C (Mardiana et al., 2022).

Taro stems and leaves contain DM 6.98 – 8.05%, PK 16.5 – 18.2%, SK 16.9 – 21.7%, and Ash 15.4 – 17.2%. The chemical composition of taro stems and leaves varies depending on the taro variety (Toan & Preston, 2010). The primary use of taro is the tubers, which are processed into snacks or alternative staple foods. The parts of the taro plant, namely tubers, stems, and leaves, can be used as local vegetables, medicine, bioethanol, and pig feed in traditional farming (Toan & Preston, 2010; Dewangga et al., 2017; Sadimo et al., 2016; Budarsa et al., 2016). The taro plant has a limiting factor in calcium oxalate, which can cause itching on the skin if exposed directly to it. Hence, it needs treatment before use to reduce the calcium oxalate content.

Research on adding taro to pre-fermented animal feed to reduce calcium oxalate shows that livestock can consume it as a substitute for corn in pigs and can also be used as fodder. The addition of brown sugar as a silage additive to taro stem and leaf silage showed the best results in this study, with a pH of 4.72 and a Fleigh Score of 32.49 (Anjalani, 2020). The addition of fermented taro tuber flour in the ratio of Landrace crossbreed pigs up to 37.5% did not affect the body length, chest circumference, shoulder height, and back fat thickness of Landrace pigs (Bhoja et al., 2019).

RESEARCH METHODS

This research was conducted in Batuq Village, Muara Muntai District, Kutai Kartanegara Regency, East Kalimantan. Data collection will be carried out from April to October 2024. This research explores the potential of various types of taro in wetlands in Batuq and Tuana Tuha Villages, Muara Muntai District, Kutai Kartanegara Regency, East Kalimantan. Observations are carried out by searching directly (survey) or interviewing residents. Samples of feed ingredients used in the proximate analysis test resulting from identification are then made into flour parameters and tested in proximate analysis to determine the nutrient content of taro. Taro chemical quality data will be analyzed descriptively.

Procedure

1. Identify Taro Plants

Local taro plant types were identified by observing around the Muara Muntai District area. Observations are carried out by searching directly (survey) or interviewing residents. The results of the observations are then recorded and documented.

2. Proximate analysis

a. Water content

Samples of ground taro leaves measurements were recorded. Next, the cup containing the sample is oven at 105°C until the sample weight is stable. After that, the cup is removed from the oven, and the difference in sample weight is weighed (AOAC 925.09).

b. Ash

The sample was weighed in a porcelain cup of 5 grams. Next, the sample cup is placed in a furnace at 550°C for 5-6 hours. Then, the crucible is cooled in a desiccator, and the Ash from the sample is weighed (AOAC 923.03).

c. Crude Protein

Crude protein was analyzed using the Kjeldahl method, which consists of digestion, distillation, and titration stages to obtain nitrogen content. Determination of protein by multiplying the nitrogen factor 6.25 (AOAC 979.09).

d. Ether Extract

Crude fat was determined using the Soxhlet method. The sample was dissolved with an organic solution (AOAC 962.09).

e. Crude Fiber

Samples were tested using the Van Soest method. Fiber is determined from the residue from washing with acidic and alkaline solutions (AOAC 923.05).

RESULTS AND DISCUSSION

Identify Taro Types

There were six types of taro found from observations made in two villages in the Central Mahakam region. People use taro only for the tubers, while taro leaves and stems can be an alternative food source. The types of taro found in the Central Mahakam region are as follows.

Table 1. Types of taro found in the Central Mahakam region.

No	Local Name	Scientific Name	Habitats
1	Tigu Taro	<i>Colocasia esculenta</i>	Terrestrial/ semi-terrestrial
2	Yellow Taro	<i>Xanthosoma sagittifolium</i>	Terrestrial
3	Taro	<i>Colocasia esculenta</i> <i>var.antiquorum</i>	Terrestrial/ semi-terrestrial
4	Red Taro	<i>Colocasia esculenta</i>	Terrestrial/ semi-terrestrial
5	Rapak Taro	<i>Colocasia esculenta</i>	Terrestrial/ semi-terrestrial
6	Pulut Taro	<i>Colocasia esculenta</i>	Terrestrial/ semi-terrestrial

The types of taro found in the Central Mahakam area are *Colocasia esculenta* and *Xanthosoma sagittifolium*, which the community uses as alternative food. This taro-growing habitat spreads from peat swamp land. The taro family (*Araceae*) is widespread in humid tropical areas (Sinaga et al., 2017). The ability of taro to survive well in wetlands makes its numbers dominate the peat swamp ecosystem. In the two observation villages in one year, there is a period of significant flooding which can submerge the area for 2 months. Taro plants can survive submerged conditions without experiencing tuber rot. When the water recedes, taro shoots will emerge to the surface with new leaves and accelerate the growth of the tubers. The taro habitat can affect the tubers' quality (Kurniadinata et al., 2024). The community has yet to use it as feed due to a lack of information about the nutritional potential contained in the leaves, stems, and tubers.

Taro Ingredients

The abundance of taro in peat swamps is a potential livestock feed source. The parts of the taro that can be used as food include leaves, stems, and tubers. The tubers are usually used as a food source of carbohydrates, which will cause competition with humans. Tubers are often processed into flour and then made into processed foods in cakes, noodles, biscuits, etc. So that other parts of the taro are used as waste that has yet to be utilized. The use of leaf parts is another option for feeding by paying attention to their chemical content, as shown in Table 2 below.

Table 2. Percentage of Chemical Content of Taro Leaves

Types of Taros	Dry Weight	Ash	Crude Protein	Crude Fat	Crude Fiber
Tigu Taro	90.47	4.46	4.42	1.08	3.61
Yellow Taro	90.52	4.39	4.47	1.06	3.56
Taro	90.50	4.40	4.52	1.05	3.51
Red Taro	90.54	4.41	4.44	1.03	3.55
Rapak Taro	90.42	4.48	4.59	1.04	3.73
Pulut Taro	90.39	4.51	4.62	1.01	3.86

As a natural food in abundant quantities, Taro leaves can fulfill the need for nutrients to support growth (Seo). The chemical content of taro leaves shows the nutrients that can be given to livestock. The dry weight of taro leaves reaches 90.54%, indicating the presence of organic material. As an alternative source, The protein feed contained in taro is a significant factor. The crude protein of taro leaves is around 4.42% - 4.62% 1.01% – 1.08%. Pig feed added with taro leaf silage, soybean flour waste, and rice fragments showed increased body weight in crossbred pigs (Botum et al., 2024). Livestock stomach with a taro content of 3.51% - 3.86%. Fresh taro leaves have the potential to be a promising feed with the protein and crude fiber they contain, as well as vitamins and minerals such as iron and magnesium, has a role in livestock nutrition (Okon et al., 2023). Taro leaf flour has 6.12% protein, 0.76% fat, 2.22% fiber, 2.62% ash, 91.7% dry weight, and 79.99% carbohydrate, which has the potential to be used as a feed substitute (Zahtul et al., 2023).

Taro leaves contain flavonoids, which can provide additional benefits for livestock as an anti-inflammatory. Taro leaves have been proven to contain high levels of antioxidants and various bioactive substances to improve health. Taro leaves contain polyphenolic flavonoids that have an antibacterial function by forming complex compounds with extracellular proteins to disrupt the integrity of bacterial cell membranes. The anti-inflammatory properties of flavonoids can be used as anti-inflammatory and anti-pain drugs. Flavonoids can also function as antioxidants that inhibit toxins (Yeap et al., 2010).

CONCLUSION

This research identified six types of taro found in the Central Mahakam region, with growing habitats in terrestrial and semi-terrestrial areas. Taro leaves have great potential as alternative livestock feed because of their nutritional content, including crude protein of 4.42%–4.62%, which can support livestock growth. Other chemical contents, such as ether extract (1.01%–1.08%) and crude fiber (3.51%–3.86%), show that taro leaves can meet livestock's energy and fiber needs. In addition, the presence of flavonoids in taro leaves is an antioxidant and anti-inflammatory, increasing its benefits for livestock health. Using taro leaves as natural food can reduce waste and support the optimal use of local resources, especially in areas with abundant availability of taro. However, increasing understanding and outreach to the public regarding this potential is necessary to encourage its wider use.

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