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Eksplorasi Nilai Etnobotani dalam Upacara Pernikahan dan Tujuh Bulanan Masyarakat Mandar untuk Pengembangan Sumber Belajar Biologi

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Abstrak

Suku Mandar di Sulawesi Barat memiliki tradisi budaya yang terpelihara dengan baik, termasuk pemanfaatan berbagai jenis tumbuhan dalam ritual adat yang mengandung nilai simbolis (ussul) dan kearifan lokal ekologi. Penelitian ini bertujuan: (1) mengidentifikasi jenis-jenis tumbuhan yang dimanfaatkan dalam upacara adat pernikahan dan tujuh bulanan masyarakat Suku Mandar di Kabupaten Majene; (2) menganalisis makna simbolis (ussul) setiap tumbuhan berdasarkan perspektif budaya Mandar dan nilai Relative Frequency of Citation (RFC); dan (3) mengembangkan e-catalog tumbuhan etnobotani menggunakan model ADDIE sebagai sumber belajar biologi pada materi keanekaragaman hayati untuk peserta didik kelas X SMA. Pendekatan deskriptif kualitatif digunakan dengan teknik pengumpulan data melalui wawancara semi-terstruktur, observasi langsung, dan dokumentasi terhadap 21 informan kunci (tokoh adat, dukun/sanro, dan masyarakat) di Lingkungan Mangge dan Kalasa, Kelurahan Totoli, Kecamatan Banggae, Kabupaten Majene, pada April–Juli 2025. Identifikasi tumbuhan dilakukan menggunakan aplikasi PlantNet, situs Plants of the World Online (POWO), dan Plantamor, serta dikonfirmasi oleh taksonom tumbuhan. Hasil penelitian menunjukkan terdapat 21 spesies dari 16 famili pada upacara pernikahan dan 9 spesies dari 8 famili pada upacara tujuh bulanan, yang didominasi oleh habitus herba dan pohon. Tujuh spesies mencatat nilai RFC tertinggi (RFC = 1,00): *Cocos nucifera, Piper betle, Areca catechu, Curcuma longa, Oryza sativa, Musa sp.,* dan *Eragrostis tenella*, masing-masing mengandung ussul yang mencerminkan filosofi kehidupan masyarakat Mandar. Temuan dikemas dalam e-catalog yang dikembangkan melalui tahap *Analysis, Design,* dan *Development* model ADDIE, memperoleh kategori Sangat Valid (M = 4,62 dari skala 5,0) berdasarkan penilaian ahli materi dan budaya, dan layak dimanfaatkan sebagai sumber belajar biologi pada materi keanekaragaman hayati.

Kata Kunci: Etnobotani; Keanekaragaman Hayati; Pernikahan; Suku Mandar; Tujuh Bulanan; E-Catalog, Sumber Belajar

Exploration of Ethnobotanical Values in Mandar Community Wedding and Seven-Month Ceremonies for the Development of Biology Learning Resources

Abstract

The Mandar tribe of West Sulawesi maintains well-preserved cultural traditions, including the ritualized use of diverse plant species imbued with symbolic values (ussul) and local ecological knowledge. This study aimed to: (1) identify plant species utilized in the wedding and seven-month ceremonies of the Mandar people in Majene Regency; (2) analyze the symbolic significance (ussul) of each plant from the Mandar cultural perspective based on the *Relative Frequency of Citation* (RFC) index; and (3) develop an ethnobotanical e-catalog using the ADDIE model as a biology learning resource on biodiversity for Grade X senior high school students. A descriptive qualitative approach was employed, with data collected through semi-structured interviews, direct observation, and documentation involving 21 key informants (customary leaders, traditional shamans, and community members) in the Mangge and Kalasa neighborhoods of Totoli Village, Banggae District, Majene Regency, from April to July 2025. Plant identification was conducted using PlantNet, Plants of the World Online (POWO), and Plantamor. Results revealed 21 species from 16 families in the wedding ceremony and 9 species from 8 families in the seven-month ceremony, predominantly herbs and trees. Seven species recorded the highest RFC values (RFC = 1.00): *Cocos nucifera, Piper betle, Areca catechu, Curcuma longa, Oryza sativa, Musa* sp., and *Eragrostis tenella*, each bearing distinct ussul reflecting the philosophy of Mandar life. The findings were compiled into an e-catalog developed through the Analysis, Design, and Development stages of the ADDIE model, validated as highly valid (M = 4.62 out of 5.0) by subject-matter and cultural experts, and deemed suitable as a biology learning resource on biodiversity.

Keywords: *Ethnobotany; Biodiversity; Mandar Tribe; Wedding Ceremony; Seven Months; E-Catalog, Learning Resource*

1. Introduction

Indonesia is an archipelagic country consisting of around 17,500 islands located in the tropical region, between the continents of Asia and Australia, and flanked by the Indian Ocean and the Pacific Ocean (Pangestu & Indah, 2024; Sun et al., 2024; Eddy et al., 2025) with a total coastline length of around 95,181 km. This unique geographic condition makes Indonesia one of the world's megadiverse countries, despite covering only about 1.3% of Earth's total surface. In terms of floral diversity, Indonesian plants are part of the Malesian flora, which is estimated to contain around 25% of all flowering plant species worldwide. Indonesia ranks seventh in the world with a total of 20,000 plant species, of which approximately 40% are endemic, or found only in Indonesia. Furthermore, Indonesia is among the countries with the highest levels of threats to plant species and extinctions worldwide (Kusmana & Hikmat, 2015).

Ethnobotany is an interdisciplinary field that examines the interactions between communities and the plants in their environments. Ethnobotanical studies encompass traditional knowledge systems for the utilization, management, and perception of plant resources to meet various needs, ranging from food, medicine, and materials to socio-cultural needs and religious rituals (Susandarini et al., 2025; Wijaya & Oktarina, 2014). Ethnobotanical studies are important for documenting local community wisdom in the sustainable use of biodiversity and for contributing to the development of modern science by exploring traditional knowledge.

The use of plants as biological resources has long been a part of Indonesian society. Various ethnic groups in Indonesia use a range of plant species in their daily activities, including religious rituals and traditional ceremonies such as engagements, weddings, births, and deaths (Sari et al., 2024; Azzam et al., 2025). Furthermore, plants are used as traditional medicines (Chekole, 2017), food sources, clothing, construction materials, and household appliances, as well as in the manufacture of handicrafts, cosmetics, natural dyes, perfumes, botanical pesticides, and even as a means of play, transportation, and communication (Aziz et al., 2018; Amanda et al., 2025). The types and quantities of plants used in traditional ceremonies vary across ethnic groups in Indonesia, as do their symbolic meanings (Ramadhani et al., 2021; Septiani et al., 2025).

The Mandar people are one of the main ethnic groups in West Sulawesi, possessing a distinctive language, social system, and cultural traditions. The Mandar people inhabit the western coastal areas of Sulawesi, particularly in the regencies of Majene, Polewali Mandar, and Mamuju (Ichsan et al., 2025). These people are known for their deep philosophical values, particularly the concept of Sibaliparriq, which embodies togetherness, social concern, and a willingness to share joys and sorrows within a strong emotional bond. This community highly values its cultural heritage, is hospitable to newcomers, possesses courage, and is renowned for its skilled and tenacious sailors. This philosophy is reflected in various aspects of life, including the selection and use of plants for important ceremonies such as weddings and births. The Mandar people also have a strong seafaring tradition and have historically played a role in the maritime trade routes of the Indonesian archipelago, fostering cultural diversity and the exchange of ethnobotanical knowledge with other ethnic groups.

In various regions of Indonesia, various types of local plants are used directly for food, traditional medicine, and traditional ceremonies (Saswita et al., 2025; Hastiwi & Purwati, 2025). The diversity of ethnic groups inhabiting the archipelago is directly proportional to the richness of traditional rituals maintained by each ethnic group. However, the current problem is that the increasingly massive flow of modernization has eroded people's understanding of local customs and culture, including among the Mandar people. The transformation of modern lifestyles has led the younger generation to be less interested in preserving local traditions. Consequently, knowledge of the procedures for performing traditional ceremonies and the symbolic meanings of the plants used in them is now held by only a handful of traditional leaders, cultural experts, and anthropologists (Teriyana, 2025). This phenomenon threatens the continuity of the transmission of ethnobotanical knowledge from the older generation to the younger, which, in turn, can lead to the loss of local wisdom that has been formed over centuries.

Several ethnobotanical studies on traditional ceremonies have been conducted across various regions of Indonesia. Harsono et al. (2025) documented 46 plant species from 28 families used in the Balinese cremation ceremony in Banyuwangi Regency, focusing on the symbolic meanings associated with death and reincarnation. Ramadhani et al. (2021) identified 20 plant species in the Tamiang wedding ceremony in Aceh, reflecting the influence of Malay and Islamic cultures. Tandirerung et al. (2023) explored ritual plants in the Traditional Mangrara Banua Ceremony Of Tongkonan Toraja, while Widyaningrum et al. (2025) examined the use of plants in the Javanese Wiwitan tradition. Although these studies make important contributions to documenting local wisdom, gaps remain in geographic coverage and the ethnic groups studied.

Comprehensive documentation on the use of plants in traditional Mandar ceremonies, particularly in wedding rituals and seven-month ceremonies, remains very limited. This is despite the Mandar having a unique culture that differs from those of other ethnic groups in Sulawesi, particularly in language, kinship systems, and ritual practices. Furthermore, efforts to integrate local ethnobotanical knowledge into wisdom-based biology learning resources remain rare, especially in interactive, contextually rich e-catalog formats. This gap underscores the urgency of research to document and analyze Mandar ethnobotanical practices before this knowledge is lost to the changing times.

A preliminary study conducted through an interview with the former Head of the Mangge Environment in April 2024 regarding the traditional ceremonies of the Mandar tribe in Majene Regency, West Sulawesi Province, revealed the urgency of this research to document and preserve community knowledge regarding the use of plants in traditional ceremonies, as well as to identify plant species that have special symbolic value in Mandar culture. Further interviews with lecturers teaching Ethnobotany in May 2024 confirmed that this research has the potential to be developed into a learning resource for biodiversity material for grade 10 high school students. By identifying and documenting the plants used in the traditional ceremonies of the Mandar Tribe, this research aims to produce a biology learning resource in the form of a contextual, locally wisdom-based electronic plant catalog (e-catalog).

E-catalogs were chosen as the learning media for this study due to their capacity to present comprehensive botanical information in a visual, interactive format that is easily accessible via digital devices (Nurhidayah & Haryunita, 2020; Primadewi et al., 2025). Their digital nature facilitates contextual, self-directed learning aligned with the Independent Curriculum framework, making them particularly suited for integrating local ethnobotanical knowledge into formal biology education (Purnamasari et al., 2025). Furthermore, the ethnobotanical e-catalog has the potential to improve students' scientific literacy by contextualizing biodiversity concepts with local culture. Cultural context-based learning has been shown to increase students' motivation and conceptual understanding (Hidayati & Julianto, 2025; Fauzi & Rahmatih, 2025). By presenting concrete examples of plant use in Mandar traditional ceremonies, students not only memorize plant taxonomy or morphology but also understand the ecological, cultural, and economic value of biodiversity in real life. This is expected to foster an appreciation for local wisdom and conservation awareness from an early age.

Based on the research background and identified gaps described above, this study aims to: (1) identify the plant species utilized in the traditional wedding and seven-month ceremonies of the Mandar people in Majene Regency; (2) analyze the symbolic significance (ussul) of each plant from the Mandar cultural perspective based on the Relative Frequency of Citation (RFC) index; and (3) develop an ethnobotanical e-catalog using the ADDIE model (limited to the Analysis, Design, and Development stages) as a biology learning resource on biodiversity for Grade X senior high school students. This research is expected to enrich the body of Indonesian ethnobotanical knowledge, particularly regarding Mandar cultural practices that have not been extensively documented scientifically, while producing a contextual and locally wisdom-based learning resource.

The Mandar people are one of the major ethnic groups of West Sulawesi Province, inhabiting coastal areas primarily in the regencies of Majene, Polewali Mandar, and Mamuju (Ichsan et al., 2025). Historically, the Mandar are recognized as accomplished maritime traders - their pinisi and sandeq vessels facilitated inter-island cultural and commercial exchanges across the Indonesian archipelago, contributing to the diffusion of ethnobotanical knowledge among Austronesian-related ethnic groups (Pelras, 1996). This seafaring heritage is reflected in their selection of plants for important life-cycle ceremonies: plants with broad ecological distribution, high utility, and strong symbolic resonance are consistently preferred across ritual contexts.

2. Methods

2.1. Research Design and Location

This study used a qualitative descriptive, exploratory design to gather information on the types of plants used in traditional Mandar weddings and seven-month ceremonies, along with their symbolic meanings. The study was conducted from April to July 2025 in two neighborhoods: Mangge and Kalasa, Totoli Village, Banggae District, Majene Regency, West Sulawesi Province.

2.2. Informant Selection

Informants were selected using a purposive sampling technique with the following criteria: in-depth knowledge of Mandar traditional ceremonies, prior involvement in the ceremonies, and willingness to serve as sources. Twenty-one informants participated in this study, consisting of five traditional leaders, three traditional leaders, four shamans/sanro, and nine members of the general public (five women and four men), aged 35–78 years. All informants provided verbal and written informed consent prior to data collection.

2.3. Data Collection

Data collection was conducted using three techniques: (1) semi-structured interviews with key informants to obtain information on plant types, parts used, methods of use, and symbolic meaning; (2) direct observation of plant morphology, including the characteristics of leaves, stems, flowers, and roots; and (3) documentation in the form of photographs, and audio recordings to support data validity (Alexiades, 1996; Tandirerung et al., 2023; Widyaningrum et al., 2025).

2.4. Plant Identification

Plant identification was conducted using (1) direct morphological observation in the field; (2) the use of the PlantNet application (Mahrani & Husain, 2025) and the Plants of the World Online (POWO) and Plantamor websites (Widyaningrum et al., 2025) as initial tools; and (3) identity confirmation by a plant taxonomist.

2.5. Ethnobotanical Data Analysis

Qualitative analysis was conducted in three stages: data reduction, data presentation, and conclusion drawing (Faruque et al., 2019; Corroto & Macia, 2021; Leonti, 2022). Data validity was tested using source and technique triangulation (Vitaloka et al., 2025). For quantitative analysis, the Relative Frequency of Citation (RFC) index was calculated using the formula of Tardio & Pardo-de-Santayana (2008):

$$RFC = FC / N$$

Where: FC = number of informants mentioning the species; N = total informants (N = 21). RFC values range from 0–1; The higher the RFC value, the more widely known and utilized the species is by the public.

2.6. E-Catalog Development

The e-catalog was developed following the first three stages of the ADDIE instructional design model (Branch & Varank, 2009; Taher et al., 2025), which included: (1) Analysis: identifying media needs and their suitability for the 10th grade high school biodiversity curriculum; (2) Design: structuring the content, including scientific names, morphology, benefits, symbolic meanings, and images; (3) Development: developing the e-catalog using the Canva platform and exporting it in PDF format. Feasibility was validated by two expert validators using a validation sheet with a content validation formula. Categorization: Very Valid ($4.5 \leq M \leq 5.0$), Valid ($3.5 \leq M \leq 4.5$), Fairly Valid ($2.5 \leq M \leq 3.5$), Less Valid ($1.5 \leq M \leq 2.5$), and Invalid ($M \leq 1.5$) (Permatasari et al., 2025).

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Hal. 39 - 63

3. Results

3.1. Plant Diversity in Mandar Wedding Ceremonies

Research results show that 21 plant species from 16 families are used in traditional Mandar wedding ceremonies in Totoli Village, Majene Regency. These plants are used in various wedding ceremonies, from the *paindo sorong* (delivering the proposal) (**Fig.1**), *melattigi* (henna application) (**Fig. 2)**, *mappi'dei solung* (bridal bathing) (**Fig. 3**), *pa'ollong* (walking along the path) (**Fig. 4**), *batu cina* (calculating auspicious days), *kappu bunga* (flower). An inventory of the species, along with their habitus, families, and photographs, is presented in Table 1.

Figure 1. Paindo sorong
(Personal documentation, 2025)

Figure 2. Melattigi
(Personal documentation, 2025)

Figure 3. Mappi'dei solung
(Personal documentation, 2025)

Figure 4. Pa'ollong
(Personal documentation, 2025)

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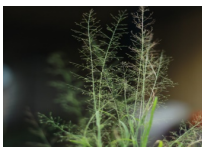
Hal. 39 - 63

Table 1. List of Plants Used in Mandar Wedding Ceremonies

No	Plant Name (Indonesian)	Local Name	Scientific Name	Part Used	Habitus	Family	Photo
1	Cocor bebek daun runcing	Bungun tuo	*Kalanchoe laciniata*	Leaves	Herbs	*Crassulaceae*	
2	Hanjuang	Atawan	*Cordyline fruticosa*	Leaves, stems	Shrubs	*Asparagaceae*	
3	Jagung	Bata'	*Zea mays*	Fruit	Herbs	*Poaceae*	
4	Jukut	Ribu-ribu	*Eragrostis tenella*	All parts	Herbs	*Poaceae*	
5	Jarong	Kai-kai	*Achyranthes aspera*	Leaves, flowers, stems	Herbs	*Amaranthaceae*	
6	Jeruk purut	Lemo puru'	*Citrus hystrix*	Fruit peel	Trees	*Rutaceae*	
7	Kelapa	Anjoro	*Cocos nucifera*	Fruit	Trees	*Arecaceae*	
8	Kemiri	Beau	*Aleurites moluccanus*	Seeds	Trees	*Euphorbiaceae*	
9	Kenanga	Landera	*Cananga odorata*	Flowers	Trees	*Annonaceae*	

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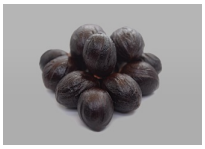
No	Plant Name (Indonesian)	Local Name	Scientific Name	Part Used	Habitus	Family	Photo
10	Kunyit	Asso	*Curcuma longa*	Rhizome	Herbs	*Zingiberaceae*	
11	Pacar kuku	Lattigi	*Lawsonia inermis*	Leaves	Shrubs	*Lythraceae*	
12	Pala	Pala	*Myristica fragrans*	Seeds	Trees	*Myristicaceae*	
13	Pandan	Panden	*Pandanus amaryllifolius*	Leaves	Herbs	*Pandanaceae*	
14	Pinang	Taru	*Areca catechu*	Seeds	Trees	*Arecaceae*	
15	Pisang	Loka	*Musa sp.*	Fruits, leaves	Herbs	*Musaceae*	
16	Rumbia/Sagu	Pa'leo	*Metroxylon sagu*	Small plants	Trees	*Arecaceae*	
17	Sirih	Baulu	*Piper betle*	Leaves	Lianas	*Piperaceae*	
18	Tebu	Pambe	*Saccharum officinarum*	Stems	Herbs	*Poaceae*	

No	Plant Name (Indonesian)	Local Name	Scientific Name	Part Used	Habitus	Family	Photo
19	Turi	Passama	*Sesbania grandiflora*	Twigs, leaves	Trees	*Fabaceae*	
20	Padi/Beras	Barras	*Oryza sativa*	Seeds	Herbs	*Poaceae*	
21	Ubi kelapa/Uwi	Lame	*Dioscorea esculenta*	Tubers	Herbs	*Dioscoreaceae*	

Each plant used in wedding ceremonies has a symbolic meaning that reflects the hopes, prayers, and philosophy of married life of the Mandar people. Based on Table 1, the plant habit includes Herbs (9 species), Trees (9 species), Shrubs (2 species), and lianas (1 species). The families with the largest number of species are Poaceae (4 species: corn, jukut, sugarcane, rice) and Arecaceae (3 species: *Cocos nucifera, Areca catechu, Metroxylon sagu*). The symbolic meaning and RFC value of each plant are presented in Table 2.

Table 2. Symbolic Meaning and RFC Value of Plants in Mandar Tribe Traditional Wedding Ceremonies

No	Plant Name	Parts Used	Symbolic Meaning (Ussul)	RFC
1	Cocor bebek daun runcing	Leaves and stems	Good life and free from disease ('*atuoan, macoai atuoan, andangi tau monge*')	0.86
2	Hanjuang	Leaves and stems	Avoiding danger ('*meatawanni laori atassalan*')	0.71
3	Jagung	Fruit	Strong attachment in marriage; even though the stalk is rotten, the corn remains firmly attached to its stalk ('*mau miapa jappona ponna, toe-toe andai rua ra'da, andai silakka ponna*')	0.62
4	Jukut	All parts	Abundant fortune ('*maribu-ribu pole dalle*')	1.00

No	Plant Name	Parts Used	Symbolic Meaning (Ussul)	RFC
5	Jarong	Leaves, flowers, stems	Attracting good fortune ('*makkai or tikai dalle*')	0.57
6	Jeruk purut	Rind	Fragrance in married life ('*nahara'i masarri pamboya-boyanganna*')	0.48
7	Kelapa	Fruit	The hope that the partner will be completely useful, from head to toe ('*anna mala ari sittengan anjoro mai'digunanna laori rupa tau*')	1.00
8	Kemiri	Seed	Symbol of a couple who complement each other; can be oil and torch for each other ('*malai napajari lomo, pallang, anna dipasiwali baine anna muane*')	0.67
9	Kenanga	Flower	Fragrance in married life ('*nahara'i masarri pamboya-boyanganna*')	0.52
10	Kunyit	Rhizome	Provisions come in abundance ('*siriwa-riwa lomai della ta*')	1.00
11	Pacar kuku	Leaf	Prayer and blessing; hope that the marriage will always be colorful ('*milattiggi irio na wenganni doa anna restu*')	0.90
12	Pala	Seed	Fragrance in marriage; symbol of a faithful couple ('*pala masarri tu'tia malai ai massarri dipamboya-bayangan*')	0.57
13	Pandan	Leaf	Fragrance in married life ('*nahara'i masarri pamboya-boyanganna*')	0.57
14	Pinang	Seed	Straight married life with lots of sustenance ('*taru maroro irai ponnana anna bua na maidi i*')	1.00
15	Pisang	Fruit and leaves	Staple food; a symbol of a man's readiness to support his family (' *loka dipakei apa diolok lako ande ta*')	1.00

No	Plant Name	Parts Used	Symbolic Meaning (Ussul)	RFC
16	Rumbia/Sagu	small plants	Food security; useful from root to shoot (*'maguna dari akarna lambi dai tindana'*)	0.48
17	Sirih	Leaf	The expected meeting; the veins that meet symbolize togetherness (*'apa siruppai urana anna siruppa tarrus tau'*)	1.00
18	Tebu	Stem	A sweet, united, and unshaken marriage (*'anna andan tise'bo pamboya-boyangan'*)	0.81
19	Turi	Branches and leaves	Uniting everything in marriage (*'mappa siama i tau tama anna di pamboya-boyangan'*)	0.62
20	Padi/Beras	Seed	The readiness of men to provide for their families (*'sadiai muane mappande dipamboya-boyangan'*)	1.00
21	Ubi kelapa/Uwi	Tubers	Depend on each other and choose to be together rather than apart (*'tiulele dai ditinda'na dotai siorrongan than na sisara-sara'*)	0.43

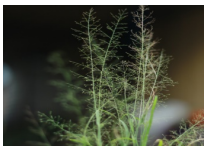
Description: RFC = *Relative Frequency of Citation*; FC/N with N = 21 informants. An RFC value of 1.00 indicates that all informants mentioned the species.

3.2. Plant Diversity in the Mandar Tribe's Seven Months Ceremony

During the seven-month traditional ceremony, which aims to ensure the safety of pregnant women and their unborn children, nine plant species from eight families were used. This number is smaller than in wedding ceremonies, but its symbolic meaning remains deeply rooted in local wisdom. These plants are summarized in Table 3.

Table 3. List of Plants Used in the Seven Months Traditional Ceremony of the Mandar Tribe

No	Plant Name (Indonesian)	Local Name	Scientific Name	Parts Used	Habitus	Family	Photo
1	Cocor bebek daun runcing	Bungun tuo	*Kalanchoe laciniata*	Leaves, stems	Herbs	*Crassulaceae*	

No	Plant Name (Indonesian)	Local Name	Scientific Name	Parts Used	Habitus	Family	Photo
2	Hanjuang	Atawan	*Cordyline fruticosa*	Leaves, stems	Shrubs	*Asparagaceae*	
3	Jukut	Ribu-ribu	*Eragrostis tenella*	All parts	Herbs	*Poaceae*	
4	Kelapa	Anjoro	*Cocos nucifera*	Fruit, flowers	Trees	*Arecaceae*	
5	Kunyit	Asso	*Curcuma longa*	Rhizome	Herbs	*Zingiberaceae*	
6	Pinang	Taru	*Areca catechu*	Flower	Trees	*Arecaceae*	
7	Pisang	Loka	*Musa sp.*	Fruit, leaves	Herbs	*Musaceae*	
8	Sirih	Baulu	*Piper betle*	Leaf	Liana	*Piperaceae*	
9	Padi/Beras	Barras	*Oryza sativa*	Seed	Herbs	*Poaceae*	

Each plant used in the Mandar people's seven-monthly traditional ceremony has a symbolic meaning that reflects the prayers, hopes, and values of the Mandar people's local wisdom regarding the processes of life. The symbolic meanings of the plants used in the seven-monthly ceremony are presented in Table 4.

Table 4. Symbolic Meaning and RFC Value of Plants in the Seven Months Traditional Ceremony of the Mandar Tribe

No	Plant Name	Parts Used	Symbolic Meaning (Ussul)	RFC
1	Cocor bebek daun runcing	Leaves and stems	A good life and free from disease for the mother and fetus ('*atuoan, macoai atuoan, andangi tau monge*')	0.86
2	Hanjuang	Leaves and stems	Protecting the mother and fetus from danger ('*meatawanni laori atassalan*')	0.71
3	Jukut	All parts	Abundant fortune for the family awaiting the birth ('*maribu-ribu pole dalle*')	1.00
4	Kelapa	Fruits and flowers	The hope is that the child will be completely useful for others ('*anna mala ari sittengan anjoro mai'digunanna laori rupa tau*')	1.00
5	Kunyit	Rhizome	Abundant sustenance for the child who will be born ('*siriwa-riwa lo'mai della ta*')	1.00
6	Pinang	Flower	The hope is that the child will have a straight life and lots of sustenance ('*taru mararo irai ponnana anna bunga na mai' di i*')	1.00
7	Pisang	Fruit and leaves	Staple food; the hope is that the child will be useful in the future (‘*loka dipakei apa diolok lako ande ta*’)	1.00
8	Sirih	Leaf	The hope that the child in the womb will be met with all goodness (‘*apa siruppai ura'na anna siruppa tarrus anak laori acoangan*’)	1.00
9	Padi/Beras	Seed	Hope for sufficient sustenance for the child who will be born ('*nahara anakna malai mai'di dalle na*')	1.00

There are 9 plant species used in both traditional ceremonies, namely *Kalanchoe laciniata*, *Cordyline fruticosa*, *Eragrostis tenella*, *Cocos nucifera*, *Curcuma longa*, *Areca catechu*, *Piper betle*, *Musa* sp., and *Oryza sativa*. This shows that these plants have very important and universal symbolic values in Mandar culture, not only in the context of marriage but also of birth.

3.3. Distribution of Plant Families and Habits

The distribution of plants used in both ceremonies based on family and habitus is presented in Table 5.

Table 5. Distribution of Families and Habitus of Ritual Plants of the Mandar Tribe

Family	Species	Number of Species	Dominant Habitus	Ceremonial Context
Poaceae	Jagung, Jukut, Tebu, Padi	4	Herbs	Wedding
Arecaceae	Kelapa, Pinang, Rumbia	3	Trees	Both of them
Zingiberaceae	Kunyit	1	Herbs	Both of them
Piperaceae	Sirih	1	Liana	Both of them
Musaceae	Pisang	1	Herbs	Both of them
Asparagaceae	Hanjuang	1	Shrubs	Both of them
Crassulaceae	Cocor bebek	1	Herbs	Both of them
Rutaceae	Jeruk purut	1	Trees	Wedding
Euphorbiaceae	Kemiri	1	Trees	Wedding
Annonaceae	Kenanga	1	Trees	Wedding
Lythraceae	Pacar kuku	1	Shrubs	Wedding
Myristicaceae	Pala	1	Trees	Wedding
Pandanaceae	Pandan	1	Herbs	Wedding
Fabaceae	Turi	1	Trees	Wedding
Dioscoreaceae	Ubi kelapa/Uwi	1	Herbs	Wedding
Amaranthaceae	Jarong	1	Herbs	Wedding

3.4. Relative Frequency of Citation (RFC) Analysis

The RFC values for all species identified in both ceremonies are presented in Table 6, sorted from highest to lowest.

Table 6. RFC Values of Mandar Tribe Ritual Plants (N = 21 Informants)

Scientific Name	Common Name	FC	RFC	Context	Habitus
Cocos nucifera	Kelapa	21	1.00	Both of them	Trees
Piper betle	Sirih	21	1.00	Both of them	Liana
Areca catechu	Pinang	21	1.00	Both of them	Trees
Curcuma longa	Kunyit	21	1.00	Both of them	Herbs
Oryza sativa	Padi/Beras	21	1.00	Both of them	Herbs
Musa sp.	Pisang	21	1.00	Both of them	Herbs
Eragrostis tenella	Jukut	21	1.00	Both of them	Herbs
Lawsonia inermis	Pacar kuku	19	0.90	Wedding	Shrubs
Kalanchoe laciniata	Cocor bebek	18	0.86	Both of them	Herbs
Saccharum officinarum	Tebu	17	0.81	Wedding	Herbs
Cordyline fruticosa	Hanjuang	15	0.71	Both of them	Shrubs
Aleurites moluccanus	Kemiri	14	0.67	Wedding	Trees
Zea mays	Jagung	13	0.62	Wedding	Herbs
Sesbania grandiflora	Turi	13	0.62	Wedding	Trees
Myristica fragrans	Pala	12	0.57	Wedding	Trees
Pandanus amaryllifolius	Pandan	12	0.57	Wedding	Herbs
Achyranthes aspera	Jarong	12	0.57	Wedding	Herbs
Cananga odorata	Kenanga	11	0.52	Wedding	Trees
Citrus hystrix	Jeruk purut	10	0.48	Wedding	Trees
Metroxylon sagu	Rumbia/Sagu	10	0.48	Wedding	Trees
Dioscorea esculenta	Ubi kelapa/Uwi	9	0.43	Wedding	Herbs

Description: FC = *Frequency of Citation* (number of informants who mentioned); RFC = *Relative Frequency of Citation* (FC/N). Seven species have an RFC value of 1.00, indicating that all informants mentioned these species.

The distribution of RFC values across all 21 plant species documented in this study is presented in Table 6. Seven species attained the maximum RFC value of 1.00, indicating universal cultural consensus regarding their symbolic significance in Mandar rituals. A progressive decline in RFC values is observed from the core species cluster (RFC ≥ 0.80) to peripheral species (RFC < 0.50), consistent with the core-periphery model of ethnobotanical knowledge distribution described by Tardio & Pardo-de-Santayana (2008). The three species with RFC values below 0.50-*Citrus hystrix, Metroxylon sagu*, and *Dioscorea esculenta* are exclusively found in wedding ceremonies and appear to represent culturally specific elements with more restricted symbolic roles.

3.5. Development of E-catalog as a Biology Learning Resource

An ethnobotanical plant e-catalog for the Mandar tribe was successfully developed on the Canva platform and exported as a PDF. The e-catalog contains complete information including: (1) plant names (common names, local Mandar names, and scientific names); (2) taxonomic classification from kingdom to species; (3) morphological description; (4) plant parts used; (5) RFC values; (6) symbolic meanings (ussul) in Mandar and their translations; and (7) visual documentation in the form of plant photos. E-catalog link: https://drive.google.com/file/d/1YRvulzkd_fydtR19kOkIw2R3UFtzx175/view?usp=sharing The validation results by two expert validators (Validator 1: Biology material expert; Validator 2: Culture expert) are presented in Table 7.

Table 7. Validation Results of the Mandar Tribe's Ethnobotany E-Catalog

No	Assessment Aspects	Validator 1	Validator 2	Average	Category
1	Suitability of material with curriculum	4.8	4.7	4.75	Very Valid
2	Accuracy of scientific information	4.7	4.6	4.65	Very Valid
3	Accuracy of cultural meaning	4.5	4.8	4.65	Very Valid
4	Image/photo quality	4.6	4.5	4.55	Very Valid
5	Design and layout	4.7	4.4	4.55	Very Valid
6	Ease of understanding	4.5	4.6	4.55	Very Valid
7	Language readability	4.6	4.7	4.65	Very Valid
Overall Average				**4.62**	**Very Valid**

3.6. E-catalog Validation Results

The developed e-catalog has been validated by two expert validators: a biology learning materials validator (for biodiversity) and a local culture validator. The validation results indicate that the e-catalog received a **Very Valid category** with an average score of 4.62 on a scale of 5.0.

4. Discussion

4.1. Species Diversity and Family Distribution

This study successfully documented 21 species from 16 families in wedding ceremonies and 9 species from 8 families in the seven-monthly ceremonies of the Mandar people. This diversity demonstrates a significant wealth of local ethnobotanical knowledge. Compared with similar studies, Ramadhani et al. (2021) recorded 20 species in the wedding ceremonies of the Tamiang people of Aceh, while Harsono et al. (2025) documented 46 species in the *ngaben ceremonies* of the Balinese people-a difference in numbers that the complexity of the ceremonial procession can explain, the availability of local biodiversity, and the level of tradition preservation.

The dominance of the Poaceae (4 species) and Arecaceae (3 species) families reflects the coastal ecosystem of West Sulawesi, the habitat of the Mandar people. Species from these two families, particularly rice, sugar cane, coconut, and areca nut, are the main cultivated crops in the region, thus having high accessibility and strong economic value (Azman, 2022). This aligns with the general ethnobotanical principle that the most accessible plants are used more frequently in ritual contexts (Tardio & Pardo-de-Santayana, 2008).

The dominance of Herbs and Trees (9 species each) in wedding ceremonies indicates a pattern of use that falls into two main ecological categories: Herbs, which are generally easy to cultivate in the yard, and Trees, which reflect the value of permanence and symbolic power. Similar patterns are found in ethnobotanical studies of rituals across various ethnic groups in the archipelago (Septiani et al., 2025; Hastiwi & Purwati, 2025), indicating a consistent ecological pattern in the selection of plants for life-cycle ceremonies.

4.2. Symbolic Meaning of Plants Based on Botanical and Ecological Characteristics

Analysis of symbolic meaning reveals a close relationship between the morphological or ecological characteristics of plants and the meanings attributed to them, indicating that symbolism in Mandar culture is not arbitrary but rather grounded in observations of plants' natural properties.

Cocos nucifera (coconut) has the highest RFC value and is used in both ceremonies. Coconut was chosen for its multifunctional botanical properties-every part can be used from the root to the shoot-in line with the Mandar philosophy of holistic benefit for life. *Piper betle* (betel) and *Areca catechu* (areca nut) are an inseparable plant pair in Mandar culture and many ethnic groups in the archipelago, symbolizing the balance and complementarity of husband and wife. From a phytochemical perspective, betel leaves contain antiseptic kavikol and eugenol (Ramdhani et al., 2025; Septiani et al., 2025), while areca nuts contain

stimulant arecoline, a bioactive compound that may indirectly underlie their use in purification and strengthening rituals.

Curcuma longa (turmeric) has golden-yellow rhizomes that hold a prominent place in Mandar cosmology as a symbol of purity and prosperity. This symbolic interpretation finds scientific support in curcumin's extensive bioactivity, the principal polyphenolic compound in turmeric. Systematic reviews and meta-analyses consistently confirm curcumin's potent antioxidant, anti-inflammatory, and antimicrobial activities (Jafari et al., 2024; Bella et al., 2025), providing an ecological rationale for its use in purification and protective ritual contexts. These findings suggest that the empirical knowledge embedded in Mandar's traditional practices aligns with contemporary phytochemical evidence, illustrating the scientific validity of ethnobotanical knowledge systems. Piper betle (betel) and Areca catechu (areca nut) constitute an inseparable dyad in Mandar ritual practice, symbolizing the complementarity and interdependence of husband and wife. Phytochemically, betel leaves are rich in antiseptic phenylpropanoids, including kavikol and eugenol, which have demonstrated significant antibacterial and antifungal activities in in vitro assays (Septiani et al., 2025; Ramdhani et al., 2025). Areca nuts contain arecoline, a parasympathomimetic alkaloid with psychoactive properties that may underlie the traditional perception of areca nut consumption as physically and spiritually invigorating (Coppola et al., 2016). The combination of betel and areca in the sirih pinang tradition may thus reflect an intuitive understanding of their pharmacological synergy.

Cordyline fruticosa (hanjuang) and *Kalanchoe laciniata* (cocor bebek) are used as spiritual protectors. The anthocyanins in hanjuang leaves impart a red/purple color, thought to possess mystical powers to ward off danger. In contrast, the cocor bebek's high regenerative ability, grown from leaf cuttings, symbolizes the vitality and survival expected for both mother and fetus during the seventh-month ceremony.

A comparative perspective within the Sulawesi cultural landscape reveals both convergences and unique characteristics of Mandar ethnobotanical practices. The Bugis and Makassar peoples of South Sulawesi share several core ritual plants with the Mandar - notably the betel-areca (sirih pinang) complex, coconut, and rice - reflecting a common Austronesian cultural heritage and centuries of inter-ethnic interaction (Pelras, 1996). However, Mandar ritual practices exhibit several distinctive features: (1) the use of Eragrostis tenella (jukut), a grass species with very high RFC (1.00) symbolizing abundant fortune, is not consistently documented in Bugis or Makassar wedding ethnobotany; (2) the philosophical framework of ussul - wherein symbolic meaning derives explicitly from observable morphological or ecological properties of the plant - represents a more systematized ethno-ecological reasoning than is typically described for neighboring ethnic groups; and (3) the prominent role of Metroxylon sagu (sago palm) in Mandar weddings reflects the distinct subsistence ecology of the western Sulawesi coast, where sago historically served as a primary food security crop alongside rice. In contrast, the Toraja of inland South Sulawesi employ a markedly different ritual plant repertoire dominated by species with highland ecological associations, including bamboo, areca, and specific tree ferns used in the Rambu Solo funerary tradition (Waterson, 1990). These contrasts underscore the uniqueness of Mandar ethnobotanical knowledge as a distinct system within

the broader mosaic of Sulawesian biocultural diversity, warranting targeted documentation and conservation efforts.

4.3. Interpretation of RFC Values and Core Plants

Seven species with RFC = 1.00 - *Cocos nucifera, Piper betle, Areca catechu, Curcuma longa, Oryza sativa, Musa* sp., and *Eragrostis tenella* can be categorized as 'core plants' (*core species*) that have universal cultural meaning in the Mandar ritual system. The *core-periphery concept* in ethnobotanical studies holds that core species with strong cultural values are more resistant to social change than complementary species. This phenomenon aligns with field findings: modernization simplifies some ritual elements, while core plants are maintained because they are considered symbolically irreplaceable.

The similarity of several core species to the traditional ceremonies of other ethnic groups in the archipelago, particularly betel, areca nut, and coconut, indicates a network of cultural exchange and ethnobotanical knowledge within the broader Austronesian context (Syam, 2024). The betel and areca nut tradition, for example, is an ancient Austronesian cultural heritage that extends from Taiwan to the Pacific and persists in various rituals throughout the Indonesian archipelago.

The specificity of several species to Mandar ceremonies, such as *Metroxylon sagu* (rumbia/sago) with an RFC of 0.48, reflects their ecological adaptation to West Sulawesi's local ecosystem. Sago is an important alternative food source in eastern Indonesia, symbolizing food security, a value highly relevant in the context of household life in coastal areas (Tana et al., 2023).

The difference in the number of species between the wedding ceremonies (21 species) and the seven-month ceremony (9 species) reflects the differences in complexity and duration of the two ceremonies. Weddings in the Mandar culture involve a series of ceremonies spanning several days, each stage of which requires plants with specific symbolism. In contrast, the seven-month ceremony, which focuses more on prayers for the safety of the mother and fetus, tends to use plants with protective meanings and hopes for a smooth delivery.

All nine species from the seven-monthly ceremony were also found in wedding ceremonies, reinforcing the concept of *core species* across ritual contexts. Twelve species found exclusively in wedding ceremonies, including jarong, sugar cane, corn, cassava, candlenut, nutmeg, pigeon pea, pandan, cananga, kaffir lime, henna, and rumbia, are generally associated with aspects of married life, beauty, and material fulfillment for starting a new life.

4.4. The Relevance of Mandar Ethnobotany as a Source for Learning Biology

The ethnobotanical knowledge of the Mandar community is highly relevant to the Basic Competencies (KD) 3.2 and 4.2 in biology learning in grade X of high school, specifically biodiversity. The integration of ethnobotanical content into biology learning provides context, making abstract concepts concrete and meaningful. Students not only memorize the scientific names and morphology of plants, but also understand their ecological and cultural functions in real life, in line with the principles of meaningful learning and the paradigm of the Independent Curriculum, which emphasizes local culture-based learning (*culturally responsive teaching*) (Fauzi & Rahmatih, 2025; Hidayati & Julianto, 2025).

The developed e-catalog facilitates self-directed learning through contextual visual presentations, symbolic narratives in Mandar and Indonesian, and RFC data that introduce students to standard ethnobotanical methodology. High validity (M = 4.62, Very Valid category) indicates that the e- *catalog meets the standards for appropriateness of content, design, and readability. However, it should be noted that validation has only reached the expert judgment* stage and has not yet undergone empirical effectiveness testing. Further research is needed to measure the impact of e-catalog use on student learning outcomes using quasi-experimental or action research designs.

The e-catalog was evaluated by two expert validators with complementary expertise: Validator 1 was a biology education specialist with expertise in ethnobotany and biodiversity learning (holding a doctoral degree in Biology Education), while Validator 2 was a Mandar cultural expert in Mandar customary practices and cultural documentation. The selection of validators from both scientific and cultural domains ensured that the e-catalog's accuracy was assessed from both pedagogical and cultural authenticity perspectives.

4.5. Implications for Conservation and Preservation of Traditional Knowledge

This documentation has important implications for local biodiversity conservation. Several identified species, such as the hanjuang and cocor bebek, are now increasingly rare in their natural habitat due to land conversion. Preserving traditional ceremonial practices can be an indirect *in situ conservation strategy*, as communities are encouraged to maintain and cultivate these plants. The concept of *biocultural conservation* emphasizes that the preservation of culture and nature must go hand in hand (Ramadhani et al., 2021).

Publication of traditional knowledge also carries the responsibility to ensure informed community *consent, acknowledge knowledge holders' contributions, and implement equitable benefit-sharing mechanisms in accordance with the principles of the Nagoya Protocol on Access and Benefit Sharing*. Further, broader-scale research encompassing the Polewali Mandar and Mamuju regions is needed to provide a more comprehensive picture of the Mandar people's ritual ethnobotany.

An assessment of the conservation status of the documented species reveals a spectrum of ecological vulnerability. Several species with high RFC values - including *Cocos nucifera, Piper betle, Areca catechu, Curcuma longa,* and *Oryza sativa* - are widely cultivated and face no immediate threat of extinction; their continued use in ritual contexts ensures their active cultivation in household gardens. However, Cordyline fruticosa and Kalanchoe laciniata are reportedly becoming less common in natural and semi-wild settings in the Majene area due to land conversion for settlements and agriculture. Metroxylon sagu, though still present in riparian areas of West Sulawesi, has experienced significant population declines due to drainage and conversion of sago-palm wetlands. The persistence of these species in traditional ceremonies may serve as a form of passive in situ conservation, as community members maintain ritual plant gardens specifically to ensure a supply for ceremonial use. This biocultural conservation dynamic - in which cultural practice sustains biological diversity - is increasingly recognized as a complementary strategy to formal protected-area management (Gavin et al., 2015). Strengthening this link through cultural

revitalization programs represents a promising avenue for integrating biodiversity conservation into community development agendas in West Sulawesi.

5. Conclusion

This study successfully identified 21 plant species from 16 families utilized in traditional Mandar wedding ceremonies and 9 species from 8 families in the seven-month ceremony, documented in the Mangge and Kalasa neighborhoods of Totoli Village, Banggae District, Majene Regency. Seven species recorded RFC values of 1.00 - Cocos nucifera, Piper betle, Areca catechu, Curcuma longa, Oryza sativa, Musa sp., and Eragrostis tenella - and were categorized as core species with universal symbolic significance in the Mandar ritual system. The dominance of Poaceae (4 species) and Arecaceae (3 species) reflects adaptation to the coastal ecosystem of West Sulawesi. Each documented plant carries a symbolic meaning (ussul) grounded in the species' observed morphological or ecological properties, demonstrating a coherent ethnoscientific reasoning system within Mandar cultural epistemology. The ethnobotanical e-catalog developed through the Analysis, Design, and Development stages of the ADDIE model received a Very Valid rating (M = 4.62 out of 5.0) from subject-matter and cultural expert validators, confirming its suitability as a biology learning resource on biodiversity for Grade X senior high school students. This research theoretically contributes to the documentation of Mandar ethnobotanical knowledge - a cultural heritage that has been insufficiently studied - and practically produces a contextual, locally wisdom-based learning medium. This study has several limitations that should be acknowledged: (1) the geographic scope was limited to two neighborhoods within Banggae District, and findings may not fully represent the diversity of ceremonial plant use across the entire Mandar cultural region; (2) the e-catalog was validated only at the expert judgment stage and has not undergone empirical effectiveness testing with student populations; and (3) several plant species, notably Musa sp., were identified only to the genus level due to the use of multiple cultivars interchangeably in ritual contexts. Based on these limitations, future research is recommended to: (1) expand the ethnobotanical study to encompass Mandar communities in Polewali Mandar and Mamuju regencies to develop a more comprehensive regional dataset; (2) test the effectiveness of the e-catalog using a quasi-experimental design with Grade X students to measure its impact on learning outcomes and scientific literacy; and (3) conduct molecular phylogenetic analyses of the Musa sp. cultivars used in Mandar ceremonies to resolve their taxonomic status. Additionally, longitudinal documentation of intergenerational knowledge transmission among Mandar youth is warranted to inform culturally appropriate conservation and educational interventions.

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