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Appreciation of the Ethnobotany of Carica (*Vasconcellea pubescens* A.DC.) by the Dieng Plateau Local Community

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ABSTRACT

Carica (*Vasconcellea pubescens* A.DC.) is a mountain papaya species with limited distribution in Indonesia, found in the Dieng Plateau, Central Java. Carica is well utilized by the Dieng Plateau community based on its local knowledge system. The decline of local knowledge is increasingly worrying, necessitating documentation efforts through ethnobotanical studies. This study aimed to examine the appreciation of the local community of the Dieng Plateau towards Carica ethnobotany. This study was descriptive research employing both qualitative and quantitative approaches, with interview techniques. The study was conducted in three Dieng Plateau villages: Dieng, Sembungan, and Karangtengah villages. The 30 respondents were selected by purposive and snowball sampling. The research instruments included interview guides and questionnaires. Appreciation was analyzed descriptively with a quantitative approach using a Likert scale. The results showed an excellent appreciation for preserving Carica in the surrounding environment (97.3%), while there was a low appreciation for using Carica to treat certain diseases (38%). Based on age, the elderly category showed the best appreciation for Carica utilization. Appreciation as a practice of local knowledge in the management and utilization of Carica can contribute to the conservation of Carica in the Dieng Plateau.

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INTRODUCTION

Carica was introduced to Indonesia by the Dutch colonial government in the period leading up to World War II for medicinal purposes. Carica (*Vasconcellea pubescens* A.DC.) is an endemic plant of the Andes Mountains, South America, and as a result, itcan only grow in low-temperature areas at s altitudes above 1500 m above sea level (Lin et al., 2020). These growing conditions limit Carica's distribution in Indonesia, where it is found in regions such as the Dieng Plateau in Central Java as well as Cangar and Bromo Tengger in East Java (Kristanti, 2015).

Carica is a plant species that is relatively abundant on the Dieng Plateau. The presence of Carica also has an impact on the needs of the community. Since the 2000s, Carica fruit has begun to be utilized by the community by processing it into sweets, chips, jams, and syrups, which have become local products with economic value (Sutopo et al., 2021). This reflects local knowledge that develops from the habits and experiments of the local community in utilizing the plant (Chekole et al., 2015). Local knowledge fosters perceptions and appreciation, which are essential factors in in shaping the community's understanding and approach to the management and use of plants (Pangestu & Indah, 2024). This condition is a natural interaction between local communities and plant resources, making it an important subject for ethnobotanical study.

Ethnobotany has excellent potential to reveal the traditional knowledge of community groups in managing biodiversity, along with conservation methods according to local culture (Tapundu et al., 2015). Documenting and maintaining local knowledge of plants shows how ethnobotany can contribute to biodiversity conservation (Pei et al., 2020). Information related to local knowledge needs to be thoroughly documented due to a lack of awareness of the importance regarding intellectual work assets (Sujarwo et al., 2014). There is concern that the decline in local knowledge will continue, making preservation efforts necessary to counterbalance this trend. Reference studies showed that local knowledge based Carica ethnobotanical research in the Dieng Plateau has not been extensively studied. . Research related to the utilization of Carica in the Dieng Plateau is limited to studies on low Carica productivity (Najib & Rahayu, 2020), efforts to improve the Carica micro-industry (Hakim et al., 2017) and the Carica intercropping system (Pradana et al., 2015). These studies have yet to focus on the local knowledge of the community. Therefore, this research aimed to study Carica ethnobotany from both emic and etic perspectives by analyzing the appreciation (practice) of the local community of the Dieng Plateau towards Carica ethnobotany. This research is needed to preserve the local knowledge of the community and maintain the existence of Carica in the Dieng Plateau.

MATERIALS AND METHODS

This research was descriptive, using both qualitative and quantitative approaches, as well as open-ended and semi-structured interview techniques. It was conducted from December 2023 to May 2024 in three villages of Dieng Plateau: Dieng Village, Sembungan Village, and Karangtengah Village. A map of the research area was created using ArcGIS version 10.3 (Figure 1).

The research target was the community living in the three research villages. The research sample was selected by purposive and snowball sampling (Hellyatunisa et al., 2022; Indah et al., 2021). The research sample involved key informants and respondents with an age limit of 17-65 years with the assumption that they possess local knowledge about Carica. The respondents consisted of 30 individuals who were categorized into four age groups: 6 young (17-30 years), 13 adults (31-44 years), 10 middle-aged (45-60 years), and 1 elderly (>60 years) (Indah et al., 2021). The grouping aimed to compare the levels of appreciation for Carica among different age groups in the local community. Key informants included Carica farmers, Carica processors, and local community leaders who could provide detailed information on how Carica is utilized by the Dieng Plateau community.

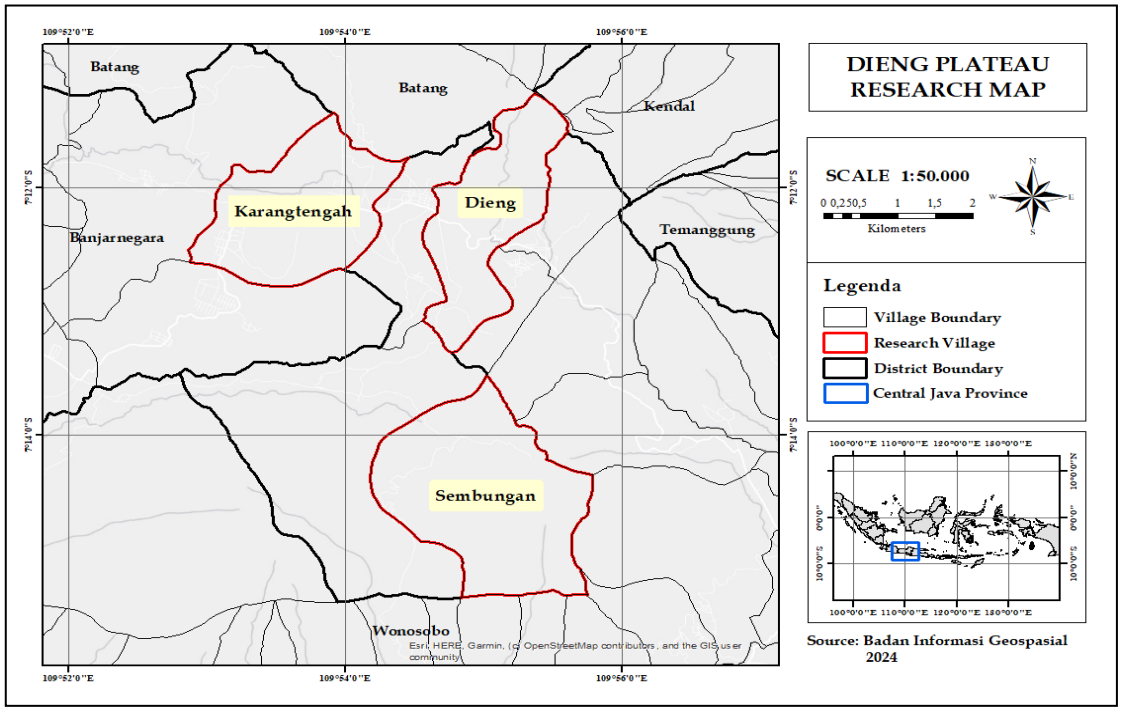

Figure 1. Research location of the Dieng Plateau area

The research instruments included interview guides and questionnaires. The research data, which focused on local knowledge of Carica ethnobotanical appreciation were analyzed through a weighting system, and percentages were then calculated based on the formula (1). The questionnaire consisted of 12 appreciation questions using a Likert scale. A score of 1 indicated the respondent had the lowest knowledge on a given question, while a score of 5 indicated the highest level of knowledge. The appreciation scores were grouped into five categories: excellent (81-100%), good (66-80%), simply (51-65%), poor (31-50%), and abysmal (≤ 30%) (Azrianingsih & Kusumahati, 2018).

$$P = \sum_{1}^{n} \frac{x.k}{n.k_{max}} \; x \; 100\%$$

Note:
P = Value of Appreciation
X= Number of respondents for the selected answer
K = Weight of answer choices
N = Total number of respondents
k max = Weight of the highest answer choice

RESULTS AND DISCUSSION

Research on the Dieng Plateau community's appreciation of Carica ethnobotany covered five aspects (Table 1). The data showed that the level of community appreciation of Carica ethnobotany was classified into poor to excellent categories.

The community's appreciation of using Carica in traditional medicine was categorized as poor (39.3% and 38%). People believe that Carica fruit contains nutrients that are good for health. However, its use in treating certain diseases remains rare. This may be due to local knowledge about the health benefits of Carica that has not been sufficiently developed in the community. Some people mentioned that Carica consumed directly is believed to help alleviate digestive problems, such as diarrhea. Although scientific studies on the benefits of Carica fruit as an antidiarrheal agent have not been widely studied, existing research shows that Carica seed and leaf extracts have potential antibacterial and antidiarrheal properties (Astuti & Hadi, 2018; Susanti et al., 2017). Carica is also believed to be rich in vitamins and antioxidant compounds that can maintain immunity because the fruit contains flavonoids, polyphenols, tannins, and triterpenoids (Minarno, 2015). Previous studies have shown the medicinal potential of *Carica*, including its sun protection factor (SPF) capability (Advaita et al., 2018). The saponin content in Carica leaves and petioles have shown potential in the treatment of Diabetes Mellitus (DM) (Minarno, 2016).

The community's appreciation related to knowledge and experience in Carica cultivation showed an excellent level (81.3% and 84%). Carica is usually planted as an intercropping crop, arranged around agricultural land to mark property boundaries (Ningsih et al., 2019). The community uses two propagation techniques for Carica: generative propagation with seeds and vegetative propagation with branch cuttings (Laily et al., 2021). Propagation using branch cuttings are often preferred they are easier, more practical, and result in faster fruiting (within one year). Ningsih et al. (2019) stated that vegetatively propagated plants usually have the same productivity as their parents, allowing them to bear fruit relatively quickly. Carica has also become a source of income for farmers while they wait for the harvest of the main crops, such as potatoes and cabbage. Carica's ability to produce many fruits, yield harvests quickly, and be relatively easy to manage are the main factors contributing to the high interest in Carica cultivation among farmers.

Carica cultivation also aims to improve soil quality on agricultural land. Dieng Plateau, once densely forested, has been transformed into extensive agricultural land, posing social, economic, and ecological challenges (Pradana et al., 2015). The monoculture potato farming system negatively impacts soil quality by continuously depleting nutrients without rotation (Pradana et al., 2015). According to Pertiwi et al. (2017), the humus-rich soil resulting from agricultural activities increases the risk of landslides. Although most farmers are aware of these conditions, they continue potato cultivation due to its excellent productivity on the Dieng Plateau. Carica is used to reduce land degradation caused by the potato monoculture system. Pradana et al. (2015) explained that the use of a Carica intercropping system could regulate soil nutrient content, increase soil biotic elements, and reduce the erosion rate from 463.86 tons/hectare/year to 115.96 tons/hectare/year. Farmers claim that landslides are less common on potato farms using the Carica intercropping system.

The community's appreciation regarding the management of Carica as a fruit with economic potential showed an excellent level (91.3% and 90%). Carica is one of the leading commodities of the Dieng Plateau, and has been widely utilized as a processed food and beverages unique to the region.

Various processed Carica products have been expanding alongside with the development of the tourism sector in the Dieng Plateau (BDS Wonosobo, 2017). These products are known for their distinctiveness, considering this plant only grows and is utilized on the Dieng Plateau. Regional characteristics attached to a product have characteristics that are not found in similar products, due to both geographical and community factors (Ningsih et al., 2019). This condition is known as geographical indication, a a designation applied to products with a specific geographical origin, possessing quality or a reputation representing the region of origin (FAO, 2023).

The Carica processing industry has developed in the Dieng Plateau as a part of regional MSMEs. The Carica processing industry is still mainly carried out traditionally on a home-industry scale, managed independently or in groups. The activities of the Carica processing industry usually involve the local community in its management, contributing to the empowerment of local communities. According to Wulandari et al. (2021), the involvement of local communities in regional MSMEs has a positive impact on socialization capabilities, economic improvement, and expansion of knowledge and skills.

The community's appreciation regarding the use of Carica in local traditional activities and their understanding of its significance, was classified as good (70.7%). Based on the narrative of traditional leaders, traditional activities that have been going on for generations always the use of local crops, including Carica. Carica is served as fresh fruit and as a processed product. Carica as a processed product, serves as a symbol of the region's superior products. As fresh fruit, Carica is involved in traditional activities, such as *slametan*, weddings, community events, *baritan* (*ruwat bumi*), Dieng Cultural Festival (DCF), and *ruwat gimbal*. Carica fruit is included in *tumpengan* or *gunungan* of local fruits and vegetables. The use of Carica in these activities symbolizes the region's identity and represents gratitude for the abundance of crops provided by God Almighty. Sari dan Haryanti (2024) added that the mountains of crops symbolize the community's reliance on nature.

The community's appreciation of Carica conservation actions shows an excellent level of appreciation (84%, 97.3%, and 86.7%). The preservation of Carica in the Dieng Plateau is inseparable from the role of the community, which has consciously and unconsciously preserved Carica. The preservation actions include planting, caring for, and harvesting Carica, which can then be utilized. The community believes that as long as Carica continues to provide benefits, it should be preserved for sustainable use. The conservation of Carica in the Dieng Plateau is expected to be maintained as long as the community manages its utilization responsibly. Sujarwo (2023) also emphasized that conserving plant resources and their ecosystems can guarantee the sustainability of their use value if managed wisely.

Table 1. Appreciation of the Dieng Plateau community for Carica ethnobotany

No	Apreciation Aspects	Description	Percentage (%)	Category
1	Carica in traditional medicine	1. Use of Carica in traditional medicine within community	39.3	Poor
		2. Experience using Carica to cure certain diseases	38.0	Poor
2	Carica cultivation	3. Experience in Carica cultivation	84.0	Excellent
		4. Use of Carica as an intercropping crop	81.3	Excellent
3	Carica in economic improvement	5. Carica in improving the economy	91.3	Excellent
		6. Carica's processing experience	90.0	Excellent
		7. Carica consumption experience	92.7	Excellent
4	Carica in traditional activities	8. Carica is involved in traditional activities	70.7	Good
		9. Understanding the meaning of Carica in traditional activities	70.7	Good
5	Conservation measures	10. Preservation by utilization and management of Carica	84.0	Excellent
		11. Carica preservation in the surrounding environment	97.3	Excellent
		12. Participation in socialization and training	86.7	Excellent

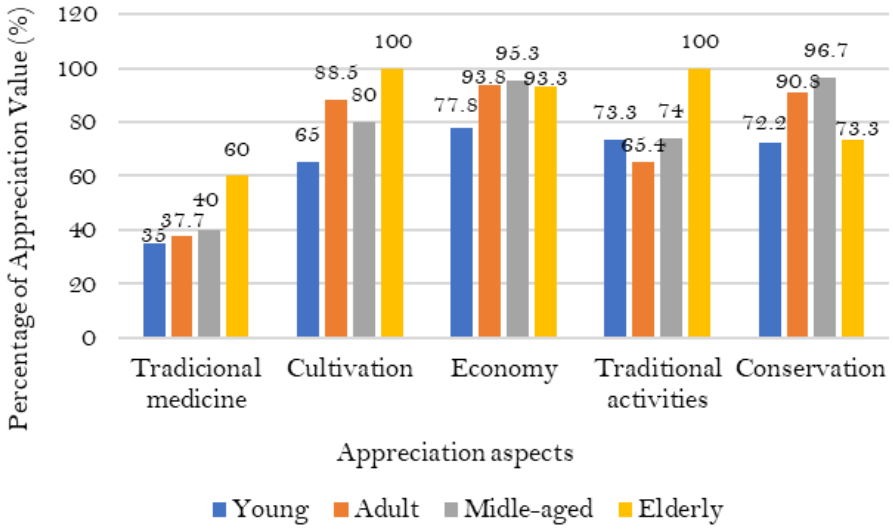

Figure 2. Appreciation of Dieng Plateau community towards Carica ethnobotany based on age category. No significant difference was found based on ANOVA test with $\alpha = 0.05$

Socialization and training activities on the management of agricultural and plantation crops, including Carica are frequently carried out for the local community. These activities represent support from the government and relevant stakeholders in educating local communities about the region's potential. The community's strong interest aims to develop knowledge and skills through socialization and training activities. PT Geo Dipa Energi (Persero) held socialization and training activities on October 31, 2023, entitled "Assistance and Training for Carica MSMEs". This program included effective marketing strategies to increase the competitiveness of Carica MSMEs, targeting Carica entrepreneurs in villages surrounding the Dieng Geothermal Power Plant (PLTP) (Filantra, 2024).

The community's appreciation of Carica ethnobotany across different age categories, including youth (17-30 years), adult (31-44 years), middle-aged (45-60 years), and elderly (>60 years), ranged from poor to excellent (Figure 2). The variance analysis showed a value of 0.489, which is greater than 0.05, suggesting that the appreciation levels among the four age categories were similar.

The elderly category (> 60 years) has the highest average level of appreciation, categorized as 'excellent' compared to other age categories. This category can explain its knowledge and experience in utilizing Carica, enabling effective management of local resources. Supiandi et al. (2019) also stated that a good cultural understanding can enhance the management and optimal utilization of surrounding biological resources. However, the elderly respondents in this study were limited to just one local individual. This scarcity is likely because the elderly are less active in Carica utilization activities, resulting in fewer respondents being able to share their local knowledge. Factors such as decreased memory and physical activity contribute to this decline in community knowledge regarding Carica utilization (Indah et al., 2021).

Adults (31-44 years) and middle-aged categories (45-59 years) have significant experience with Carica utilization, although they often focus on one or two specific types. The youth category (17-30 years) has the lowest appreciation level but is still within the good category. This is possible because younger individuals are usually students or workers who do not directly interact with Carica. At this age, they are often still in the process of learning or developing knowledge in the community (Indah et al., 2021).

CONCLUSION

The local knowledge of the Dieng Plateau community's appreciation of Carica ethnobotany ranged from poor to excellent. Appreciation for preserving Carica in the surrounding environment was rated excellent (97.3%), while appreciation for using Carica to treat certain diseases was rated poor (38%). Based on age, the elderly category demonstrates the highest level of appreciation for Carica utilization.

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