

Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar  
Tribe in South Kalimantan, Indonesia

1. Submission acknowledgment
2. Revisi 1\_ **[biodiv] Editor Decision Tue, Nov 28, 2023 at 7:19 AM; Our decision is: Revisions Required**
3. Input naskah hasil revisi 1 ke OJS; January 1, 2024
4. Revisi 2\_ **[biodiv] Editor Decision, Jan 20, 2024, 6:13 PM; Reviewer A: Recommendation: Revisions Required**
5. Naskah setelah di revisi.
6. Input naskah hasil revisi 2 ke OJS; February 18, 2024.
7. **Revisi 3\_ [biodiv] Editor Decision, Feb 20, 2024, 6:36 AM; Our decision is: Revisions Required.**
8. Naskah setelah di revisi
9. Input naskah hasil revisi 3 ke OJS,
10. Revisi 4\_ [biodiv] Editor Decision, Apr 1, 2024, 4:14 PM
11. Naskah setelah revisi ke 4.
12. Input naskah revisi 4 ke OJS
13. "Uncorrected proof"
14. Accepted
15. Billing



Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;

---

**[biodiv] Submission Acknowledgement**

---

**Ahmad Dwi Setyawan via SMUJO** <support@smujo.com>

Sun, Nov 26, 2023 at 6:46 AM

Reply-To: Ahmad Dwi Setyawan &lt;editors@smujo.id&gt;

To: Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;

Gunawan Gunawan:

Thank you for submitting the manuscript, "Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm) by Banjar Tribe in South Kalimantan, Indonesia " to Biodiversitas Journal of Biological Diversity. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Submission URL: <https://smujo.id/biodiv/authorDashboard/submission/16591>

Username: gunawanulm

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Ahmad Dwi Setyawan

---

[Biodiversitas Journal of Biological Diversity](#)

Caution: This e-mail (including attachments, if any) is sent by system and only intended for the recipients listed above. If you are not the intended recipient, then you are not permitted to use, distribute, distribute, or duplicate this e-mail and all its attachments. Please cooperate to immediately notify Smujo International and delete this e-mail and all attachments. This email was sent due to, your email is listed as participant on Biodiversitas Journal of Biological Diversity.



Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;

---

**[biodiv] Editor Decision**

---

Smujo Editors via SMUJO &lt;support@smujo.com&gt;

Tue, Nov 28, 2023 at 7:19 AM

Reply-To: Smujo Editors &lt;editors@smujo.id&gt;

To: Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;, Magfiroh Magfiroh &lt;magfiroh.net@gmail.com&gt;, Muhamat Muhamat &lt;muhamat@ulm.ac.id&gt;

Gunawan Gunawan, Magfiroh Magfiroh, Muhamat Muhamat:

We have reached a decision regarding your submission to Biodiversitas Journal of Biological Diversity, "Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm) by Banjar Tribe in South Kalimantan, Indonesia ". Complete your revision with a Table of Responses containing your answers to reviewer comments (for multiple comments) or enable Track Changes.

Our decision is: Revisions Required

-----  
Reviewer A:

- This manuscript has a plagiarism percentage of 11%, please revise it first so plagiarism does not exceed 4%. Kindly check the attached file for the detail.
- The introduction is too brief, it should compose about 600-700 words.
- This manuscript has outdated references. It should compose a minimum 80% of scientific journals published in the last 10 years (2013-2023).
- This manuscript has several references in local language. References in Indonesian are only allowed a maximum of 10%.
- Please write all the references based on the author's guidelines, include DOI. Kindly check the author's guidelines here <https://smujo.id/biodiv/guidance-for-author>

e.g.,

**Yuliani S, Yanuwadi B, Leksono AS. 2015. The relationship between habitat altitude, enviromental factors and morphological characteristics of *Pluchea Indica*, *Ageratum conyzoides* and *Elephantopus scaber*. J Biol Sci 15 (3): 143-151. DOI: 10.3844/ojbsci.2015.143.151.**

**Kindly revise your paper accordingly based on the comments.**

Recommendation: Revisions Required

---

Biodiversitas Journal of Biological Diversity

Caution: This e-mail (including attachments, if any) is sent by system and only intended for the recipients listed above. If you are not the intended recipient, then you are not permitted to use, distribute, distribute, or duplicate this e-mail and all its attachments. Please cooperate to immediately notify Smujo International and delete this e-mail and all attachments. This email was sent due to, your email is listed as participant on Biodiversitas Journal of Biological Diversity.



**A-Grammarly check - 16591-Article Text-1101029-1-4-20231125.doc**

2947K

## COVERING LETTER

Dear **Editor-in-Chief**,

I herewith enclosed a research article,

**Title:**

Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm) by Banjar Tribe in South Kalimantan, Indonesia

**Author(s) name:**

GUNAWAN, MUHAMAT, MAGHFIROH

**Address**

(Fill in your institution's name and address, your personal cellular phone and email)

Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Lambung Mangkurat. Jl. A. Yani Km 36.4, Banjarbaru 70714, South Kalimantan, Indonesia. Tel./fax.: +62-511-4773112, ♥email: gunawan@ulm.ac id

**For possibility publication on the journal:**

(fill in *Biodiversitas* or *Nusantara Bioscience* or mention the others)

Biodiversitas

**Novelty:**

(state your claimed novelty of the findings versus current knowledge)

This investigation is might be the first study report on ethnobotany Kasturi on Banjar tribe

**Statements:**

This manuscript has not been published and is not under consideration for publication to any other journal or any other type of publication (including web hosting) either by me or any of my co-authors.

Author(s) has been read and agree to the Ethical Guidelines.

**List of five potential reviewers**

(Fill in names of five potential reviewers **that agree to review your manuscript** and their **email** addresses. He/she should have Scopus ID and come from different institution with the authors; and from at least three different countries)

1. Prof. Dr. Fitmawati, M.Si / fitmawati2008@yahoo.com; fitmawati@lecturer.unri.ac.id / Indonesia
2. Yohanes Purwanto; purwanto.lipi@gmail.com / Indonesia
3. Erizal Mukhtar / erizalmukhtar@sci.unand.ac.id / Indonesia
4. Johan Iskandar / johan.iskandar@unpad.ac.id

**Place and date:**

Banjarbaru, 21<sup>th</sup> November 2023

**Sincerely yours,**

(fill in your name, no need scanned autograph)

Gunawan

# Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm) by Banjar Tribe in South Kalimantan, Indonesia

GUNAWAN<sup>✉</sup>, MUHAMAT, MAGHFIROH

Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Lambung Mangkurat. Jl. A. Yani Km 36.4, Banjarbaru 70714, South Kalimantan, Indonesia. Tel./fax.: +62-511-4773112, <sup>✉</sup>email: gunawan@ulm.ac.id

Manuscript received: DD MM 2016 (Date of abstract/manuscript submission). Revision accepted: ..... 2016. (8 pt)

**Abstract.** Kasturi (*Mangifera casturi* Koesterm.) is a local fruit and has become the identity flora of South Kalimantan. This study aimed to investigate the knowledge of the Banjar tribe community and formulate a conservation strategy for Kasturi as the identity flora of South Kalimantan. Data on ethnobotanical knowledge was collected through interview technique. There were two types of informant: key informants and recommended informants. Key informants were chosen through purposive sampling technique while recommended informants were chosen through snowball sampling and purposive sampling technique. The informants in this study have different background: sex, age, job, marital status, and educational levels. The informants were grouped based on their age: children (5-11 years), 18 teenagers (12-25 years), 13 adults (26-45 years), 9 elder (46-65 years) and old age ( $\geq 65$  years). Data were analyzed using value of of parts of Kasturi plants used (F), Fidelity level (FL). All data collected were analyzed descriptively and presented in tables or diagrams. The Banjar tribe used *M. casturi* as source of food (63%), building material (32%), and drugs (5%). The parts of the Kasturi plant that are widely used by the community are fruit, which is 58%, stems are 37%, and leaves are 5%. The values of F observed from the economic use aspects of Kasturi include; (i) construction materials, (ii) food sources, (iii) economic and (iv) medicine. The result of fidelity level (FL) analysis proves that all age groups had 100% of FL in utilizing fruits of Kasturi as local food source. The FL of Kasturi bark used is described as follows: 25.41% among children, 51.34% among teenagers, 87.32% among adults, 88.33% among elder and 100% among old age. The FL value of leaf described as follows: 5% among old age. Most of the Banjar tribe get Kasturi fruit from plants that grow wild in their yards (42%) and only 6% have planted. Conservation of Kasturi can be performed by 1. intensification of socialization and publication of Kasturi's uses; 2. ex-situ conservation; 3. Network Development and Collaboration for conservation efforts, 3. Environmental education in botanical gardens.

**Key words:** Kasturi, conservation, ethnobotany, endemic, Banjar

**Abbreviations** (if any): All important abbreviations must be defined at their first mention there. Ensure consistency of abbreviations throughout the article.

**Running title:** Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm)

## INTRODUCTION

Indonesia is a tropical country characterized by a high diversity of fruit with numerous benefits. Among several regions in the country, Kalimantan also called Borneo has been identified as one of the 24 other hotspot of flora diversity globally (Marchese 2015). Within this diverse flora, *Mangifera* is an important genus of Anacardiaceae, a plant family producing several commercial fruits globally (Fitmawati et al., 2016). *Mangifera* holds the second rank among tropical fruits renowned for their exceptional taste, color, and diversity, following bananas (Singh, 2016). Globally, this genus comprises around 69 species, with 30 of them being endemic to Indonesia (Anggraheni & Mulyaningih 2021). Based on IUCN data, two Borneo-endemic species, *Mangifera casturi* Kosterm. and *M. rubropetala* Kosterm., have already become extinct in their natural habitats. Additionally, four species are classified as endangered, and eleven are considered vulnerable. Moreover, the abundant variety within the Anacardiaceae family plays an essential role in ecosystem services, significantly contributing to the food supply (Labdelli et al. 2020).

*Mangifera casturi* known as "Kasturi" belonging to Anacardiaceae family is a native and endemic plant from Kalimantan, particularly South Kalimantan (Kostermans 1993). The species went extinct due to the destruction of its native habitat. The decline in the Kasturi mango population is attributed to the felling of various local mango fruit trees, including Kasturi, for use as building materials. This significant reduction in population has led to the scarcity or complete disappearance of the plants. Additionally, forest exploitation in the form of illegal logging and clearing forests for settlements and plantations (oil palm) can damage the ecosystem, including the natural habitat of mango fruit plants.

47 Kasturi has fragrant fruit and a sweet taste characterized by small-sized fruit with colors ranging from yellow-orange to  
48 purple-black. The Decree of the Minister of Indonesia No. 48 issued in 1989 designated Kasturi as the flora identity of  
49 South Kalimantan Province (Darmawan 2015). This is due to the popularity of the fruit, leading to rapid market sales  
50 during fruiting. Kalimantan Island, commonly known as Borneo, is divided into five provinces, including South  
51 Kalimantan Province which majorly consists of the majority of the Banjar tribe. The Meratus Mountains area in South  
52 Kalimantan is home to an indigenous group called Meratus Mountains Dayak or Bukit Dayak tribe. Additionally,  
53 Banjarese people have local knowledge about using plant resources to meet the required needs, such as traditional  
54 medicinal materials. However, the information regarding the knowledge of using Kasturi has not been disclosed.

55 Ethnobotany explores the relationship between humans and plants, providing insights about the traditional local  
56 knowledge of the community regarding plants use. This research supplies valid information on the benefits of plants to the  
57 community such as ecology, economics, and pharmacology. In recent years, ethnobotanical research has significantly  
58 increased in the field of pharmaceuticals and conservation programs globally, influencing biodiversity conservation  
59 (Pieroni et al. 2014), and the discovery of new food sources, health, and culture (Tamalene et al. 2016).

60 Local knowledge of the community requires maintenance as it is highly valuable for preserving biodiversity in Borneo  
61 forests (Yusro et al. 2014). In this context, several strategies have been established regarding biodiversity conservation,  
62 such as the inventory of the utilization, cultivation, and preservation of plants through ethnobotany (Supiani et al. 2019).  
63 Hence, the ethnobotanical study is anticipated to play a role in bolstering cultural sustainability in plant utilization. The  
64 knowledge within local communities also enhances advancements in science and technology (Arsyad 2018), offering  
65 scientific methodologies that can be expanded upon for future sustainable applications (Cao et al. 2020). Accordingly, the  
66 objective of this study was to investigate the knowledge of the Banjar tribe community and formulate a conservation  
67 strategy for Kasturi, which serves as the emblematic flora of Borneo. The results are anticipated to become the basis for  
68 developing and managing Kasturi conservation strategies.  
69

## 70 MATERIALS AND METHODS

### 71 Study area

72 The research was conducted in Desember 2022-Juli 2023 in South Kalimantan yang terdapat suku Banjar (Figure 2).  
73 Kabupaten yang menjadi lokasi penelitian adalah Kabupaten Banjar (BN), Tapin (TP), Hulu Sungai Selatan (HS), Hulu  
74 Sungai Tengah (HT), Balangan (BL), and Tabalong. The geographic scope of this study includes the area of approximately  
75 1021'49" LS - 1010'14" LS and 114019'33" BT - 116033'28".  
76

### 77 Data collection and analysis

78 This study was carried out using a qualitative method with an ethnobotanical approach. Qualitative data were obtained  
79 using open-ended, semi-structured, and structured interviews by visiting the homes of key informants, who were selected  
80 using the purposive sampling method (Yamini et al. 2023). Additional informants were selected using a combination of  
81 purposive and snowball sampling methods based on certain criteria (Yamini et al. 2023). The criteria focused on the  
82 knowledge and use of Kasturi within the Banjar tribe. The data obtained from informants consisted of ethnobotany and  
83 characteristics such as sex, age, formal education level, and occupation (Susiarti et al. 2020).

84 A total of 210 informants were included for analysis, comprising 35 persons from each district, who had different  
85 backgrounds such as sex, age, job, marital status, and educational levels. Participants were categorized by age, including  
86 children (5-11 years), 18 teenagers (12-25 years), 13 adults (26-45 years), 9 elders (46-65 years), and the elderly ( $\geq$  65  
87 years), as indicated in Table 1 (Tamalene et al. 2016). Ethnobotanical information encompassed the identification, habitat  
88 characteristics, techniques for obtaining Kasturi, cultivation methods, and its various uses (Desti et al. 2019). The gathered  
89 data underwent descriptive analysis and was presented through tables or diagrams (Tallet et al. 2019). Descriptive  
90 statistical analysis was also used to describe/analyze parts of the Kasturi plant, which were often used for economic,  
91 ecological, medical, and cultural aspects (Tamalene et al. 2016).

92 The frequency of Kasturi plant parts usage was assessed by gauging informant responses using the following formula:

$$93 F = (S/N) * 100;$$

94 Where S represents the count of informants with positive responses regarding plant parts used, and N stands for the  
95 total number of informants. The formula elucidated by Monteiro et al. (2006) was employed to assess the level of  
96 consensus among the informants regarding the plant parts utilized.

97 The fidelity level (FL), employed to understand the specific purposes of using particular plant parts, was computed  
98 using the formula recommended by Friedman et al. (1986):

$$99 FL (\%) = (n/N) * 100$$

100 Where n denotes the number of informants for a specific use, and N represents the total number of informants.  
101  
102  
103

104  
105  
106  
107  
108  
109  
110  
111  
112  
113  
114  
115  
116  
117  
118  
119  
120  
121  
122  
123  
124  
125  
126  
127  
128  
129  
130  
131  
132  
133  
134  
135  
136  
137  
138  
139  
140  
141  
142  
143  
144  
145  
146  
147  
148  
149  
150  
151  
152  
153  
154  
155  
156  
157  
158  
159  
160  
161  
162  
163  
164  
165  
166  
167  
168



Figure 1. Tree and fruit of *Mangifera casturi*

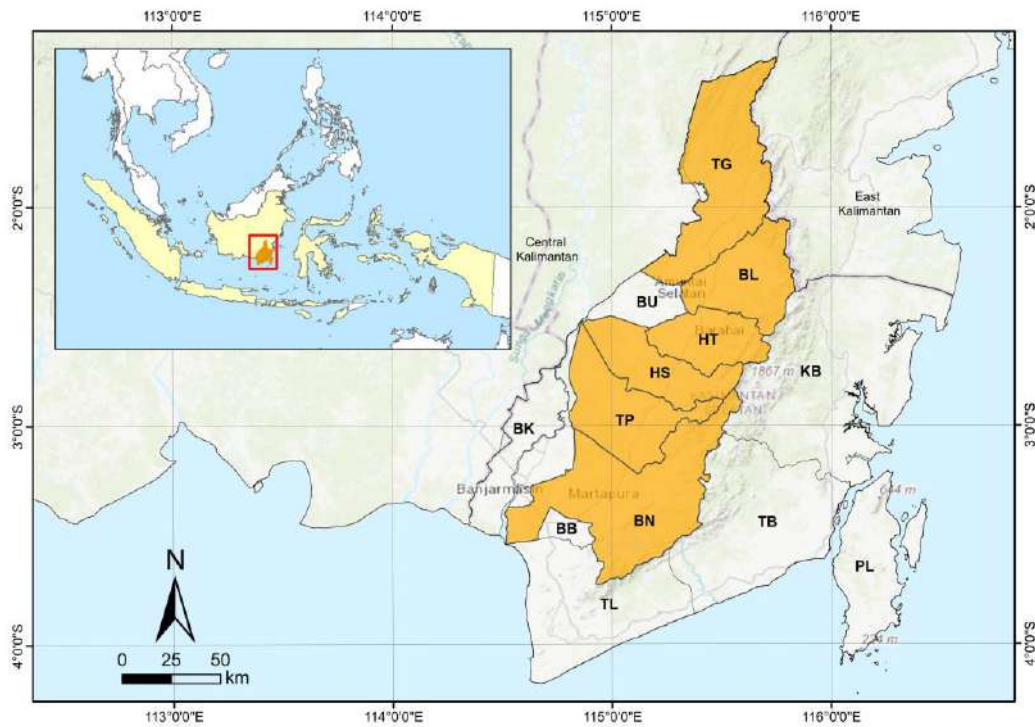


Figure 2. Location of study in South Kalimantan. BN: Banjar; TP: Tapin; HS: Hulu Sungai Selatan; HT: Hulu Sungai Tengah; BL: Balangan; TG: Tabalong



169 Table 1. Characteristic of respondent  
170

Characteristics	Data	Total	Percentage (%)
Sex	Male	77	37
	Female	135	64
Age	12-25	35	17
	26-45	65	31
	46-65	62	30
	> 65	48	23
Formal education	No educations	20	10
	Elementary school	48	23
	Secondary school	60	29
	High school	76	36
	University	6	3
Marital status	Single	27	13
	Maried	167	80
	Widowed	16	8
Occupation	Farmer	75	36
	Trader	25	12
	Laborer	46	22
	Employee	15	7
	Housewife	29	14
	Unemployed	20	10

171  
172

173

## RESULTS AND DISCUSSION

### 174 Socio-demographic characteristics

175 A total of 210 person were obtained as informants in this study, with details of 135 men and 77 women. The  
176 educational background consists of elementary school to college education, but most informants graduate from high  
177 school. The age range is 26 - >55 years, with the most being 36-45 years old and married.

### 178 Morphology

179 The bark of Kasturi plants has a grayish-white to light brown color, occasionally consisting of small cracks or gaps of  $\pm$   
180 1 cm in the form of dead bark, which is similar to *Mangifera indica*. These plants can reach a height of 25-50 m or even  
181 more, with a stem diameter of  $\pm$ 40-115 cm, without buttress roots. When injured, the bark emits sap which is initially  
182 clear, reddish, and black within a few hours. The sap contains turpentine and has a sharp smell, capable of injuring the skin  
183 or causing irritation, particularly for sensitivity. The leaves are singular, glabrous, arranged in a spiral or tight spiral, long-  
184 stemmed, elongated lanceolate with a pointed tip. Both sides of the central leaves vein are characterized by 12-25 sides,  
185 without support, while the young leaves hang limp and are dark purple.

186 Kasturi flowers are bisexual compounds, forming coralline flowers in panicles with numerous, actinomorphic, and  
187 often covered in dense hairs. The length of the flower stalk is  $\pm$  28 cm with a very short stalk of 2-4 mm, sitting on panicle  
188 branches, while the leaves are elongated ovate and 2-3 mm long. The crown leaves are elongated and the flowers smell  
189 sweet. The stamens are the same length as the corolla, and the staminodia are very short, resembling stamens stuck to the  
190 base of the flower (Rashedy 2014). Kasturi mango fruit is round to elliptical, weighing 60-84 g, 4.5-5.5 cm long, and 3.5-  
191 3.9 cm wide. Furthermore, the flesh is yellow or orange, stringy, and the texture is slightly rough, the fruit tastes sweet,  
192 slightly sour, and has a distinctive aroma. The skin of the fruit when it is young is green, and turns blackish brown at an  
193 older age, with a smooth surface. The fruit is oval with a length/width ratio of 1.25-1.53. The thickness of the fruit skin is  
194 around 0.24 mm and the seeds are classified as stone seeds with thick walls. A single seed, occasionally with multiple  
195 embryos, is enveloped in a hardened, skin-like endocarp shell. This mango bears fruit at the beginning of the rainy season  
196 or around January.

197

### 198 Habitat

199 The growing environment for musk mango plants comes from people's yards, fields and forests. From the results of a  
200 survey conducted on several owners of musk mango trees, it is known that the majority of these fruit plants were left over  
201 from the owners' parents, many of which grow wild (without cultivation technology), are up to 50 years old, and there has  
202 been no effort from the owners to carry out rejuvenation or seeding. Profile habitat of *M. casturi* is at an altitude (35-109

203 masl), air temperature (27,9 – 33,1 °C), humidity (64,3 - 86,9 %), light intensity (19.442 – 96.938 lux), soil temperature  
204 (27,1 - 32,8 °C), soil moisture (40,6 – 77,2 %), and soil pH (5,4 – 6,8) (Gunawan et al. 2022).  
205

### 206 Local knowledge of *Mangifera casturi*

207 Mangoes have become an integral part of Indonesian life, offering economic, ecological, health, and cultural benefits.  
208 The Javanese people have also been acquainted with mangoes for more than 10 centuries, as written in the Old Javanese  
209 Ramayana (Mulyanto et al. 2023). Similarly, the Banjar tribe in South Kalimantan has been using plants, including  
210 mangoes, during the time of their ancestors.

211 In this study, the values of F observed from the economic use aspects of Kasturi included (i) construction materials, (ii)  
212 food sources, (iii) economics, and (iv) medicine. Knowledge values of Kasturi as construction materials were found in  
213 12.78% of teenagers, 80,12% of adults, as well as 100% of elderly and old age, with all groups using plants as food  
214 sources (100%). Furthermore, knowledge of the economic values of Kasturi as fruit that sells in the market was found in  
215 16.68% of children, 85.13% of teenagers, 100% of adults, elders, and old age. As medicine in Banjarese ethnic group, a  
216 proportion of 5% was observed in the old age, indicating significant health benefits, particularly as high uric acid.

217 The result of fidelity level (FL) analysis showed that all age groups had 100% FL in using fruits of Kasturi as a local  
218 food source. The FL of Kasturi bark used was described as follows, 25.41%, 51.34%, 87.32%, 88.33%, and 100% among  
219 children, teenagers, adults, elderly, and old age, respectively. Furthermore, the FL value of leaves had a proportion of 5%  
220 among old age.

221 Based on the results, the parts of the Kasturi plant that are widely used by the community include 58% fruit, 37%  
222 stems, and 5% leaves. The morphology characteristics show that the fruit flesh is dark orange, has a sweet and delicious  
223 taste. Moreover, the exceptional properties of the plant are evident in the fragrant fruit aroma, leading to the high  
224 preference by the majority population in South Kalimantan. Local people consume Kasturi fruit fresh and as a complement  
225 to fruit iced drinks. During the fruit season, namely November-January, the plant bears abundant fruit, with bunch prices  
226 ranging from Rp. 20,000 to Rp. 25,000. Although the fruit flesh has a high water content (87.2%), acid levels (4.7%), and  
227 carbohydrates (12%) several other chemical components are low, such as protein (0.3%), fat (0.04%), starch (1.4%), total  
228 sugar (2% ), and calories (9.6 cal/100g) (Darmawan 2015). Kasturi fruit also contains useful phytochemicals as a source of  
229 medicine, namely saponins, tannins, triterpenoids, flavonoids, polyphenols, and phenolics (Darmawan 2015).

230 Harvesting Kasturi fruit when ripe is crucial for maintaining aroma and color quality. When harvested prematurely, the  
231 thick and hard skin of the fruit cannot be stored for more than 6 days, experiencing weight loss from 5 to 17%.  
232 Furthermore, a decrease in texture is observed during storage, leading to a wrinkled appearance. Another part used by the  
233 community is the stem (wood), serving as building material and containers. According to informants, the wood quality is  
234 not excellent for building materials due to its softness, leading to rapid decay. The Banjar tribe also uses the leaves as  
235 medicine for treating gout, although only 5% of informants were identified in an ethnobotany survey. Research conducted  
236 by Dewangga et al. 2014 stated that young mango leaves from *Mangifera foetida* L. contained acetic acid, which is  
237 essential in reducing uric acid.

238

239

240

241

242

243

244

245

246

247

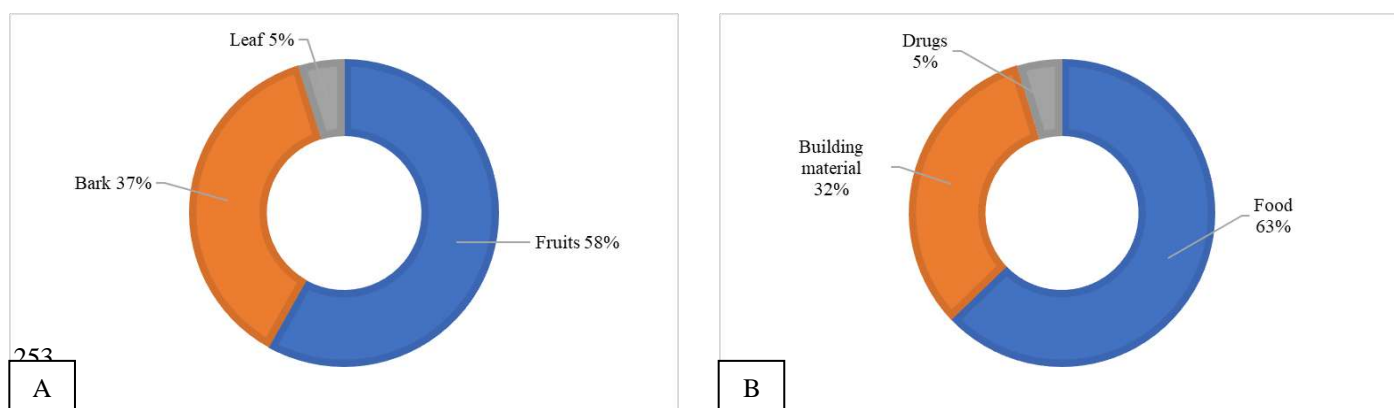
248

249

250

251

252



256 **Figure 3.** A. Percentage part used of Kasturi. B. Percentage useful of Kasturi by Banjar tribe

257

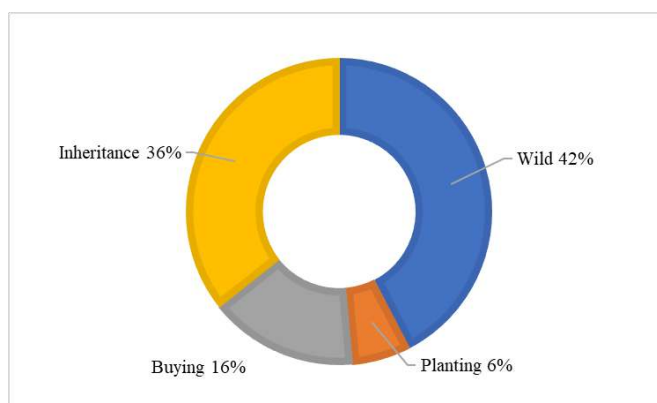
258 Every component of a mango tree, including flowers, leaves, bark, fruit, peel, pulp, and seeds, possesses vital nutrients  
259 that can be utilized. Moreover, mango peel comprises minerals, fiber, and antioxidants (such as phenolic compounds like  
260 mangiferin, kaempferol, quercetin, and anthocyanins), while the mango seed kernel contains starch, fiber, lipids, sterols  
261 (like campesterol, stigmasterol, and  $\beta$ -sitosterol), and tocopherols (Juhnul et al. 2015). *Mangifera* has been extensively  
262 employed in traditional medicine for the treatment of conditions such as diabetes, diarrhea, dysentery, rheumatism, high

263 blood pressure, and various skin diseases (Parvez, 2016). Table 2 shows that Kasturi is not only useful as a source of food  
 264 and materials, but its parts have the potential to be used as medicine.  
 265  
 266

**Table 2.** Content and potential of *Mangifera casturi* part

Part	Content	Potency
Skin	saponins, flavonoids, tannins, and steroids (Mutia and Wati 2018), distearil phosphite, Trans-13-octadecenoic acid, Heptadecane (Zulfina et al., 2021)	Anti-infectives, such as antiseptics, antibiotics, chemotherapy, contraception, antiasthmatic, bronchodilator, and medicine for bladder system illness (Zulfina et al., 2021).
Fruit	methyl gallate (sutomo et al. 2017), alpha hydroxy acid (Zulfina et al. 2021).	Antioxidants, Speed up the exfoliation of dead skin cells to promote soft and blemish-free skin
Leaf	terpenoid and polifenol (Darmawan 2015); alkaloid, terpenoid, flavonoid, saponin (Rahim et al. 2017), acetic acid (Dewangga et. al. 2014),	Antioxidants and tannins exhibit antibacterial, antiviral, and antitumor activities, antioxidants (Sutomo et al. 2017)
Bark	terpenoid, steroid, and saponin (Rahim et al. 2017)	Antioxidants (Ramadhan et al., 2021),
Root	Saponin and tanin (Darmawan 2015)	Hypercholesterolemia, antioxidants, hyperglycemia, anticancer, antifungal, and anti-inflammatory properties

267  
 268  
 269 Intensive cultivation of Kasturi has not been carried out by the Banjar tribe, with small population planting the  
 270 seeds in the gardens. *Mangifera casturi* and species such as *M. caesia* ('Binjai'), *M. foetida* ('Hambawang'), and *M.*  
 271 *odorata* ('Kueni') ('Kasturi') have been cultivated by local farmers. In contrast, others are wild in the forest to obtain the  
 272 stems and fruit (Ariffin et al. 2015). Based on the survey conducted, the Banjar tribe obtained Kasturi fruit by planting,  
 273 growing wild, inheritance, and buying at traditional markets, as shown in Figure 4. The majority of informants obtained  
 274 the fruit from plants growing wild in the gardens, while the trees were acquired from parents to children. The existence of  
 275 the Kasturi was attributed to fruit-bearing capacity, with most informants selling fruits to collectors. Specifically, buyers  
 276 would climb the trees, and harvest the fruits, which are transported to the local market.  
 277



**Figure 4.** Way to get *Mangifera casturi* by Banjar tribe

298 **Conservation strategies of Kasturi**

299 local cultivation efforts. Based on the survey conducted on several owners of musk mango trees, it was discovered that  
 300 the majority of these fruit were left over from parents and have been growing wild without cultivation technology for  
 301 approximately 50 years. However, there has been no effort from the owners to carry out rejuvenation or seeding. The  
 302 cultivation is only carried out by plant collectors, causing a decline in the musk mango and affecting both individual  
 303 counts and genetic diversity. According to informants, the lack of cultivating musk mangoes is attributed to the long  
 304 fruiting period and thin flesh. Kiloes et al. (2014) expressed that the Kasturi was capable of developing into regional fruit,  
 305 indicating factors such as small flesh relative to large seed size, a lengthy plant maturation age, and a short harvest period.

306 Kasturi has been assigned a classification in the IUCN Red List Categories. The assessment team from the World  
307 Conservation Monitoring Center decided that Kasturi was in the extinct in situ or Extinct in the Wild (EW) category.  
308 Endemic fruit plants that are wild or have not been cultivated are often threatened by various human activities such as the  
309 expansion of agricultural land, fires, conversion to plantations, and selective harvesting (Suwardi et al. 2020). In the case  
310 of Indonesia, mainly in the Kalimantan region, the depletion of forests can be attributed to the conversion of land for  
311 agricultural purposes (Busch & Ferretti-Gallon 2017), such as oil palm plantations, and mining. Restoration should be  
312 performed for the recuperation of forest ecosystems (Sofiah et al. 2018). According to Yang et al. (2013) habitat  
313 degradation, fragmentation, over-exploitation, and an increasing human population, are crucial factors responsible for  
314 species loss globally.

315 Conservation strategies are essential to protect species from extinction. Several efforts that can be made to protect the  
316 Kasturi from extinction include intensification of socialization and publication of Kasturi's uses, ex-situ conservation,  
317 network development, and collaboration, as well as environmental education in botanical gardens. These conservation  
318 efforts require collaboration from various parties, including academics, government companies, private companies, related  
319 agencies, local governments. The success of conservation really depends on the role of each of these parties. Furthermore,  
320 conservation efforts should be sustained over time, ensuring the continuous preservation of Kasturi as the identity flora of  
321 South Kalimantan.

322 This study has presented insights into the ethnobotanical knowledge of the Banjar tribe concerning the utilization of  
323 Kasturi. The findings contribute to advancements in science and technology, shedding light on the potential of tropical  
324 plants in Borneo, Indonesia. Furthermore, these results serve as a foundation for sustainable conservation efforts, aiming to  
325 empower the local community.  
326

## 327 ACKNOWLEDGEMENTS

328 The authors would like to express high appreciation and gratitude to the Rector of Lambung Mangkurat University for  
329 support in this research by *Program Dosen Wajib Meneliti*. We also pay thanks to all parties involved in this present study.

## 330 REFERENCES

- 331 Anggraheni YGD, Mulyaningsih ES. 2021. Diversity assessment of mango (*Mangifera* spp.) plant collection of Cibinong Germplasm Garden based on  
332 leaves morphology and RAPD markers. IOP Conference Series: Earth and Environmental Science. 715(1):012045. DOI:10.1088/1755-  
333 1315/715/1/012045.
- 334 Busch J, Ferretti-Gallon K. 2017. What drives deforestation and what stops it? A meta-analysis. Rev Environ Econ Policy 11(1):3-23.  
335 DOI:10.1093/reep/rew013
- 336 Cao Y, Li R, Zhou S, Song L, Quan R, Hu H. 2020. Ethnobotanical study on wild edible plants used by three trans-boundary ethnic groups in Jiangcheng  
337 County, Pu'er, Southwest China. J Ethnobiol Ethnomed 16: 66. DOI: 10.1186/s13002-020-00420-1.
- 338 Cahyaningsih AP, Arifiani KN, Aprilia D, Nugroho ME, Setyawan AD. 2022. Ethnobotanical study of the non-medicinal plant by village communities  
339 in the karst area of Pacitan, East Java, Indonesia. Int J Trop Drylands. 6 (1): 1-10 DOI: 10.13057/tropdrylands/t060101.
- 340 Darmawan, A. R. B. 2015. Usaha Peningkatan Kualitas Mangga Kasturi (*Mangifera casturi*) dengan Modifikasi Budidaya Tanaman. *PROS SEM NAS*  
341 *MASY BIODIV INDON*, 1(4), 894–899.
- 342 Desti, Isda MN, Fitmawati, Yulis PAR. 2019. Local wisdom of Ria u mascot flora (Onchosperma tigillarum (Jack) Ridl.) in Baganbatu,  
343 Bengkalis District Riau Indonesia. Advances in Engineering Research 190: 92-95. DOI:10.2991/iccelst-st-19.2019.18
- 344 Fitmawati, Hayati, I., & Sofiyanti, N. 2016. Using ITS as a Molecular Marker for *Mangifera* Species Identification in Central Sumatra. *Biodiversitas*,  
345 17(2), 653–656. DOI: 10.13057/biodiv/d170238
- 346 Friedman J, Yaniv Z, Dafni A, Palewitch D. 1986. A preliminary classification of the healing potential of medicinal plants, based on  
347 arational analysis of an ethno pharmacological field survey among Bedouins in the Negev Desert, Israel. J Ethnopharmacol 116:275-87.  
348 DOI: 10.1016/0378-8741(86)90094-2.
- 349 Gunawan, Muhamat, Fadhila S, Olivia AF. 2022. Habitat characteristics of *Mangifera casturi* kosterm. In banjar district of south Kalimantan, Indonesia.  
350 *RJOAS*, 10(130): 83-90. DOI 10.18551/rjoas.2022-10.10
- 351 Jahurul MHA, Zaidul ISM, Ghafoor K, Al-Juhaimi FY, Nyam KL, Norulaini NAN, Sahena F, Omar MAK. 2015. Mango (*Mangifera indica* L.) by-  
352 products and their valuable components: A review. Food Chemistry 183: 173–180. DOI: 10.1016/j.foodchem.2015.03.046
- 353 Kiloes AM, Yanuar, Yassin M. 2015. Kasturi: dari hutan ke pasar modern. Jakarta (ID): IAARD Press
- 354 Kostermans AJGH & Bompard JM. 1993. The Mangoes: Teir Botany, Nomenclature, Horticulture, and Utilization (Academic Press).
- 355 Labdelli A, De La Herrán R, Arafeh R, Resentini F, Trainotti L, Halis Y, Adda A, Merah O. 2020. Genetic variation in damaged populations of *Pistacia*  
356 *atlantica* Desf. Plants. 9: 1541-1552. DOI: 10.3390/plants9111541
- 357 Marchese C. 2015. Biodiversity hotspots: A shortcut for a more complicated concept. Glob Ecol Conserv 3:297-309. DOI: 10.1016/j.gecco.2014.12.008.
- 358 Monteiro JM, Albuquerque UP, LinsNeto EMF, Araújo EL, Amorim ELC. 2006. Use patterns and knowledge of medicinal species among two rural  
359 communities in Brazil's Semi-Arid Northeastern Region. J Ethnopharmacol 105:173-86. DOI: 10.1016/j.jep.2005.10.016
- 360 Mulyanto D, Supangkat B, Nurseto HE, Iskandar J. 2023. Ethnobotanical identification of mango (*Mangifera indica* L.) and other fruit trees mentioned in  
361 Old Javanese Ramayana (10th century Java, Indonesia). Biodiversitas 24(1): 609-916. DOI: 10.13057/biodiv/d240169
- 362 Parves GM. 2016. Pharmacological Activities of Mango (*Mangifera indica*): A Review. Journal of Pharmacognosy and Phytochemistry JPP. 1(53): 1–7.  
363 DOI: 10.22271/phyto.
- 364 Pieroni A, Anely N, Avni H, Mustafa B, Bruno S, Kevin C, Cassandra LQ. 2014. Local knowledge on plant and domestic remedies in the mountain  
365 village of Peshkopia (Eastern Albania). J Mt Sci 11 (1): 180-194. DOI: 10.1007/s11629-013-2651-3.

366 Rahim MA, Suartha IN, Sudimartini LM. 2017. Immunostimulatory effect of leaf extract kasturi (*mangifera casturi*) in mice. Indonesia Medicus  
367 Veterinus. 6(1): 10-19. DOI: 10.19087/imv.2017.6.1.10  
368 Ramadhan H, Rezky DP, Susiani EF. 2021. Penetapan Kandungan Total Fenolik-Flavonoid pada Fraksi Etil Asetat Kulit Batang Kasturi (*Mangifera*  
369 *casturi* Kosterman). *Farmasi Dan Ilmu Kefarmasian Indonesia* 8(1): 58–67. DOI : 10.20473/jfiki.v8i12021.58-67.  
370 Rashedy, A. A., El Ksheshin, M. A., & Abd. Allatif, A. M. (2014). Histological Parameters Related to Dwarfism in Some Mango Cultivars. *World J Agric*  
371 *Sci*, 10, 216–222. DOI: 10.5829/idosi.wjas.2014.10.5.1826.  
372 Sutomo , Arnida, Yunus R. Wahyuono S. , Setywati EP, Riyanto S. 2017. Isolation And Identification Of Active Compound Of Ethylacetate Fraction  
373 Of Kasturi (*Mangifera casturi* Konsterm.) Fruit From South Kalimantan Indonesia. *Res. J. Pharm. Biol. Chem. Sci.* 8(1S): 251. DOI:  
374 10.33887/rjpbcs.  
375 Suwardi AB, Navia ZI, Harmawan T, Syamsuardi, Mukhtar E. 2020. Wild edible fruits generate substantial income for local people of the Gunung  
376 Leuser National Park, Aceh Tamiang region. *Ethnobot Res Appl* 20: 1-13. DOI: 10.32859/era.20.11.1-13  
377 Singh, N. K. (2016). Origin, Diversity and Genome Sequence of Mango (*Mangifera indica* L.). *Indian Journal of History of Science*, 51(2.2), 355–368.  
378 DOI:10.16943/ijhs/2016/v51i2.2/48449  
379 Sofiah S , Metusala D, Trimanto, Nurfadilah S. 2018. Flora Diversity, Composition And Ecology In Besiq Bermai Tropical Forest of Damai District, East  
380 Kalimantan. *Biotropia*. 25 (2): 85 – 94. DOI: 10.11598/btb.2018.25.2.724  
381 Supiandi MI, Mahanal S, Zubaidah S, Julung H, Ege B. 2019. Ethnobotany of traditional medicinal plants used by Dayak Desa Community in Sintang,  
382 West Kalimantan, Indonesia. *Biodiversitas*. 20 (5): 1264-1270. DOI: 10.13057/biodiv/d200516  
383 Susiarti S, Rahayu M, Kuncari ES, Astuti IP. 2020. Utilization of “Benda” (*Arthocarpus elasticus* Reinw. Ex Blume) in Bogor, West Java,  
384 Indonesia: An Ethnobotanical Case Study). *Journal of Tropical biology and Conservation* 17: 297 - 307. DOI: 10.51200/jtbc.v17i.2670.  
385 Tallei TE, Pelealu JJ, Pollo HN, Pollo GAV, Adam AA, Effendi Y, Karuniawan A, Rahimah, Idroes R. 2019. Ethnobotanical dataset of local  
386 edible fruits in North Sulawesi, Indonesia. *Journal of Data in Brief* 27: 1- 12. DOI: 10.1016/j.dib.2019.104681.  
387 Tamalene MN, Muhdhar MHIA, Suarsini E, Rahman E, Hasan S. 2016. Ethnobotany of Canariumplant species used byTobeloDalam(Togutil)ethnic  
388 community of Halmahera Island, Indonesia. *Biodiversitas* 17(1): 61-69. DOI: 10.13057/biodiv/d170109  
389 Yamini THA, Djuita NR, Chikmawati T, Purwanto Y. 2023. Ethnobotany of wild and semi-wild edible plants of the Madurese Tribe in Sampang and  
390 Pamekasan Districts, Indonesia. *Biodiversitas* 24: 947-957. DOI:10.13057/biodiv/d240234.  
391 Yang XQ, Kushwaha SPS, Saran S, Xu J, Roy PS. 2013. Maxent modeling for predicting the potential distribution of medicinal plant *Justicia adhatoda* L:  
392 in Lesser Himalayan foothills. *Ecol Eng* 51:83- 87. DOI: 10.1016/j.ecoleng.2012.12.004.  
393 Yusro, Fathul, Yeni M, Farah D, Kazuhiro. 2014. Inventory of medicinal plants for fever used by four Dayak Sub Ethnic in West Kalimantan, Indonesia.  
394 *Kuroshio Sci* 8 (1): 33-38.  
395 Zulfina S , Fathoni MAN, Poerwanto R,Matra DD. 2021. Characterization of secondary metabolites in kasturi mango (*Mangifera casturi*) using gas  
396 chromatography-mass spectrometry. *IOP Conf. Ser.: Earth Environ. Sci.* 948 012059. DOI:10.1088/1755-1315/948/1/012059 4  
397  
398  
399  
400

401  
402  
403  
404  
405

## SUBMISSION CHECKLIST

Ensure that the following items are present:

The first corresponding author must be accompanied with contact details:

**Give mark (X)**

<ul style="list-style-type: none"><li>E-mail address</li></ul>	X
<ul style="list-style-type: none"><li>Full postal address (incl street name and number (location), city, postal code, state/province, country)</li></ul>	X
<ul style="list-style-type: none"><li>Phone and facsimile numbers (incl country phone code)</li></ul>	X

All necessary files have been uploaded, and contain:

<ul style="list-style-type: none"><li>Keywords</li></ul>	X
<ul style="list-style-type: none"><li>Running titles</li></ul>	X
<ul style="list-style-type: none"><li>All figure captions</li></ul>	X
<ul style="list-style-type: none"><li>All tables (incl title and note/description)</li></ul>	X

Further considerations

<ul style="list-style-type: none"><li>Manuscript has been "spell &amp; grammar-checked" Better, if it is revised by a professional science editor or a native English speaker</li></ul>	X
<ul style="list-style-type: none"><li>References are in the correct format for this journal</li></ul>	X
<ul style="list-style-type: none"><li>All references mentioned in the Reference list are cited in the text, and vice versa</li></ul>	X
<ul style="list-style-type: none"><li>Colored figures are only used if the information in the text may be losing without those images</li></ul>	X
<ul style="list-style-type: none"><li>Charts (graphs and diagrams) are drawn in black and white images; use shading to differentiate</li></ul>	X

406  
407

16591 / GUNAWAN et al. / Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan

Library

Submissions

Workflow

Publication

Submission

Review

Copyediting

Production

Round 1

Round 2

Round 3

Round 4

Round 5

Round 6

Round 1 Status

New reviews have been submitted and are being considered by the editor.

Notifications

[biodiv] Editor Decision

2023-11-27 11:19 PM

[biodiv] Editor Decision

2024-04-01 08:14 AM

[biodiv] Editor Decision

2024-04-14 02:45 AM

 1101196-1 , Grammarly check - 16591-Article Text-1101029-1-4-20231125.doc November 27, 2023

**Revisions**

[Search](#)

[Upload File](#)

  1104601-1 [Article Text, 16591-1101196-1-5-20231127\\_rev 1.doc](#) January 1, 2024 Article Text

**Review Discussions**

[Add discussion](#)

Name	From	Last Reply	Replies	Closed
<a href="#">Uncorrected proof</a>	atriyanto1 2024-04-08 06:11 AM	gunawanulm 2024-04-08 07:03 AM	1	<input type="checkbox"/>
<a href="#">BILLING</a>	dewinurpratiwi 2024-04-08 06:32 AM	dewinurpratiwi 2024-04-22 07:10 AM	3	<input type="checkbox"/>



Platform &  
workflow by  
OJS / PKP



Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;

---

**[biodiv] Editor Decision**

---

**Smujo Editors via SMUJO** <support@smujo.com>

Sat, Jan 20, 2024 at 6:13 PM

Reply-To: Smujo Editors &lt;editors@smujo.id&gt;

To: Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;, Magfiroh Magfiroh &lt;magfiroh.net@gmail.com&gt;, Muhamat Muhamat &lt;muhamat@ulm.ac.id&gt;

Gunawan Gunawan, Magfiroh Magfiroh, Muhamat Muhamat:

We have reached a decision regarding your submission to Biodiversitas Journal of Biological Diversity, "Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm) by Banjar Tribe in South Kalimantan, Indonesia". Complete your revision with a Table of Responses containing your answers to reviewer comments (for multiple comments) or enable Track Changes.

Our decision is: Revisions Required

-----  
Reviewer A:Recommendation: Revisions Required  
-----

---

[Biodiversitas Journal of Biological Diversity](#)

Caution: This e-mail (including attachments, if any) is sent by system and only intended for the recipients listed above. If you are not the intended recipient, then you are not permitted to use, distribute, distribute, or duplicate this e-mail and all its attachments. Please cooperate to immediately notify Smujo International and delete this e-mail and all attachments. This email was sent due to, your email is listed as participant on Biodiversitas Journal of Biological Diversity.



---

**A-16591-Article Text-1105480-1-4-20240108-review.doc**

2877K

# Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan, Indonesia

**Abstract.** Kasturi (*Mangifera casturi* Koesterm.) is a local fruit and has become the identity flora of South Kalimantan. This study aimed to investigate the knowledge of the Banjar tribe community and formulate a conservation strategy for Kasturi as the identity flora of South Kalimantan. Data on ethnobotanical knowledge was collected through interview technique. There were two types of informant: key informants and recommended informants. Key informants were chosen through purposive sampling technique while recommended informants were chosen through snowball sampling and purposive sampling technique. The informants in this study have different background: sex, age, job, marital status, and educational levels. The informants were grouped based on their age: children (5-11 years), 18 teenagers (12-25 years), 13 adults (26-45 years), 9 elder (46-65 years) and old age ( $\geq 65$  years). Data were analyzed using the formula of Kasturi plant parts usage ( $F$ ), Fidelity level ( $FL$ ). All data collected were analyzed descriptively and presented in tables or diagrams. The Banjar tribe used *M. casturi* as source of food (63%), building material (32%), and drugs (5%). The parts of the Kasturi plant that are widely used by the community are fruit, which is 58%, stems are 37%, and leaves are 5%. The values of  $F$  (the frequency of parts of Kasturi used) observed from the economic use and health aspects of Kasturi include: (i) construction materials, (ii) food sources, (iii) economic and (iv) medicine. The value of  $F$  for economic use are 12.78% - 100% and the value  $F$  for health aspect are 5%. The result of fidelity level ( $FL$ ) analysis proves that all age groups had 100% of  $FL$  in utilizing fruits of Kasturi as local food source. The  $FL$  of Kasturi bark used is described as follows: 25.41% among children, 51.34% among teenagers, 87.32% among adults, 88.33% among elder and 100% among old age. The  $FL$  value of leaf described as follows: 5% among old age. Most of the Banjar tribe get Kasturi fruit from plants that grow wild in their yards (42%) and only 6% have planted. The research indicated that *M. casturi* had high utility value for Banjar tribe. All parts of the plant (fruit, stems, and leaves) were exploited for economic and health. Conservation of Kasturi can be performed by 1. intensification of socialization and publication of Kasturi's uses; 2. ex-situ conservation; 3. Network Development and Collaboration for conservation efforts, 3. Environmental education in botanical gardens. The result of the study can be used for management conservation of *M. casturi* to ensure the availability in the future.

**Keywords:** Banjar, conservation, endemic, ethnobotany, Kasturi

**Running title:** Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.)

## INTRODUCTION

Indonesia is a tropical country characterized by a high diversity of fruit with numerous benefits. Among several regions in the country, Kalimantan also called Borneo has been identified as one of the 24 other hotspot of flora diversity globally (Marchese 2015). Within this diverse flora, *Mangifera* is an important genus of *Anacardiaceae*, a plant family producing several commercial fruits globally (Fitmawati et al., 2016). *Mangifera* holds the second rank among tropical fruits renowned for their exceptional taste, color, and diversity, following bananas (Singh, 2016). Globally, this genus comprises around 69 species, with 30 of them being endemic to Indonesia (Anggraheni & Mulyaningsih 2021). Based on IUCN data, two Borneo-endemic species, *Mangifera casturi* Kosterm. and *M. rubropetala* Kosterm., have already become extinct in their natural habitats. Additionally, four species are classified as endangered, and eleven are considered vulnerable. Moreover, the abundant variety within the *Anacardiaceae* family plays an essential role in ecosystem services, significantly contributing to the food supply (Labdelli et al. 2020).

*Mangifera casturi* known as "Kasturi" is a native and endemic plant from Kalimantan, particularly South Kalimantan (Kostermans 1993). The species went extinct due to the destruction of its native habitat. The decline in the Kasturi mango

Formatted: Not Highlight

Formatted: Not Highlight

47 population is attributed to the felling of various local mango fruit trees, including Kasturi, for use as building materials.  
48 This significant reduction in population has led to the scarcity or complete disappearance of the plants. Additionally, forest  
49 exploitation in the form of illegal logging and clearing forests for settlements and plantations (oil palm) can damage the  
50 ecosystem, including the natural habitat of mango fruit plants.

51 Kasturi has fragrant fruit and a sweet taste characterized by small-sized fruit with colors ranging from yellow-orange to  
52 purple-black. The Decree of the Minister of Indonesia No. 48 issued in 1989 designated Kasturi as the flora identity of  
53 South Kalimantan Province (Darmawan 2015). This is due to the popularity of the fruit, leading to rapid market sales  
54 during fruiting season. Kalimantan Island, is divided into five provinces, including South Kalimantan Province which  
55 majorly consists of the majority of the Banjar tribe. The Meratus Mountains area in South Kalimantan is home to an  
56 indigenous group called Meratus Mountains Dayak or Bukit Dayak tribe. Additionally, Banjarese people have local  
57 knowledge about using plant resources to meet the required needs, such as traditional medicinal materials. However, the  
58 information regarding the knowledge of using Kasturi has not been disclosed.

59 Ethnobotany explores the relationship between humans and plants, providing insights about the traditional local  
60 knowledge of the community regarding plants use. This research supplies valid information on the benefits of plants to the  
61 community such as ecology, economics, and pharmacology. In recent years, ethnobotanical research has significantly  
62 increased in the field of pharmaceuticals and conservation programs globally, influencing biodiversity conservation  
63 (Pieroni et al. 2014), and the discovery of new food sources, health, and culture (Tamalene et al. 2016).

64 Local knowledge of the community requires maintenance as it is highly valuable for preserving biodiversity in Borneo  
65 forests (Yusro et al. 2014). In this context, several strategies have been established regarding biodiversity conservation,  
66 such as the inventory of the utilization, cultivation, and preservation of plants through ethnobotany (Supiani et al. 2019).  
67 Hence, the ethnobotanical study is anticipated to play a role in bolstering cultural sustainability in plant utilization. The  
68 knowledge within local communities also enhances advancements in science and technology (Arsyad 2018), offering  
69 scientific methodologies that can be expanded upon for future sustainable applications (Cao et al. 2020). Accordingly, the  
70 objective of this study was to investigate the knowledge of the Banjar tribe community and formulate a conservation  
71 strategy for Kasturi, which serves as the emblematic flora of Borneo. The results are anticipated to become the basis for  
72 developing and managing Kasturi conservation strategies.

## 73 MATERIALS AND METHODS

### 74 Study area

75 The research was conducted in Desember 2022-Juli 2023 in South Kalimantan. [Surveys were done in the areas that](#)  
76 [chosen based on availability of Banjar tribe, that is district yang terdapat suku Banjar \(Figure 2\). Kabupaten yang menjadi](#)  
77 [lokasi penelitian adalah Kabupaten Banjar \(BN\), Tapin \(TP\), Hulu Sungai Selatan \(HS\), Hulu Sungai Tengah \(HT\),](#)  
78 [Balangan \(BL\), and Tabalong \(Figure 2\).](#) The geographic scope of this study includes the area of approximately 1o21'49"  
79 LS - 1o10'14" LS and 114o19'33" BT - 116o33'28".

Formatted: Normal

### 80 Data collection and analysis

81 This study was carried out using a qualitative method with an ethnobotanical approach. Qualitative data were obtained  
82 using open-ended, semi-structured, and structured interviews by visiting the homes of key informants, who were selected  
83 using the purposive sampling method (Yamini et al. 2023). Additional informants were selected using a combination of  
84 purposive and snowball sampling methods based on certain criteria (Yamini et al. 2023). The criteria focused on the  
85 knowledge and use of Kasturi within the Banjar tribe. The data obtained from informants consisted of ethnobotany and  
86 characteristics such as sex, age, formal education level, and occupation (Susiarti et al. 2020).

87 A total of 210 informants were included for analysis, comprising 35 persons from each district, who had different  
88 backgrounds such as sex, age, job, marital status, and educational levels. Participants were categorized by age, including  
89 children (5-11 years), 18 teenagers (12-25 years), 13 adults (26-45 years), 9 elders (46-65 years), and the elderly ( $\geq$  65  
90 years), as indicated in Table 1 (Tamalene et al. 2016). Ethnobotanical information encompassed the identification, habitat  
91 characteristics, techniques for obtaining Kasturi, cultivation methods, and its various uses (Desti et al. 2019). The gathered  
92 data underwent descriptive analysis and was presented through tables or diagrams (Tallet et al. 2019). Descriptive  
93 statistical analysis was also used to describe/analyze parts of the Kasturi plant, which were often used for economic,  
94 ecological, medical, and cultural aspects (Tamalene et al. 2016).

95 The frequency of Kasturi plant parts usage was assessed by gauging informant responses using the following formula:

$$96 F = (S/N) * 100;$$

97 Where S represents the count of informants with positive responses regarding plant parts used, and N stands for the  
98 total number of informants. The formula elucidated by [Monteiro et al. \(2006\)](#) was employed to assess the level of  
99 consensus among the informants regarding the plant parts utilized.

100 The fidelity level (FL), employed to understand the specific purposes of using particular plant parts, was computed  
101 using the formula recommended by Friedman et al. (1986):

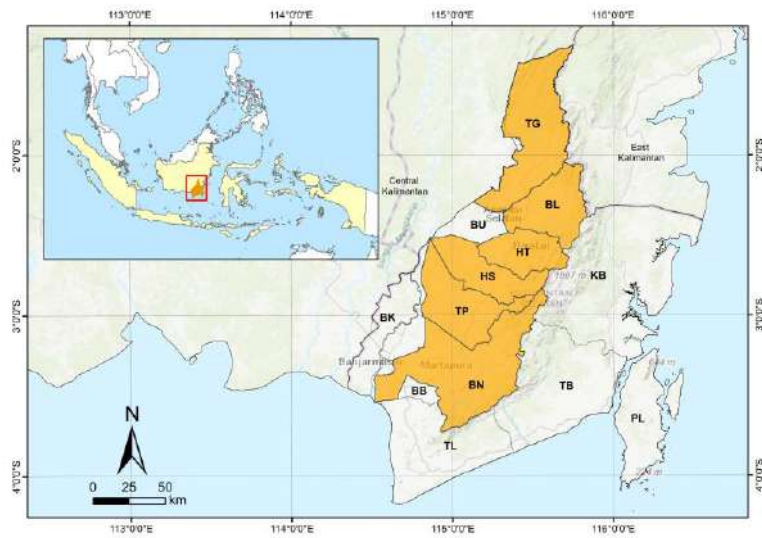
$$102 FL (\%) = (n/N) * 100$$

Commented [A1]: Please recheck again the citation. I cant find this formula in Monteiro et al. 2006

103 Where n denotes the number of informants for a specific use, and N represents the total number of informants.  
104  
105



106  
107  
108  
109  
110  
**Figure 1.** Tree and fruit of *Mangifera casturi*



111  
112  
113  
114  
**Figure 2.** Location of study in South Kalimantan. BN: Banjar; TP: Tapin; HS: Hulu Sungai Selatan; HT: Hulu Sungai Tengah; BL: Balangan; TG: Tabalong

115  
116  
117  
118  
119

Table 1. Characteristic of respondent

Characteristics	Data	Total	Percentage (%)
Sex	Male	77	37
	Female	135	64
Age	12-25	35	17
	26-45	65	31
	46-65	62	30
	> 65	48	23
Formal education	No educations	20	10
	Elementary school	48	23
	Secondary school	60	29
	High school	76	36
	University	6	3
Marital status	Single	27	13
	Married	167	80
	Widowed	16	8
Occupation	Farmer	75	36
	Trader	25	12
	Laborer	46	22
	Employee	15	7
	Housewife	29	14
	Unemployed	20	10

120

121

## RESULTS AND DISCUSSION

122

### Socio-demographic characteristics

123  
124  
125

A total of 210 person were obtained as informants in this study, with details of 135 men and 77 women. The educational background consists of elementary school to college education, but most informants graduate from high school. The age range is 26 - >55 years, with the most being 36-45 years old and married.

126

### Morphology

127  
128  
129  
130  
131  
132  
133

The bark of Kasturi plants has a grayish-white to light brown color, occasionally consisting of small cracks or gaps of  $\pm$  1 cm in the form of dead bark, which is similar to *Mangifera indica*. These plants can reach a height of 25-50 m or even more, with a stem diameter of  $\pm$ 40-115 cm, without buttress roots. When injured, the bark emits sap which is initially clear, reddish, and black within a few hours. The sap contains turpentine and has a sharp smell, capable of injuring the skin or causing irritation, particularly for sensitivity. The leaves are singular, glabrous, arranged in a spiral or tight spiral, long-stemmed, elongated lanceolate with a pointed tip. Both sides of the central leaves vein are characterized by 12-25 sides, without support, while the young leaves hang limp and are dark purple.

134  
135  
136  
137  
138  
139  
140  
141  
142  
143  
144

Kasturi flowers are bisexual compounds, forming coralline flowers in panicles with numerous, actinomorphic, and often covered in dense hairs. The length of the flower stalk is  $\pm$  28 cm with a very short stalk of 2-4 mm, sitting on panicle branches, while the leaves are elongated ovate and 2-3 mm long. The crown leaves are elongated and the flowers smell sweet. The stamens are the same length as the corolla, and the staminodia are very short, resembling stamens stuck to the base of the flower (Rashedy 2014). Kasturi mango fruit is round to elliptical, weighing 60-84 g, 4.5-5.5 cm long, and 3.5-3.9 cm wide. Furthermore, the flesh is yellow or orange, stringy, and the texture is slightly rough, the fruit tastes sweet, slightly sour, and has a distinctive aroma. The skin of the fruit when it is young is green, and turns blackish brown at an older age, with a smooth surface. The fruit is oval with a length/width ratio of 1.25-1.53. The thickness of the fruit skin is around 0.24 mm and the seeds are classified as stone seeds with thick walls. A single seed, occasionally with multiple embryos, is enveloped in a hardened, skin-like endocarp shell. This mango bears fruit at the beginning of the rainy season or around January.

145

### Habitat

146  
147  
148

Based on observations at the location, Kasturi grows in the yards and fields of the Banjar tribe. Besides that, it is also found growing in secondary forests and on the banks of rivers. The growing environment for musk mango plants comes from people's yards, fields and forests. From the results of a survey conducted on several owners of musk mango

reesKasturi, it is known that the majority of these fruit plants were left over from the owners' parents, many of which grow wild (without cultivation technology), are up to 50 years old, and there has been no effort from the owners to carry out rejuvenation or seeding. Profile habitat of *M. casturi*Kasturi is at an altitude (35-109 masl), air temperature (27,9 – 33,1 °C), humidity (64,3 - 86,9 %), light intensity (19.442 – 96.938 lux), soil temperature (27,1 - 32,8 °C), soil moisture (40,6 – 77,2 %), and soil pH (5,4 – 6,8) (Gunawan et al. 2022).

**Local knowledge of *Mangifera casturi***

Mangoes have become an integral part of Indonesian life, offering economic, ecological, health, and cultural benefits. The Javanese people have also been acquainted with mangoes for more than 10 centuries, as written in the Old Javanese Ramayana (Mulyanto et al. 2023). Similarly, the Banjar tribe in South Kalimantan has been using plants, including mangoes, during the time of their ancestors.

In this study, the values of F observed from the economic use and health aspects of Kasturi included: (i) construction materials, (ii) food sources, (iii) economics, and (iv) medicine. Knowledge values of Kasturi as construction materials were found in 12.78% of teenagers, 80,12% of adults, as well as 100% of elderly and old age, with all groups using plants as food sources (100%). Furthermore, knowledge of the economic values of Kasturi as fruit that sells in the market was found in 16.68% of children, 85.13% of teenagers, 100% of adults, elders, and old age. As medicine in Banjarese ethnic group, a proportion of 5% was observed in the old age, indicating significant health benefits, particularly as high uric acid.

The result of fidelity level (FL) analysis showed that all age groups had 100% FL in using fruits of Kasturi as a local food source. The FL of Kasturi bark used was described as follows, 25.41%, 51.34%, 87.32%, 88.33%, and 100% among children, teenagers, adults, elderly, and old age, respectively. Furthermore, the FL value of leaves had a proportion of 5% among old age.

Based on the results, the parts of the Kasturi plant that are widely used by the community include 58% fruit, 37% stems, and 5% leaves. The morphology characteristics show that the fruit flesh is dark orange, has a sweet and delicious taste. Moreover, the exceptional properties of the plant are evident in the fragrant fruit aroma, leading to the high preference by the majority population in South Kalimantan. Local people consume Kasturi fruit fresh and as a complement to fruit iced drinks. During the fruit season (November-January), the plant bears abundant fruit, with bunch prices ranging from Rp. 20,000 to Rp. 25,000. Although the fruit flesh has a high water content (87.2%), acid levels (4.7%), and carbohydrates (12%) several other chemical components are low, such as protein (0.3%), fat (0.04%), starch (1.4%), total sugar (2% ), and calories (9.6 cal/100g) (Darmawan 2015). Kasturi fruit also contains useful phytochemicals as a source of medicine, namely saponins, tannins, triterpenoids, flavonoids, polyphenols, and phenolics (Darmawan 2015).

Harvesting Kasturi fruit when ripe is crucial for maintaining aroma and color quality. When harvested prematurely, the thick and hard skin of the fruit cannot be stored for more than 6 days, experiencing weight loss from 5 to 17%. Furthermore, a decrease in texture is observed during storage, leading to a wrinkled appearance (Antarlina 2009). Another part used by the community is the stem (wood), serving as building material and containers. According to informants, the wood quality is not excellent for building materials due to its softness, leading to rapid decay. The Banjar tribe also uses the leaves as medicine for treating gout, although only 5% of informants were identified in an ethnobotany survey. Research conducted by Dewangga et al. 2014 stated that young mango leaves from *Mangifera foetida* L. contained acetic acid, which is essential in reducing uric acid.

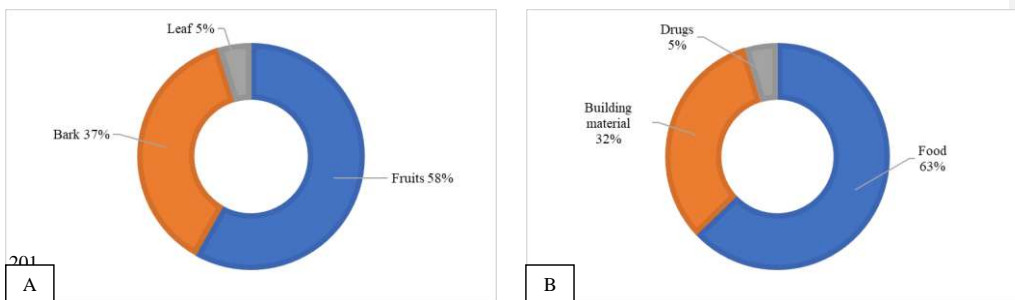


Figure 3. A. Percentage part used of Kasturi. B. Percentage useful of Kasturi by Banjar tribe

Every component of *Mangifera a-mango* tree, including flowers, leaves, bark, fruit, peel, pulp, and seeds, possesses vital nutrients that can be utilized. Moreover, *Mangifera mango* peel comprises minerals, fiber, and antioxidants (such as phenolic compounds like mangiferin, kaempferol, quercetin, and anthocyanins), while the mango seed kernel contains starch, fiber, lipids, sterols (like campesterol, stigmasterol, and  $\beta$ -sitosterol), and tocopherols (Juhnul et al. 2015).

Formatted: Font: Not Italic

Formatted: Not Highlight

Formatted: Font: Italic

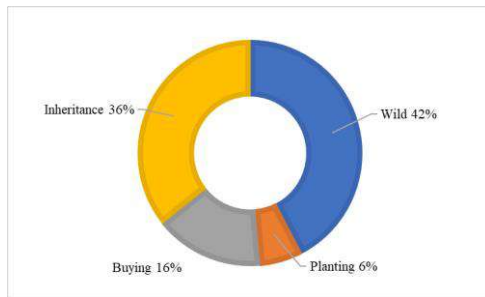
Formatted: Font: Italic

210 *Mangifera* has been extensively employed in traditional medicine for the treatment of conditions such as diabetes,  
 211 diarrhea, dysentery, rheumatism, high blood pressure, and various skin diseases (Parvez, 2016). Table 2 shows that Kasturi  
 212 is not only useful as a source of food and materials, but its parts have the potential to be used as medicine.  
 213

214 **Table 2.** Content and potential of *Mangifera casturi* part

Part	Content	Potency
Skin	saponins, flavonoids, tannins, and steroids (Mutia and Wati 2018), distearil phosphite, Trans-13-octadecenoic acid, Heptadecane (Zulfina et al., 2021)	Anti-infectives, such as antiseptics, antibiotics, chemotherapy, contraception, antiasthmatic, bronchodilator, and medicine for bladder system illness (Zulfina et al., 2021).
Fruit	methyl gallate (sutomo et al. 2017), alpha hydroxy acid (Zulfina et al. 2021).	Antioxidants, Speed up the exfoliation of dead skin cells to promote soft and blemish-free skin
Leaf	terpenoid and polifenol (Darmawan 2015); alkaloid, terpenoid, flavonoid, saponin (Rahim et al. 2017), acetic acid (Dewangga et. al. 2014),	Antioxidants and tannins exhibit antibacterial, antiviral, and antitumor activities, antioxidants (Sutomo et al. 2017)
Bark Root	terpenoid, steroid, and saponin (Rahim et al. 2017) Saponin and tannin (Darmawan 2015)	Antioxidants (Ramadhan et al., 2021), Hypercholesterolemia, antioxidants, hyperglycemia, anticancer, antifungal, and anti-inflammatory properties

215  
 216  
 217 Intensive cultivation of Kasturi has not been carried out by the Banjar tribe, with small population planting the seeds in  
 218 the gardens. *Mangifera casturi* and species such as *M. caesia* ('Binjai'), *M. foetida* ('Hambawang'), and *M. odorata*  
 219 ('Kueni') ('Kasturi') have been cultivated by local farmers. In contrast, others are wild in the forest to obtain the stems and  
 220 fruit (Ariffin et al. 2015). Based on the survey conducted, the Banjar tribe obtained Kasturi fruit by planting, growing wild,  
 221 inheritance, and buying at traditional markets, as shown in Figure 4. The majority of informants obtained the fruit from  
 222 plants growing wild in the gardens, while the trees were acquired from parents to children. The existence of the Kasturi  
 223 was attributed to fruit-bearing capacity, with most informants selling fruits to collectors. Specifically, buyers would climb  
 224 the trees, and harvest the fruits, which are transported to the local market.  
 225



226  
 227  
 228  
 229  
 230  
 231  
 232  
 233  
 234  
 235  
 236  
 237  
 238  
 239  
 240  
 241  
 242  
 243  
 244  
 245 **Figure 4.** Way to get *Mangifera casturi* by Banjar tribe

246 **Conservation strategies of Kasturi**

247 *Kasturi* is a fruit plant endemic to South Kalimantan, which faces the threat of extinction due to the absence of local  
 248 cultivation efforts. Based on the survey conducted on several owners of *musk-mangoKasturi* trees, it was discovered that  
 249 the majority of these fruit were left over from parents and have been growing wild without cultivation technology for  
 250 approximately 50 years. However, there has been no effort from the owners to carry out rejuvenation or seeding. The  
 251 cultivation is only carried out by plant collectors, causing a decline in the *musk-mangoKasturi* and affecting both  
 252 individual counts and genetic diversity. According to informants, the lack of cultivating *Kasturi musk-mangoes* is



253 attributed to the long fruiting period and thin flesh. Kiloes et al. (2014) expressed that the Kasturi was capable of  
254 developing into regional fruit, indicating factors such as small flesh relative to large seed size, a lengthy plant maturation  
255 age, and a short harvest period.

256 Kasturi has been assigned a classification in the IUCN Red List Categories. The assessment team from the World  
257 Conservation Monitoring Center decided that Kasturi was in the extinct in situ or Extinct in the Wild (EW) category.  
258 Endemic fruit plants that are wild or have not been cultivated are often threatened by various human activities such as the  
259 expansion of agricultural land, fires, conversion to plantations, and selective harvesting (Suwardi et al. 2020). In the case  
260 of Indonesia, mainly in the Kalimantan region, the depletion of forests can be attributed to the conversion of land for  
261 agricultural purposes (Busch & Ferretti-Gallon 2017), such as oil palm plantations, and mining. Restoration should be  
262 performed for the recuperation of forest ecosystems (Sofiah et al. 2018). According to Yang et al. (2013) habitat  
263 degradation, fragmentation, over-exploitation, and an increasing human population, are crucial factors responsible for  
264 species loss globally.

265 Conservation strategies are essential to protect species from extinction. Several efforts that can be made to protect the  
266 Kasturi from extinction include intensification of socialization and publication of Kasturi's uses, ex-situ conservation,  
267 network development, and collaboration, as well as environmental education in botanical gardens. These conservation  
268 efforts require collaboration from various parties, including academics, government companies, private companies, related  
269 agencies, local governments. The success of conservation really depends on the role of each of these parties. Furthermore,  
270 conservation efforts should be sustained over time, ensuring the continuous preservation of Kasturi as the identity flora of  
271 South Kalimantan.

272 This study has presented insights into the ethnobotanical knowledge of the Banjar tribe concerning the utilization of  
273 Kasturi. The findings contribute to advancements in science and technology, shedding light on the potential of tropical  
274 plants in Borneo, Indonesia. Furthermore, these results serve as a foundation for sustainable conservation efforts, aiming to  
275 empower the local community. [Traditional knowledge can be used as a means for in-situ conservation. Locations  
276 identified as having Kasturi can be protected from deforestation and prioritized for conservation. Kasturi in native habitats.](#)

## 277 ACKNOWLEDGEMENTS

278 The authors would like to express high appreciation and gratitude to the Rector of Lambung Mangkurat University for  
279 support in this research by *Program Dosen Wajib Meneliti*. We also pay thanks to all parties involved in this present study.

## 280 REFERENCES

- 281 Anggraheni YGD, Mulyaningsih ES. 2021. Diversity assessment of mango (*Mangifera* spp.) plant collection of Cibinong Germplasm Garden based on  
282 leaves morphology and RAPD markers. IOP Conference Series: Earth and Environmental Science. 715(1):012045. DOI:10.1088/1755-  
283 1315/715/1/012045.
- 284 [Antarlina SS. 2009. Identifikasi sifat fisik dan kimia buah-buahan lokal Kalimantan. Buletin Plasma Nutfah 15: 80-90.](#)
- 285 Busch J, Ferretti-Gallon K. 2017. What drives deforestation and what stops it? A meta-analysis. Rev Environ Econ Policy 11(1):3-23.  
286 DOI:10.1093/reep/rew013
- 287 Cao Y, Li R, Zhou S, Song L, Quan R, Hu H. 2020. Ethnobotanical study on wild edible plants used by three trans-boundary ethnic groups in Jiangcheng  
288 County, Pu'er, Southwest China. J Ethnobiol Ethnomed 16: 66. DOI: 10.1186/s13002-020-00420-1.
- 289 Cahyaningsih AP, Arifiani KN, Aprilia D, Nugroho ME, Setyawan AD. 2022. Ethnobotanical study of the non-medicinal plant by village communities  
290 in the karst area of Pacitan, East Java, Indonesia. Int J Trop Drylands. 6 (1): 1-10 DOI: 10.13057/tropdrylands/060101.
- 291 Darmawan, A. R. B. 2015. Usaha Peningkatan Kualitas Manga Kasturi (*Mangifera casturi*) dengan Modifikasi Budidaya Tanaman. *PROS SEM NAS*  
292 *MASY BIODIV INDON*, 1(4), 894-899.
- 293 Desti, Isda MN, Fitmawati, Yulis PAR. 2019. Local wisdom of Ria u mascot flora (*Onchosperma tigillarum* (Jack) Ridl.) in Baganbatu,  
294 Bengkalis District Riau Indonesia. Advances in Engineering Research 190: 92-95. DOI:10.2991/iccst-st-19.2019.18
- 295 Fitmawati, Hayati, L., & Sofiyanti, N. 2016. Using ITS as a Molecular Marker for *Mangifera* Species Identification in Central Sumatra. *Biodiversitas*,  
296 17(2), 653-656. DOI: 10.13057/biodiv/d170238
- 297 Friedman J, Yaniv Z, Dafni A, Palewitch D. 1986. A preliminary classification of the healing potential of medicinal plants, based on  
298 arational analysis of an ethno pharmacological field survey among Bedouins in the Negev Desert, Israel. J Ethnopharmacol 116:275-87.  
299 DOI: 10.1016/0378-8741(86)90094-2.
- 300 Gunawan, Muhamat, Fadhlila S, Olivia AF. 2022. Habitat characteristics of *Mangifera casturi* kosterm. In banjar district of south Kalimantan, Indonesia.  
301 RJOAS, 10(130): 83-90. DOI 10.18551/rjoas.2022-10.10
- 302 Jahurul MHA, Zaidul ISM, Ghafoor K, Al-Juhaimi FY, Nyam KL, Norlaili NAN, Sahena F, Omar MAK. 2015. Mango (*Mangifera indica* L.) by-  
303 products and their valuable components: A review. Food Chemistry 183: 173-180. DOI: 10.1016/j.foodchem.2015.03.046
- 304 Kiloes AM, Yanuar, Yassin M. 2015. Kasturi: dari hutan ke pasar modern. Jakarta (ID): IAARD Press
- 305 Kostermans AJGH & Bompard JM. 1993. The Mangoes: Teir Botany, Nomenclature, Horticulture, and Utilization (Academic Press).
- 306 Labdelli A, De La Herrán R, Arafeh R, Resentini F, Trainotti L, Halis Y, Adda A, Merah O. 2020. Genetic variation in damaged populations of *Pistacia*  
307 *atlantica* Desf. Plants. 9: 1541-1552. DOI: 10.3390/plants9111541
- 308 Marchese C. 2015. Biodiversity hotspots: A shortcut for a more complicated concept. Glob Ecol Conserv 3:297-309. DOI: 10.1016/j.gecco.2014.12.008.
- 309 [Monteiro JM, Albuquerque UP, LinsNeto EMF, Araújo EL, Amorim ELC. 2006. Use patterns and knowledge of medicinal species among two rural  
310 communities in Brazil's Semi-And Northeastern Region. J Ethnopharmacol 105:173-86. DOI: 10.1016/j.jep.2005.10.016](#)
- 311 Mulyanto D, Supangkat B, Nurseto HE, Iskandar J. 2023. Ethnobotanical identification of mango (*Mangifera indica* L.) and other fruit trees mentioned in  
312 Old Javanese Ramayana (10th century Java, Indonesia). Biodiversitas 24(1): 609-916. DOI: 10.13057/biodiv/d240169

Commented [A2]: Monteiro et al. 2006

313 Parves GM. 2016. Pharmacological Activities of Mango (*Mangifera indica*): A Review. *Journal of Pharmacognosy and Phytochemistry JPP*. 1(53): 1–7.  
314 DOI: 10.22271/phyto.

315 Pieroni A, Anely N, Avni H, Mustafa B, Bruno S, Kevin C, Cassandra LQ. 2014. Local knowledge on plant and domestic remedies in the mountain  
316 village of Peshkopia (Eastern Albania). *J Mt Sci* 11 (1): 180-194. DOI: 10.1007/s11629-013-2651-3.

317 Rahim MA, Suartha IN, Sudimartini LM. 2017. Immunostimulatory effect of leaf extract kasturi (*mangifera casturi*) in mice. *Indonesia Medicus*  
318 *Veterinus*. 6(1): 10-19. DOI: 10.19087/imv.2017.6.1.10

319 Ramadhan H, Rezky DP, Susiani EF. 2021. Penetapan Kandungan Total Fenolik-Flavonoid pada Fraksi Etil Asetat Kulit Batang Kasturi (*Mangifera*  
320 *casturi* Kosterman). *Farmasi Dan Ilmu Kefarmasian Indonesia* 8(1): 58–67. DOI : 10.20473/jfiki.v8i12021.58-67.

321 Rashedy, A. A., El Kheshin, M. A., & Abd. Allatif, A. M. (2014). Histological Parameters Related to Dwarfism in Some Mango Cultivars. *World J Agric*  
322 *Sci*, 10, 216–222. DOI: 10.5829/idosi.wjas.2014.10.5.1826.

323 Sutomo, Arnida, Yunus R, Wahyuono S., Setywati EP, Riyanto S. 2017. Isolation And Identification Of Active Compound Of Ethylacetate Fraction  
324 Of Kasturi (*Mangifera casturi* Konsterm.) Fruit From South Kalimantan Indonesia. *Res. J. Pharm. Biol. Chem. Sci.* 8(1S): 251. DOI:  
325 10.33887/rjpbcs.

326 Suwardi AB, Navia ZI, Harmawan T, Syamsuardi, Mukhtar E. 2020. Wild edible fruits generate substantial income for local people of the Gunung  
327 Leuser National Park, Aceh Tamiang region. *Ethnobot Res Appl* 20: 1-13. DOI: 10.32859/era.20.11.1-13

328 Singh, N. K. (2016). Origin, Diversity and Genome Sequence of Mango (*Mangifera indica* L.). *Indian Journal of History of Science*, 51(2.2), 355–368.  
329 DOI:10.16943/ijhs/2016/v51i2.2/48449

330 Sofiah S., Metusala D, Trimanto, Nurfadilah S. 2018. Flora Diversity, Composition And Ecology In Besiq Bermai Tropical Forest of Damai District, East  
331 Kalimantan. *Biotropia*. 25 (2): 85 – 94. DOI: 10.11598/btb.2018.25.2.724

332 Supiandi MI, Mahanal S, Zubaidah S, Julung H, Ege B. 2019. Ethnobotany of traditional medicinal plants used by Dayak Desa Community in Sintang,  
333 West Kalimantan, Indonesia. *Biodiversitas*. 20 (5): 1264-1270. DOI: 10.13057/biodiv/d200516

334 Susiarti S, Rahayu M, Kuncari ES, Astuti IP. 2020. Utilization of “Benda” (*Arthocarpus elasticus* Reinw. Ex Blume) in Bogor, West Java,  
335 Indonesia: An Ethnobotanical Case Study). *Journal of Tropical biology and Conservation* 17: 297 - 307. DOI: 10.51200/jtbc.v17i.2670.

336 Tallei TE, Pelealu JJ, Pollo HN, Pollo GAV, Adam AA, Effendi Y, Karuniawan A, Rahimah, Idroes R. 2019. Ethnobotanical dataset of local  
337 edible fruits in North Sulawesi, Indonesia. *Journal of Data in Brief* 27: 1- 12. DOI: 10.1016/j.dib.2019.104681.

338 Tamalene MN, Muhdhar MHIA, Suarsini E, Rahman E, Hasan S. 2016. Ethnobotany of Canariumplamt species used byTobeloDalam(Togutil)ethnic  
339 community of Halmahera Island, Indonesia. *Biodiversitas* 17(1): 61–69. DOI: 10.13057/biodiv/d170109

340 Yamini THA, Djuita NR, Chikmawati T, Purwanto Y. 2023. Ethnobotany of wild and semi-wild edible plants of the Madurese Tribe in Sampang and  
341 Pamekasan Districts, Indonesia. *Biodiversitas* 24: 947-957. DOI:10.13057/biodiv/d240234.

342 Yang XQ, Kushwaha SPS, Saran S, Xu J, Roy PS. 2013. Maxent modeling for predicting the potential distribution of medicinal plant *Justicia adhatoda* L:  
343 in Lesser Himalayan foothills. *Ecol Eng* 51:83- 87. DOI: 10.1016/j.ecoleng.2012.12.004.

344 Yusro, Fathul, Yeni M, Farah D, Kazuhiro. 2014. Inventory of medicinal plants for fever used by four Dayak Sub Ethnic in West Kalimantan, Indonesia.  
345 *Kuroshio Sci* 8 (1): 33-38.

346 Zulfina S , Fathoni MAN, Poerwanto R,Matra DD. 2021. Characterization of secondary metabolites in kasturi mango (*Mangifera casturi*) using gas  
347 chromatography-mass spectrometry. *IOP Conf. Ser.: Earth Environ. Sci.* 948 012059. DOI:10.1088/1755-1315/948/1/012059 4.

348  
349  
350  
351

16591 / GUNAWAN et al. / Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan

Library

Submissions

Workflow

Publication

Submission

Review

Copyediting

Production

Round 1

Round 2

Round 3

Round 4

Round 5

Round 6

Round 3 Status

A review is overdue.

Notifications

[biodiv] Editor Decision


2023-11-27 11:19 PM

[biodiv] Editor Decision

2024-04-01 08:14 AM

[biodiv] Editor Decision


2024-04-14 02:45 AM

 1106839-1 , [16591-Article Text-1105480-1-4-20240108-review.doc](#) January 20, 2024

Revisions

[Search](#)

[Upload File](#)

▶  1109652-1 [Article Text, A-16591-Article Text-1105480-1-4-20240108-review\\_rev.do](#) February 18, 2024 Article Text  
c

Review Discussions

[Add discussion](#)

Name	From	Last Reply	Replies	Closed
<a href="#">Uncorrected proof</a>	atriyanto1 2024-04-08 06:11 AM	gunawanulm 2024-04-08 07:03 AM	1	<input type="checkbox"/>
<a href="#">BILLING</a>	dewinurpratiwi 2024-04-08 06:32 AM	dewinurpratiwi 2024-04-22 07:10 AM	3	<input type="checkbox"/>

Platform &  
workflow by  
OJS / PKP



Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;

---

**[biodiv] Editor Decision**

---

**Smujo Editors via SMUJO** <support@smujo.com>

Tue, Feb 20, 2024 at 6:35 AM

Reply-To: Smujo Editors &lt;editors@smujo.id&gt;

To: Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;, Magfiroh Magfiroh &lt;magfiroh.net@gmail.com&gt;, Muhamat Muhamat &lt;muhamat@ulm.ac.id&gt;

Gunawan Gunawan, Magfiroh Magfiroh, Muhamat Muhamat:

We have reached a decision regarding your submission to Biodiversitas Journal of Biological Diversity, "Ethnobotany and conservation of *Kasturi* (*Mangifera casturi* Koesterm) by Banjar Tribe in South Kalimantan, Indonesia". Complete your revision with a Table of Responses containing your answers to reviewer comments (for multiple comments) or enable Track Changes.

Our decision is: Revisions Required

-----  
Reviewer A:

I wrote comments below, attached the manuscript file (see track changes), and iThenticate's result. The author(s) must incorporate all comments and consider the iThenticate as well.

The outcomes of this research on *M. casturi* present intriguing findings, however, there are several recommendations we would like to propose:**Introduction Section:**

The cohesion between paragraphs in the introduction section requires improvement to avoid each paragraph appearing isolated, thus failing to systematically convey the research's significance. We suggest incorporating a sentence that acts as a link between each paragraph and either the preceding or succeeding paragraph.

If the introduction uses a deductive to inductive approach, it would be advantageous to commence by introducing Anacardiaceae broadly and then narrow the focus to *M. casturi* (detailing its utilization and current challenges). Furthermore, researchers can convey the importance of immediate conservation efforts for *M. casturi* and identify effective methods to realize these efforts by examining the local knowledge of the Banjar community in South Kalimantan using an ethnobiological approach.

**Materials and Methods Section:**

1. Please review the notation of the research coordinates, the units should not be LS and BT. It is advisable to incorporate the information on a research location (Banjar, Tapin, Hulu Sungai, etc) as a legend on the map. Additionally, the legend should encompass details regarding the mean of the orange polygons, red boxes, and the black line. Does the black line represent the province boundaries? Where do you get the data to create this map? Is it from BIG or another agency? Please mention on the map
2. The research methodology involves a combination of snowball and purposive sampling. It would be better to elucidate the operational procedures of these methods:
3. Clarify the sequence of employing purposive and snowball sampling (line 83). If snowball sampling precedes purposive sampling, state it explicitly as "...a combination of snowball and purposive sampling".
4. A researcher use the terminology of key informants in the abstract but this term didn't found in the materials and methods section. Then, specify whether the sampling process initiates with the identification of key informants who subsequently recommend individuals knowledgeable about *casturi*. This detail is essential for clarity.

5. Regarding the sentence in line 84 referencing '... ethnobotany and characteristics such as sex, age, formal education level, and occupation,' clarify whether ethnobotanical information or informant data was collected first. If informant data was prioritized, revise the sentence accordingly to include both aspects.
6. In the methods section, a researcher mentions the identification process of *casturi*. If identification refers to morphological identification, provide details on the methodology employed, such as reference materials or laboratory procedures.

### Results and Discussion Section:

In the introduction and methods sections, a researcher indicates an intention to delve deeper into the uses and fidelity level of *M. casturi*. However, this information is not explained in detail in the sub-bab of local knowledge of *M. casturi* in the results and discussion (line 162). We recommend creating a table detailing plant parts, uses, and fidelity levels.

The author proposes four strategic conservation recommendations, however, these should be organized sequentially based on the findings, progressing from upstream to downstream. Given that the primary issue identified in the field is the lack of cultivation among the people in Kalimantan, the initial solution should focus on increasing public awareness to promote cultivation by the local community in South Kalimantan. If the first proposed solution involves outreach and publication, likely, the primary target audience is not the local community.

### Acknowledgment

The author should include information regarding (1) the grant provider and contract number, and (2) convey that this research has permission from the local government.

### Other Feedback:

1. Inconsistencies in terminology usage, such as the use of 'informant' and 'respondent.'
2. Inconsistencies in bibliography formatting, e.g., variations in the presentation of author names (e.g., Darmawan A. R. B., Rashedy, A. A., etc.).
3. There are several typographical errors.

Recommendation: Revisions Required

-----


---

Biodiversitas Journal of Biological Diversity

Caution: This e-mail (including attachments, if any) is sent by system and only intended for the recipients listed above. If you are not the intended recipient, then you are not permitted to use, distribute, distribute, or duplicate this e-mail and all its attachments. Please cooperate to immediately notify Smujo International and delete this e-mail and all attachments. This email was sent due to, your email is listed as participant on Biodiversitas Journal of Biological Diversity.

---

### 2 attachments

 **A-16591-Article Text-1109659-1-4-20240218.doc**  
2892K

 **A-lthenticate Check.pdf**  
2551K

# Ethnobotany and conservation of *Kasturi* (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan, Indonesia

**Abstract.** *Kasturi* (*Mangifera casturi* Koesterm.) is a local fruit and has become the identity flora of South Kalimantan. This study aimed to investigate the knowledge of the Banjar tribe community and formulate a conservation strategy for *Kasturi* as the identity flora of South Kalimantan. Data on ethnobotanical knowledge was collected through interview technique. There were two types of informant: key informants and recommended-additional informants. Key informants were chosen through purposive-snowball sampling technique while recommended-additional informants were chosen through a combination snowball sampling and purposive sampling technique. The informants in this study have different background: sex, age, job, marital status, and educational levels. The informants were grouped based on their age: children (5-11 years), 18-teenagers (12-25-10-18 years), 13-adults (26-45-19-59 years), 9 and -elders (46-65-60+ years)-and-old-age ( $\geq 65$  years). Data were analyzed using the formula of *Kasturi* plant parts usage (F), Fidelity level (FL). All data collected were analyzed descriptively and presented in tables or diagrams. The Banjar tribe used *M. casturi* as source of food (63%), building material (32%), and drugs (5%). The parts of the *Kasturi* plant that are widely used by the community are fruit, which is 58%, stems are 37%, and leaves are 5%. The values of F (the frequency of parts of *Kasturi* used) observed from the economic use and health aspects of *Kasturi* include: (i)-construction materials, (ii)-food sources, (iii)-economic and (iv)-medicine. The value of F for economic use are 12.78% - 100% and the value F for health aspect are 5%. The result of fidelity level (FL) analysis proves that all age groups had 100% of FL in utilizing fruits of *Kasturi* as local food source. The FL of *Kasturi* bark used is described as follows: 25.41% among children, 51.34% among teenagers, 87.3289.54% among adults, 88.3387.23% among elder as construction materials, and 100% among old age. The FL value of leaf described as follows: 5% among elder, old-age. Most of the Banjar tribe get *Kasturi* fruit from plants that grow wild in their yards (42%) and only 6% have planted. The research indicated that *M. casturi* had high utility value for Banjar tribe. All parts of the plant (fruits, stems/bark, and leaves) were exploited for economic and health. Conservation of *Kasturi* can be performed by 1. Network Development and Collaboration for conservation efforts, intensification of socialization and publication of *Kasturi*'s uses, 2. ex-situ conservation, 3. intensification of socialization and publication of *Kasturi*'s uses, Network Development and Collaboration for conservation efforts, 4. Environmental education in botanical gardens. The result of the study can be used for management conservation of *M. casturi* to ensure the availability in the future.

**Keywords:** Banjar, conservation, endemic, ethnobotany, *Kasturi*

**Running title:** Ethnobotany and conservation of *Kasturi* (*Mangifera casturi* Koesterm.)

## INTRODUCTION

Indonesia is a tropical country characterized by a high diversity of fruit with numerous benefits. Among several regions in the country, Kalimantan, also called Borneo, has been identified as one of the 24 other hotspots of flora diversity globally (Marchese 2015). In the diverse flora Kalimantan, Within this diverse flora, *Mangifera* is an important genus of *Anacardiaceae*, a plant family producing several commercial fruits globally (Fitmawati et al., 2016). *Mangifera* holds the second rank among tropical fruits renowned for their exceptional taste, color, and diversity, following bananas (Singh, 2016). Globally, this genus comprises around 69 species, with 30 of them being endemic to Indonesia (Anggraheni & Mulyaningsih 2021). Based on IUCN data (2022), two Borneo-endemic species, *Mangifera casturi* Kosterm. and *M. rubropetala* Kosterm., have already become extinct in their natural habitats. Additionally, four species are classified as endangered, and eleven are considered vulnerable. Moreover, the abundant variety within the *Anacardiaceae* family plays an essential role in ecosystem services, significantly contributing to the food supply (Labdelli et al. 2020).

Formatted: Font: Not Italic

Formatted: Font: Not Italic



47 *Mangifera casturi*, known as *Kasturi*, is a native and endemic plant from Kalimantan, particularly South Kalimantan  
48 (Kostermans & Bompar 1993). The species went extinct due to the destruction of its native habitat. The decline of  
49 *Kasturi* mango population is attributed to the felling of various local mango fruit trees, including *Kasturi*, to be used as  
50 building materials. This significant population reduction has led to the scarcity or complete disappearance of the plants.  
51 Additionally, forest exploitation in the form of illegal logging and clearing forests for settlements and plantations (oil  
52 palm) can damage the ecosystem, including the natural habitat of mango fruit plants.

53 Continued population decline and loss of *Kasturi*'s natural habitat could lead to the species' extinction. One of the  
54 efforts for conservation is through revealing the benefits of the species through ethnobotanical studies. Ethnobotany is a  
55 study that reveals the relationship between humans and plants and the use of plants by certain ethnicities. The results of  
56 ethnobotanical research can be used as basic data for conservation efforts and sustainable utilization of biological  
57 resources. Yusro et al. (2014) stated that local knowledge of the community needs to be maintained because it is very  
58 valuable for preserving biodiversity in Kalimantan forests. In this context, several biodiversity conservation strategies have  
59 been developed, such as the inventory of plant use, cultivation and conservation through ethnobotany (Supiani et al. 2019).  
60 Hence, the ethnobotanical study is anticipated to play a role in bolstering cultural sustainability in plant utilization. The  
61 knowledge within local communities also enhances advancements in science and technology, offering scientific  
62 methodologies that can be expanded upon for future sustainable applications (Cao et al. 2020).

63 Local knowledge of the community requires maintenance as it is highly valuable for preserving biodiversity in Borneo  
64 forests (Yusro et al. 2014). In this context, several strategies have been established regarding biodiversity conservation,  
65 such as the inventory of the utilization, cultivation, and preservation of plants through ethnobotany. In this context, several  
66 biodiversity conservation strategies have been developed, such as the inventory of plant use, cultivation and conservation  
67 through ethnobotany (Supiani et al. 2019). Hence, the ethnobotanical study is anticipated to play a role in bolstering  
68 cultural sustainability in plant utilization. The knowledge within local communities also enhances advancements in science  
69 and technology (Arsyad 2018), offering scientific methodologies that can be expanded upon for future sustainable  
70 applications (Cao et al. 2020).

71  
72 *Kasturi* as endangered Kalimantan endemic has fragrant fruit and a sweet taste characterized by small-sized fruit with  
73 colors ranging from yellow-orange to purple-black. The Decree of the Minister of Indonesia No. 48 issued in 1989  
74 designated *Kasturi* as the flora identity of South Kalimantan Province (Darmawan 2015). This is due to the popularity of  
75 the fruit, leading to rapid market sales during the fruiting season. Kalimantan Island is divided into five provinces,  
76 including South Kalimantan Province which majorly consists of the majority of the Banjar tribe. The Meratus Mountains  
77 area in South Kalimantan is home to an indigenous group called the Meratus Mountains Dayak or Bukit Dayak tribe.  
78 Additionally, Banjarnese people have local knowledge about using plant resources to meet the required needs, such as  
79 traditional medicinal materials. However, the information regarding to the knowledge of using *Kasturi* has not been  
80 disclosed. In recent years, ethnobotanical research has significantly increased in the field of pharmaceuticals and  
81 conservation programs globally, influencing biodiversity conservation (Pieroni et al. 2014), and the discovery of new food  
82 sources, health, and culture (Tamalene et al. 2016). Traditionally, relationship between *Kasturi* and local community has  
83 been established as a consume fruit. Thus, ethnobotany of the *Kasturi* can be explored in the form the relationship between  
84 humans and plants to provide insights about the traditional local knowledge of the community regarding plants use to  
85 become valid information.

86 The decline of *Kasturi* population, which leads to extinction, may result in the loss of the benefits of *Kasturi*.  
87 Therefore, this study aims to reveal the utilization of *Kasturi* by the Banjar tribe and provide recommendations for *Kasturi*  
88 conservation strategies as a typical flora of South Kalimantan.

89  
90  
91 This research aims to give valid information on the benefits of plants to the community such as ecology, economics,  
92 and pharmacology. By investigating the knowledge of the Banjar tribe community and formulate a conservation strategy  
93 for *Kasturi*, which serves as the emblematic flora of Borneo and also become the basis for developing and managing  
94 *Kasturi* conservation policy.

95  
96 Ethnobotany explores the relationship between humans and plants, providing insights about the traditional local  
97 knowledge of the community regarding plants use. This research supplies valid information on the benefits of plants to the  
98 community such as ecology, economics, and pharmacology. In recent years, ethnobotanical research has significantly  
99 increased in the field of pharmaceuticals and conservation programs globally, influencing biodiversity conservation  
100 (Pieroni et al. 2014), and the discovery of new food sources, health, and culture (Tamalene et al. 2016).

101 Local knowledge of the community requires maintenance as it is highly valuable for preserving biodiversity in Borneo  
102 forests (Yusro et al. 2014). In this context, several strategies have been established regarding biodiversity conservation,  
103 such as the inventory of the utilization, cultivation, and preservation of plants through ethnobotany (Supiani et al. 2019).  
104 Hence, the ethnobotanical study is anticipated to play a role in bolstering cultural sustainability in plant utilization. The  
105 knowledge within local communities also enhances advancements in science and technology (Arsyad 2018), offering  
106 scientific methodologies that can be expanded upon for future sustainable applications (Cao et al. 2020). Accordingly, the

107 objective of this study was to investigate the knowledge of the Banjar tribe community and formulate a conservation  
108 strategy for *Kasturi*, which serves as the emblematic flora of Borneo. The results are anticipated to become the basis for  
109 developing and managing *Kasturi* conservation strategies.

## 110 MATERIALS AND METHODS

### 111 Study area

112 The research was conducted in December 2022-July 2023 in South Kalimantan. ~~Surveys were done in the areas that~~  
113 ~~were chosen based on the availability of~~ ~~Surveys were conducted in areas that were selected based on having~~ the Banjar  
114 tribe, including district Banjar (BN), Tapin (TP), Hulu Sungai Selatan (HS), Hulu Sungai Tengah (HT), Balangan (BL),  
115 and Tabalong (Figure 2). The geographic scope of this study includes the area of approximately 1°21'49" LS - 1°10'14" LS  
116 and 114°19'33" E BT - 116°33'28" E.

### 117 Data collection and analysis

118 This study was carried out using a qualitative method with an ethnobotanical approach. Qualitative data were collected  
119 through open-ended, semi-structured, and structured interviews conducted at the homes of key ~~informants and additional~~  
120 ~~informants. Key informants were selected through snowball sampling based on information from the village head.~~  
121 ~~Additional informants were selected using a combination of snowball and purposive sampling with the following criteria:~~  
122 ~~(i) respondents/informants who have used kasturi plants; (ii) respondents/informants who know about the use of kasturi~~  
123 ~~plants (Yamini et al. 2023). Firstly, additional informants were obtained based on the recommendations of previous key~~  
124 ~~informants, and secondly, the informants were screened to ensure that they met the predetermined criteria. The data~~  
125 ~~collection process begins with the identification of key informants and ordinary informants who have knowledge about~~  
126 ~~kasturi.~~

127  
128 ~~The informants were selected using the purposive sampling method. Additional informants were selected using a~~  
129 ~~combination of purposive and snowball sampling methods based on certain criteria (Yamini et al. 2023). The criteria~~  
130 ~~focused on the knowledge and use of *Kasturi* within the Banjar tribe. The data obtained from informants with consisted of~~  
131 ~~ethnobotany and characteristics such as sex, age, formal education level, and occupation to get ethnobotany information~~  
132 ~~(Susiarti et al. 2020).~~

133 The analysis included 212 informants, with 35 individuals from each district, representing diverse backgrounds in  
134 terms of sex, age, job, marital status, and educational levels (Susiarti et al. 2020). The participants were classified into  
135 different age groups, namely ~~children (5-11 years), 18~~ teenagers (12-10-25-18 years), ~~13~~ adults (26-19-45-59 years), ~~9~~ elders  
136 (46-65 years), and the elderly ( $\geq 65-60+$  years), as indicated in Table 1 (Tamalene et al. 2016, 2024).  
137 Ethnobotanical information encompassed the identification, habitat characteristics, techniques for obtaining *Kasturi*,  
138 cultivation methods, and its various uses (Desti et al. 2019). ~~Kasturi specimens were collected in the field. Voucher~~  
139 ~~specimens are kept at the Biosystematics Laboratory of Lambung Mangkurat University. The identification process uses~~  
140 ~~the Mango Book (Kostermans & Bompard 1993) by matching the morphological characteristics of the specimen with the~~  
141 ~~morphological characteristics in the book.~~ -The gathered data underwent descriptive analysis and was presented through  
142 tables or diagrams (Tallet et al. 2019). Descriptive statistical analysis was also used to describe/analyze parts of the *Kasturi*  
143 plant, which were often used for economic, ~~ecological, and medical,~~ and cultural aspects (Tamalene et al. 2016).

144 The frequency of *Kasturi* plant parts usage was assessed by gauging informant responses using the following formula:

$$145 F = (S/N) * 100;$$

146 Where S represents the number of informants with positive responses regarding plant parts used, and N stands for the  
147 total number of informants. The formula elucidated by Monteiro et al. (2006) was employed to assess the level of  
148 consensus among the informants regarding the plant parts utilized.

149 The fidelity level (FL), employed to understand the specific purposes of using particular plant parts, was computed  
150 using the formula recommended by Friedman et al. (1986):

$$151 FL (\%) = (n/N) * 100$$

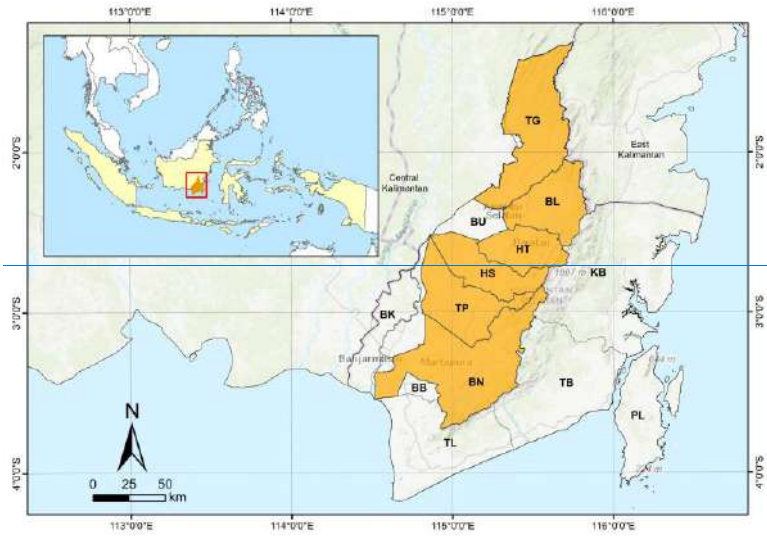
152 Where n denotes the number of informants for a specific use, and N represents the total number of informants.

153

154



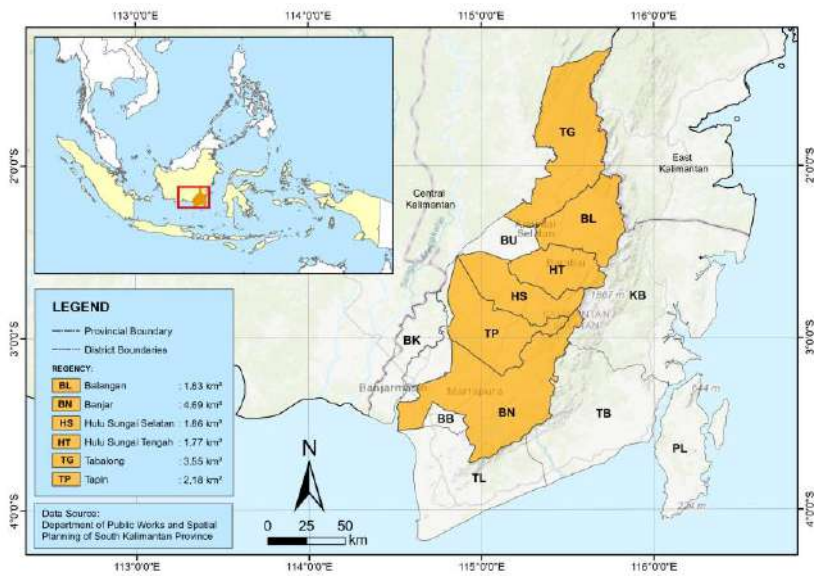
Figure 1. Tree and fruit of *Mangifera casturi*



155  
156  
157  
158  
159

160  
161  
162  
163  
164  
165  
166

167  
 168  
 169  
 170  
 171  
 172  
 173  
 174  
 175  
 176  
 177  
 178  
 179  
 180  
 181  
 182  
 183  
 184  
 185  
 186  
 187  
 188  
 189  
 190  
 191  
 192  
 193  
 194  
 195  
 196  
 197  
 198  
 199  
 200  
 201  
 202  
 203  
 204



**Figure 2.** Location of study in South Kalimantan. BN: Banjar; TP: Tapin; HS: Hulu Sungai Selatan; HT: Hulu Sungai Tengah; BL: Balangan; TG: Tabalong

**Table 1.** Characteristic of respondent

Characteristics	Data	Total	Percentage (%)
Sex	Male	77	37
	Female	135	64
Age	12-25	35	17
	26-45	65	31
	46-65	62	30
	> 65	48	23
Formal education	No educations	20	10
	Elementary school	48	23
	Secondary school	60	29
	High school	76	36
	University	6	3
Marital status	Single	27	13
	Married	167	80
	Widower	16	8
Occupation	Farmer	75	36
	Trader	25	12
	Laborer	46	22
	Employee	15	7
	Housewife	29	14
	Unemployed	20	10

## RESULTS AND DISCUSSION

### Socio-demographic characteristics

A total of 212-210 informants were included-participated in this study, comprising 135 men-males and 77 females-women. The educational background of informants ranged from elementary school to college education, but most informants graduate from high schools. The age range of the informants is-was 26-10 - 55-60+ years old, with the majority being 2619-4559 years old and married (Table 1).

Table 1. Characteristic of respondent informants

Characteristics	Data	Total	Percentage (%)
Sex	Male	77	3736.7
	Female	1353	6463.3
Age	12-2510-18	35	1716.7
	26-4519-59	65110	3152.4
	46-65 60+	6265	30.9
	≥65	48	23
Formal education	No educations	20	109.5
	Elementary school	48	2322.8
	Secondary school	60	2928.6
	High school	76	36.1
	University	6	3
Marital status	Single	27	1312.9
	Married	167	8079.5
	Widower	16	87.6
Occupation	Farmer	75	3635.7
	Trader	25	1211.9
	Laborer	46	2221.9
	Employee	15	7.2
	Housewife	29	1413.8
	Unemployed	20	109.5

Formatted: Indent: First line: 0 cm

### Morphology

The bark of *Kasturi*, has a grayish-white to light brown color, occasionally consisting of small cracks or gaps of  $\pm 1$  cm in the form of dead bark, which is similar to *Mangifera indica*. These plants can reach a height of 25-50 m or even more, with a stem diameter of  $\pm 40-115$  cm, without buttress roots. When injured, the bark emits sap which is initially clear, reddish, and black within a few hours. The sap contains turpentine and has a strong odor, capable of injuring the skin or causing irritation, particularly for sensitivity. The leaves are singular, glabrous, arranged in a spiral or tight spiral, long-stemmed, elongated lanceolate with a pointed tip. Both sides of the central leaves vein are characterized by 12-25 sides, without support, while the young leaves hang limp, and are dark purple.

*Kasturi* flowers are bisexual compounds, forming coralline flowers in panicles with numerous, actinomorphic, and often covered in dense hairs. The length of the flower stalk is  $\pm 28$  cm with a very short stalk of 2-4 mm, sitting on panicle branches, while the leaves are elongated ovate and 2-3 mm long. The crown leaves are elongated and the flowers smell sweet. The stamens are the same length as the corolla, and the staminodia are very short, resembling stamens stuck to the base of the flower (Rashedy 2014). *Kasturi* mango fruit is round to elliptical, weighing 60-84 g, 4.5-5.5 cm long, and 3.5-

3.9 cm wide. Furthermore, the flesh is yellow or orange, stringy, and the texture is slightly rough, the fruit tastes sweet, slightly sour, and has a distinctive aroma. The skin of the fruit when it is young is green, and turns blackish brown at an older age, with a smooth surface. The fruit is oval with a length/width ratio of 1.25-1.53. The thickness of the fruit skin is around 0.24 mm and the seeds are classified as stone seeds with thick walls. A single seed, occasionally with multiple embryos, is enveloped in a hardened, skin-like endocarp shell. [At the beginning of the rainy season or around January, this mango bears fruit. This mango bears fruit at the beginning of the rainy season or around January.](#)

#### Habitat

Based on observations at the location, *Kasturi* grows in the yards and fields of the Banjar tribe. Besides that, it is also found growing in secondary forests and on the banks of rivers. From the results of a survey conducted on several owners of *Kasturi*, it is known that the majority of these fruit plants were left over from the owners' parents, many of which grow wild (without cultivation technology), are up to 50 years old, and there has been no effort from the owners to carry out rejuvenation or seeding. Profile habitat of *Kasturi* is at an altitude (35-109 masl), air temperature (27,9 – 33,1 °C), humidity (64,3 - 86,9 %), light intensity (19.442 – 96.938 lux), soil temperature (27,1 - 32,8 °C), soil moisture (40,6 – 77,2 %), and soil pH (5,4 – 6,8) (Gunawan et al. 2022).

#### Local knowledge of *Mangifera casturi*

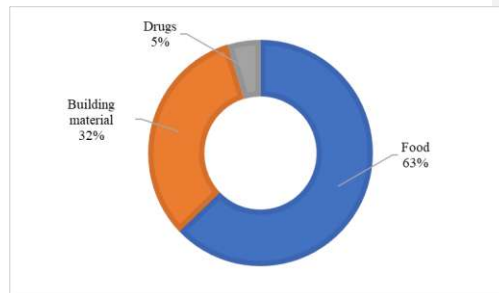
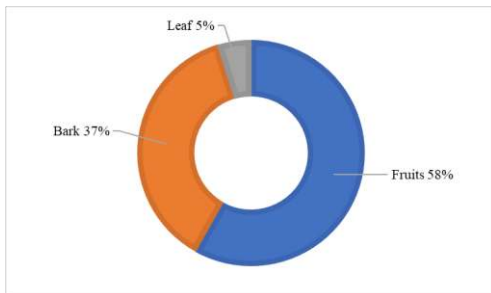
Mangoes have become an integral part of Indonesian life, offering economic, ~~ecological~~, health, and cultural benefits. The Javanese people have also been acquainted with mangoes for more than 10 centuries, as written in the Old Javanese Ramayana (Mulyanto et al. 2023). Similarly, the Banjar tribe in South Kalimantan has been using plants, including mangoes, during the time of their ancestors.

In this study, the values of F observed from the economic use and health aspects of *Kasturi* included: (i) ~~building construction~~ materials, (ii) food sources, (iii) economics, and (iv) medicine. Knowledge values of *Kasturi* as construction materials were found in 12.78% of teenagers, ~~8085.12%~~ of adults, as well as 100% of elderly ~~and old age~~, with all groups using plants as food sources (100%). Furthermore, knowledge of the economic values of *Kasturi* as fruit that sells in the market was found in ~~46.68% of children, 8589.431%~~ of teenagers, 100% of adults, ~~and~~ elders ~~and old age~~. As medicine in Banjarnese ethnic group, a proportion of 5% was observed in the ~~old elders~~ age, indicating significant health benefits, particularly as high uric acid.

~~Resulting fidelity level (FL) analysis. The result of the fidelity level (FL) analysis~~ showed that all age groups had 100% FL in using fruits of *Kasturi* as a local food source. The FL of *Kasturi* bark used was described as follows, ~~25.41%, 51.34%, 87.32%, 88.33%, and 100% among children, 51.34%, 89.54%, and 87.23% among~~ teenager, adult, ~~and elderly, and old age~~, respectively. Furthermore, the FL value of leaves had a proportion of 5% among ~~old age elderly~~ (Table 2).

Based on the results, the parts of the *Kasturi* plant that are widely used by the community include 58% fruits, 37% stems, and 5% leaves (Figure 3). The morphology characteristics show that the fruit flesh is dark orange, has a sweet and delicious taste. Moreover, the exceptional properties of the plant are evident in the fragrant fruit aroma, leading to the high preference by the majority population in South Kalimantan. Local people consume *Kasturi* fruit fresh and as a complement to fruit iced drinks. During the fruit season (November-January), the plant bears abundant fruit, with bunch prices ranging from IDR 20,000 to 25,000. Although the fruit flesh has a high water content (87.2%), acid levels (4.7%), and carbohydrates (12%) several other chemical components are low, such as protein (0.3%), fat (0.04%), starch (1.4%), total sugar (2%), and calories (9.6 cal/100g). The *Kasturi* fruit is a source of medicine due to its useful phytochemicals, including saponins, tannins, triterpenoids, flavonoids, polyphenols, and phenolics (Darmawan 2015).

Harvesting *Kasturi* fruit when ripe is crucial for maintaining aroma and color quality. When harvested prematurely, the thick and hard skin of the fruit cannot be stored for more than 6 days, experiencing weight loss from 5 to 17%. Furthermore, a decrease in texture is observed during storage, leading to a wrinkled appearance (Antarlina 2009). Another part used by the community is the stem (wood), serving as building material and containers. According to the informants, the wood quality is not excellent for building materials due to its softness, leading to rapid decay. Additionally, only 5% of informants identified the Banjar tribe's use of the leaves as medicine for treating gout. ~~Research conducted by Dewangga et al. 2014 stated that young mango leaves from *Mangifera foetida* L. contained acetic acid, which is essential in reducing uric acid.~~





301  
302  
303



307 **Figure 3.** A. Percentage part used of *Kasturi*. B. Percentage useful of *Kasturi* by Banjar tribe

**Commented [A1]:** Figure 3 should be quoted in the sentence or paragraph to indicate which sentence is being described by this figure  
**Formatted:** Font: Italic

308 **Table 2.** Part use and fidelity level of *Mangifera casturi*

Part use	Used	Fidelity Level (FL) %		
		Teenage rs	Adults	Elderly
Fruits	Food	100	100	100
Leaves	Medicine	-	-	5
Bark	construction materials	51.34	89.54	87.23

**Formatted:** Font: Not Italic

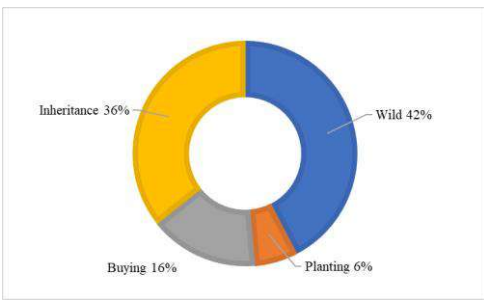
310  
311  
312 Every component of the *Mangifera* tree, including flowers, leaves, bark, fruit, peel, pulp, and seeds, possesses vital nutrients that can be utilized. Moreover, *Mangifera* peel comprises minerals, -fiber, and antioxidants (such as phenolic compounds like mangiferin, kaempferol, quercetin, and anthocyanins), while the mango seed kernel contains starch, fiber, lipids, sterols (like campesterol, stigmasterol, and  $\beta$ -sitosterol), and tocopherols (Juhnul et al. 2015). *Mangifera* has been used extensively employed in traditional medicine for the treatment of conditions such as, diabetes, diarrhea, dysentery, rheumatism, high blood pressure, and various skin diseases (Parvez, 2016). Table 2 demonstrates that *Kasturi* is not only a source of food and materials, but its parts also have medicinal potential..

320 **Table 2.** Content and potential of *Mangifera casturi* *Mangifera casturi* content and potential part

Part	Content	Potency
Skin	saponins, flavonoids, tannins, and steroids (Mutia and Wati 2018), distearil phosphite, Trans-13-octadecenoic acid, Heptadecane (Zulfina et al., 2021)	Anti-infectives, such as antiseptics, antibiotics, chemotherapy, contraception, antiasthmatic, bronchodilator, and medicine for bladder system illness (Zulfina et al., 2021).
Fruit	methyl gallate (sutomo et al. 2017), alpha hydroxy acid (Zulfina et al. 2021).	Antioxidants, Speed up the exfoliation of dead skin cells to promote soft and blemish-free skin
Leaf	terpenoid and polifenol (Darmawan 2015); alkaloid, terpenoid, flavonoid, saponin (Rahim et al. 2017), acetic acid (Dewangga et al. 2014).	Antioxidants and tannins exhibit antibacterial, antiviral, and antitumor activities, antioxidants (Sutomo et al. 2017)
Bark	terpenoid, steroid, and saponin (Rahim et al. 2017)	Antioxidants (Ramadhan et al., 2021),
Root	Saponin and tanin (Darmawan 2015)	Hypercholesterolemia, antioxidants, hyperglycemia, anticancer, antifungal, and anti-inflammatory properties

**Formatted:** Font: Italic  
**Formatted:** Normal

321  
322  
323 The Banjar tribe has not extensively cultivated *Kasturi*, with only a small population planting the seeds in gardens.-  
324 *Mangifera casturi* ('Kasturi'), *M. caesia* ('Binjai'), *M. foetida* ('Hambawang'), and *M. odorata* ('Kueni') have been  
325 cultivated by local farmers. In contrast, others are wild in the forest to obtain the stems and fruit (Ariffin et al. 2015).  
326 According to the survey, the Banjar tribe obtained *Kasturi* fruit through planting, inheritance, and purchasing at traditional  
327 markets, as well as from wild plants, as shown in Figure 4. The majority of informants reported obtaining the fruit from  
328 wild plants in their gardens, while trees were typically passed down from parents to children.- The fruit-bearing capacity  
329 was cited as the reason for the *Kasturi*'s existence, with many informants selling the fruit to collectors.- Specifically,  
330 buyers would climb the trees, and harvest the fruits, which are transported to the local market.



331  
332  
333  
334  
335  
336  
337

338  
339  
340  
341  
342  
343  
344  
345  
346  
347  
348  
349  
350  
351

Figure 4. Way to get *Mangifera casturi* by Banjar tribe

352

### Conservation strategies of *Kasturi*

353

*Kasturi* is a fruit plant endemic to South Kalimantan, that faces the threat of extinction due to the absence of local cultivation efforts and loss of *Kasturi*'s natural habitat due to land conversion to plantations and residential areas. Based on the survey conducted on several owners of *Kasturi* trees, it was discovered that most of these fruit were left over from their parents and have been growing wild without cultivation technology for approximately 50 years. However, there has been no effort from the owners to conduct rejuvenation or seeding. The cultivation is only carried out by plant collectors, causing a decline in the *Kasturi* and affecting both individual counts and genetic diversity. According to informants, the lack of cultivating *Kasturi* is attributed to the long fruiting period and thin flesh. Kiloes et al. (2014) expressed that the *Kasturi* was capable of developing into regional fruit, indicating factors such as small flesh relative to large seed size, a lengthy plant maturation age, and a short harvest period.

361

*Kasturi* has been assigned a classification in the IUCN Red List Categoriescategories. The World Conservation Monitoring Center assessment team decided that *Kasturi* should be listed was in the category extinct in situ of extinct in the wild (EW) category. Endemic fruit plants that are wild or have not been cultivated are often threatened by various human activities, such as the expansion of agricultural land, fires, conversion to plantations, and selective harvesting (Suwardi et al. 2020). In the case of Indonesia, mainly in the Kalimantan area-region, the depletion of forests can be attributed to the conversion of land for agricultural purposes (Busch & Ferretti-Gallon 2017), such as oil palm plantations, and mining. Restoration should be performed for the recuperation of forest ecosystems (Sofiah et al. 2018). According to Yang et al. (2013) habitat degradation, fragmentation, over-exploitation, and an increasing-growing human population, are crucial-critical factors responsible for species loss globallyworldwide.

370

Conservation strategies are essential to protect species from extinction. Based on research results, Several-several

371

efforts that can be made to protect the *Kasturi* from extinction include:

372

373

374

375

376

377

378

379

380

381

382

383

384

385

386

387

388

389

390

391

392

393

394

395

396

397

Formatted: Indent: First line: 0 cm

Formatted: Indent: First line: 0 cm



398 efforts should be sustained over time, ensuring the continuous preservation of *Kasturi* as the identity flora of South  
399 Kalimantan.

400 This study presents insights into the ethnobotanical knowledge of the Banjar tribe regarding the utilization of *Kasturi*.  
401 The findings contribute to advancements in science and technology, shedding light on the potential of tropical plants in  
402 Borneo, Indonesia. Furthermore, these results serve as a foundation for sustainable conservation efforts, aiming to  
403 empower the local community. Traditional knowledge can be used as a means for in-situ conservation. Some ~~locations-site~~  
404 that identified as having *Kasturi* can be protected from ~~logging deforestation~~ and prioritized for ~~conserving ation~~ *Kasturi*  
405 in ~~its~~ native habitats.

#### 406 ACKNOWLEDGMENTS

407 For all the support in this research, The authors would like to express their deep high appreciation and gratitude to the  
408 Rector of Lambung Mangkurat University for all the support in this research through Dosen Wajib Meneliti program  
409 (PDWM Grant No. 064.10/UN8.2/PG/2023). Thanks to all the village officials in the the research site for allowing us to  
410 conduct research, as well as the informants in this study. We also pay thanks to all parties involved in this present study.

#### 411 REFERENCES

412 Anggraheni YGD, Mulyaningsih ES. 2021. Diversity assessment of mango (*Mangifera* spp.) plant collection of Cibinong Germplasm Garden based on  
413 leaves morphology and RAPD markers. IOP Conference Series: Earth and Environmental Science. 715(1):\_012045. DOI:10.1088/1755-  
414 1315/715/1/012045.

415 Antarlina SS. 2009. Identifikasi sifat fisik dan kimia buah-buahan lokal Kalimantan. Buletin Plasma Nutffah 15: 80-90. [Indonesian].

416 Busch J, Ferretti Gallon K. 2017. What drives deforestation and what stops it? A meta-analysis. Rev Environ Econ Policy 11(1):3-23.  
417 DOI:10.1093/reep/rew013. [Indonesian]

418 Arifin Z, Sah MSM, Idris S, Hashim N. 2015. Genetic diversity of selected *Mangifera* species revealed by inter simple sequence repeats markers. Int J  
419 Biodivers. V (15): 1-8. DOI: 10.1155/2015/458237.

420

421 Busch J, Ferretti-Gallon K. 2017. What drives deforestation and what stops it? A meta-analysis. Rev Environ Econ Policy 11(1): 3-23.  
422 DOI:10.1093/reep/rew013.

423 Cao Y, Li R, Zhou S, Song L, Quan R, Hu H. 2020. Ethnobotanical study on wild edible plants used by three trans-boundary ethnic groups in Jiangcheng  
424 County, Pu'er, Southwest China. J Ethnobiol Ethnomed 16: 66. DOI: 10.1186/s13002-020-00420-1.

425 Cahyaningsih AP, Arifiani KN, Aprilia D, Nugroho ME, Setyawan AD. 2022. Ethnobotanical study of the non medicinal plant by village communities  
426 in the karst area of Pacitan, East Java, Indonesia. Int J Trop Drylands. 6 (1): 1-10 DOI: 10.13057/tropdrylands/060101.

427 Darmawan, A–R–B. 2015. Usaha Peningkatan Kualitas Mangga *Kasturi* (*Mangifera casturi*) dengan Modifikasi Budidaya Tanaman. Pros Sem Nas  
428 Masy Biodiv Indon., 1(4): 894–899. [Indonesian].

429 Desti, Isda MN, Fitrawati, Yulis PAR. 2019. Local wisdom of Ria u mascot flora (*Onchosperma tigillarum* (Jack) Ridl.) in Baganbatu,  
430 Bengkalis District Riau Indonesia. *Advances in Engineering Research Adv. Eng. Res.* 190: 92-95. DOI:10.2991/iceclst-st-19.2019.18.

431 Fitrawati, Hayati, & Sofiyanti-N. 2016. Using ITS as a Molecular Marker for Mangifera Species Identification in Central Sumatra. *Biodiversitas*.  
432 17(2): 653–656. DOI: 10.13057/biodiv/d170238.

433 Friedman J, Yaniv Z, Dafni A, Palewitch D. 1986. A preliminary classification of the healing potential of medicinal plants, based on  
434 arational analysis of an ethno pharmacological field survey among Bedouins in the Negev Desert, Israel. J Ethnopharmacol. 116: 275-87.  
435 DOI: 10.1016/0378-8741(86)90094-2.

436 Gunawan, Muhamat, Fadhila S, Olivia AF. 2022. Habitat characteristics of *Mangifera casturi* kosterm. In banjar district of south Kalimantan, Indonesia.  
437 RJOAS. 10(130): 83-90. DOI 10.18551/rjoas.2022-10.10.

438 [IUCN] International Union for Conservation of Nature. 2022. Available at [https://www.iucnredlist.org/sea\\_rch?taxonomies=101139searchType=species](https://www.iucnredlist.org/sea_rch?taxonomies=101139searchType=species).  
439 [Date accessed: 13 July 2022]

440 Jahurul MHA, Zaidul ISM, Ghafoor K, Al-Juhaimi FY, Nyam KL, Norulaini NAN, Sahena F, Omar MAK. 2015. Mango (*Mangifera indica* L.) by-  
441 products and their valuable components: A review. Food Chemistry 183: 173–180. DOI: 10.1016/j.foodchem.2015.03.046

442 [KEMENKES] Ministry of Health of the Republic of Indonesia. 2024. Available at <https://ayosehat.kemkes.go.id/home>. (Date accessed: 4 April 2024).  
443 //ayosehat.kemkes.go.id/home. (Date accessed: 4 April 2024).

444 Kloes AM, Yassar, Yassin M. 2015. *Kasturi: dari hutan ke pasar modern*. Jakarta (ID): IAARD Press. [Indonesian]

445 Kostermans AJGH & Bompard JM. 1993. The Mangoes: Teir Botany, Nomenclature, Horticulture, and Utilization (Academic Press).

446 Labdelhi A, De La Herrán R, Arafeh R, Resentini F, Trainotti L, Halls Y, Adda A, Merah O. 2020. Genetic variation in damaged populations of *Pistacia*  
447 *atlantica* Desf. Plants. 9: 1541–1552. DOI: 10.3390/plants9111541

448 Marchese C. 2015. Biodiversity hotspots: A shortcut for a more complicated concept. Glob Ecol Conserv 3:297-309. DOI: 10.1016/j.gecco.2014.12.008.

449 Monteiro JM, Albuquerque UP, LinsNeto EMF, Araújo EL, Amorim ELC. 2006. Use patterns and knowledge of medicinal species amongtwo rural  
450 communities in Brazil's Semi-Arid Northeastern Region. J Ethnopharmacol. 105:173-86. DOI: 10.1016/j.jep.2005.10.016

451 Mulyanto D, Supangkat B, Nurseto HE, Iskandar J. 2023. Ethnobotanical identification of mango (*Mangifera indica* L.) and other fruit trees mentioned in  
452 Old Javanese Ramayana (10th century Java, Indonesia). Biodiversitas 24(1): 609-916. DOI: 10.13057/biodiv/d240169

453 Parves GM. 2016. Pharmacological Activities of Mango (*Mangifera indica*): A Review. Journal of Pharmacognosy and Phytochemistry JPP. 1(53): 1–7.  
454 DOI: 10.22271/phyto.

455 Pieroni A, Anely N, Avni H, Mustafa B, Bruno S, Kevin C, Cassandra LQ. 2014. Local knowledge on plant and domestic remedies in the mountain  
456 village of Peshkopia (Eastern Albania). J Mt Sci. 11(1): 180-194. DOI: 10.1007/s11629-013-2651-3.

457 Rahim MA, Suartha IN, Sudmartini LM. 2017. Immunostimulatory effect of leaf extract *Kasturi* (*mangifera casturi*) in mice. Indonesia Medicus  
458 Veterinus. 6(1): 10-19. DOI: 10.19087/imv.2017.6.1.10

459 Ramadhan H, Rezky DP, Susiani EF. 2021. Penetapan Kandungan Total Fenolik-Flavonoid pada Fraksi Etil Asetat Kulit Batang *Kasturi* (*Mangifera*  
460 *casturi* Kosterman). *Farmasi Dan Ilmu Kefarmasian Indonesia*. 8(1): 58–67. DOI: 10.20473/jfiki.v8i12021.58-67. [Indonesian]

Formatted: Font: Italic

Formatted: Indent: Left: 0 cm, Hanging: 0.5 cm

Formatted: Font: Not Italic

Formatted: Font: 8 pt

Formatted: Font: 8 pt, Italic

Formatted: Font: 8 pt

Formatted: Normal, Indent: Left: 0 cm, Hanging: 0.5 cm

Formatted: Font: Not Italic

Formatted: Font: Not Italic

Formatted: Font: 8 pt

Formatted: Indent: Left: 0 cm, Hanging: 0.5 cm

Formatted: Font: Italic

Formatted: Font: 8 pt

Formatted: Indent: Left: 0 cm, Hanging: 0.5 cm

Formatted: Font: Italic

Formatted: Font: Not Italic

Formatted: Font: Not Italic

461 Rashedy A, El Kheshin M, Abd-Allatif A, M. (2014). Histological Parameters Related to Dwarfism in Some Mango Cultivars. *World J*  
 462 *Agric Sci.* 10: 216-222. DOI: 10.5829/idosi.wjas.2014.10.5.1826.

463 Sutomo, Armida, Yunus R, Wahyuono S, Setywati EP, Riyanto S. 2017. Isolation And Identification Of Active Compound Of Ethylacetate Fraction  
 464 Of *Kasturi (Mangifera casturi* Konsterm.) Fruit From South Kalimantan Indonesia. *Res. J. Pharm. Biol. Chem. Sci.* 8(1S): 251. DOI:  
 465 10.33887/rjpbcs.

466 Suwardi AB, Navia ZI, Harmawan T, Syamsuardi, Mukhtar E. 2020. Wild edible fruits generate substantial income for local people of the Gunung  
 467 Leuser National Park, Aceh Tamiang region. *Ethnobot Res Appl.* 20: 1-13. DOI: 10.32859/era.20.11.1-13.

468 Singh N-K. (2016). Origin, Diversity and Genome Sequence of Mango (*Mangifera indica* L.). *Indian Journal of History of Science.* 51(2.2):355-368.  
 469 DOI:10.16943/ijhs/2016/v51i2.2/48449.

470 Sofiah S, Metusala D, Trimanto, Nurfadilah S. 2018. Flora Diversity, Composition And Ecology In Besiq Bermai Tropical Forest of Damai District, East  
 471 Kalimantan. *Biotropia.* 25 (2): 85 - 94. DOI: 10.11598/btb.2018.25.2.724.

472 Supiandi MI, Mahanal S, Zubaidah S, Julung H, Ege B. 2019. Ethnobotany of traditional medicinal plants used by Dayak Desa Community in Sintang,  
 473 West Kalimantan, Indonesia. *Biodiversitas.* 20(5): 1264-1270. DOI: 10.13057/biodiv/d200516.

474 Susiarti S, Rahayu M, Kuncari ES, Astuti IP. 2020. Utilization of "Benda" (*Arthocarpus elasticus* Reinw. Ex Blume) in Bogor, West Java,  
 475 Indonesia: An Ethnobotanical Case Study). *Journal of Tropical biology and Conservation* 17: 297 - 307. DOI: 10.51200/jtbc.v17i.2670.

476 Tallei TE, Pelealu JJ, Pollo HN, Pollo GAV, Adam AA, Effendi Y, Karuniawan A, Rahimah, Idroes R. 2019. Ethnobotanical dataset of local  
 477 edible fruits in North Sulawesi, Indonesia. *Journal of Data in Brief* 27: 1- 12. DOI: 10.1016/j.dib.2019.104681.

478 Tamalene MN, Muhdhar MHIA, Suarsini E, Rahman E, Hasan S. 2016. Ethnobotany of Canarium plant species used by Tobelo Dalam (Togutil) ethnic  
 479 community of Halmahera Island, Indonesia. Biodiversitas 17(1): 61-69. DOI: 10.13057/biodiv/d170109.

480

481 Yamini THA, Djuita NR, Chikmawati T, Purwanto Y. 2023. Ethnobotany of wild and semi-wild edible plants of the Madurese Tribe in Sampang and  
 482 Pamekasan Districts, Indonesia. *Biodiversitas* 24: 947-957. DOI:10.13057/biodiv/d240234.

483 Yang XQ, Kushwaha SPS, Saran S, Xu J, Roy PS. 2013. Maxent modeling for predicting the potential distribution of medicinal plant *Justicia adhatoda*  
 484 L: in Lesser Himalayan foothills. *Ecol Eng.* 51:83- 87. DOI: 10.1016/j.ecoleng.2012.12.004.

485 Yusro, Fathul, Yeni M, Farah D, Kazuhiro. 2014. Inventory of medicinal plants for fever used by four Dayak Sub Ethnic in West Kalimantan, Indonesia.  
 486 *Kuroshio Sci.* 8(1): 33-38.

487 Zulfina S-, Fathoni MAN, Poerwanto R, Matra DD. 2021. Characterization of secondary metabolites in *Kasturi* mango (*Mangifera casturi*) using gas  
 488 chromatography-mass spectrometry. *IOP Conf. Ser.: Earth Environ. Sci.* 948 012059. DOI:10.1088/1755-1315/948/1/012059 4.

489

490

491

492

Formatted: Font: Not Italic

Formatted: Font: Not Italic

Formatted: Font: Italic

Formatted: Font: Not Italic

Formatted: Font: Not Italic

Formatted: Font: Italic

Formatted: Indent: Left: 0 cm, First line: 0 cm

Formatted: Font: Italic

Formatted: Font: Italic

16591 / GUNAWAN et al. / Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan

Library

Submissions

Workflow

Publication

Submission

Review

Copyediting

Production

Round 1

Round 2

Round 3

Round 4

Round 5

Round 6

Round 4 Status

New reviews have been submitted and are being considered by the editor.

Notifications

[biodiv] Editor Decision




2023-11-27 11:19 PM

[biodiv] Editor Decision

2024-04-01 08:14 AM

[biodiv] Editor Decision

2024-04-14 02:45 AM

 1109797-1	, <a href="#">16591-Article Text-1109659-1-4-20240218.doc</a>	February 19, 2024
 1109798-1	, <a href="#">Ithenticate Check.pdf</a>	February 19, 2024
<b>Revisions</b>		
 1113732-1	<a href="#">Article Text, 16591-1113722-1-5-20240401.doc</a>	April 1, 2024 Article Text

[Search](#)

[Upload File](#)

Review Discussions			<a href="#">Add discussion</a>	
Name	From	Last Reply	Replies	Closed
<a href="#">Uncorrected proof</a>	atriyanto1 2024-04-08 06:11 AM	gunawanulm 2024-04-08 07:03 AM	1	<input type="checkbox"/>
<a href="#">BILLING</a>	dewinurpratiwi 2024-04-08 06:32 AM	dewinurpratiwi 2024-04-22 07:10 AM	3	<input type="checkbox"/>

Platform &  
workflow by  
OJS / PKP



Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;

---

**[biodiv] Editor Decision**

---

**Smujo Editors via SMUJO** <support@smujo.com>

Mon, Apr 1, 2024 at 4:14 PM

Reply-To: Smujo Editors &lt;editors@smujo.id&gt;

To: Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;, Magfiroh Magfiroh &lt;magfiroh.net@gmail.com&gt;, Muhamat Muhamat &lt;muhamat@ulm.ac.id&gt;

Gunawan Gunawan, Magfiroh Magfiroh, Muhamat Muhamat:

We have reached a decision regarding your submission to Biodiversitas Journal of Biological Diversity, "Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm) by Banjar Tribe in South Kalimantan, Indonesia". Complete your revision with a Table of Responses containing your answers to reviewer comments (for multiple comments) or enable Track Changes.

Our decision is: Revisions Required

-----  
Reviewer A:

I thought the editorial office had been wrong in attaching the revised version from the author(s). I was thinking that this attached file was a review from another reviewer.

Recommendation: Revisions Required  
-----

---

[Biodiversitas Journal of Biological Diversity](#)

Caution: This e-mail (including attachments, if any) is sent by system and only intended for the recipients listed above. If you are not the intended recipient, then you are not permitted to use, distribute, distribute, or duplicate this e-mail and all its attachments. Please cooperate to immediately notify Smujo International and delete this e-mail and all attachments. This email was sent due to, your email is listed as participant on Biodiversitas Journal of Biological Diversity.



Gunawan Gunawan <gunawan@ulm.ac.id>

---

## [biodiv] Editor Decision

---

**Gunawan Gunawan** <gunawan@ulm.ac.id>  
To: Smujo Editors <editors@smujo.id>

Tue, Apr 2, 2024 at 10:08 AM

Thank you for your email  
I will complete the revision as soon as I send my manuscript.

thank you  
Gunawan  
[Quoted text hidden]

## Ethnobotany and conservation of *Kasturi* (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan, Indonesia

GUNAWAN\*, MUHAMAT, MAGHIROH

Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Lambung Mangkurat. Jl. A. Yani Km 36.4, Banjarbaru 70714, South Kalimantan, Indonesia. Tel./fax.: +62-511-4773112, \*email: gunawan@ulm.ac.id

Manuscript received: 25 November 2023. Revision accepted: xxx April 2024.

**Abstract.** Gunawan, Muhamat, Maghfiroh. 2024. Ethnobotany and conservation of *Kasturi* (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan, Indonesia. *Biodiversitas* 25: xxxx. *Kasturi* (*Mangifera casturi* Koesterm.) is a local fruit and has become the identity flora of South Kalimantan. This study aimed to investigate the knowledge of the Banjar tribe community and formulate a conservation strategy for *Kasturi* as the identity flora of South Kalimantan. Data on ethnobotanical knowledge were collected through interview technique. There were two types of informant: Key informants and additional informants. Key informants were selected through snowball sampling technique while additional informants were selected a combination snowball sampling and purposive sampling technique. The informants in this study have different background: Sex, age, job, marital status, and educational levels. The informants were grouped based on their age: teenagers (10-18 years), adults (19-59 years), and elders (60+ years). Data were analyzed using the formula of *Kasturi* plant parts usage (F), Fidelity Level (FL). All data collected were analyzed descriptively and presented in tables or diagrams. The Banjar tribe used *M. casturi* as source of food (63%), building material (32%), and drugs (5%). The parts of the *Kasturi* plant that are widely used by the community are fruit, which is 58%, stems are 37%, and leaves are 5%. The values of F (the frequency of parts of *Kasturi* used) observed from the economic use and health aspects of *Kasturi* include: building materials, food sources, economic and medicine. The value of F for economic use are 12.78% - 100% and the value F for health aspect are 5%. The result of Fidelity Level (FL) analysis proves that all age groups had 100% of FL in utilizing fruits of *Kasturi* as local food source. The FL of *Kasturi* bark used is described as follows: 51.34% among teenagers, 89.54% among adults, 87.23% among elder as building materials. The FL value of leaf described 5% among elder. Most of the Banjar tribe get *Kasturi* fruit from plants that grow wild in their yards (42%) and only 6% have planted. The research indicated that *M. casturi* had high utility value for Banjar tribe. All parts of the plant (fruits, bark, and leaves) were exploited for economic and health. Conservation of *Kasturi* can be performed by: 1. Network development and collaboration for conservation efforts, 2. Ex-situ conservation, 3. Intensification of socialization and publication of *Kasturi*'s uses, and 4. Environmental education. The result of the study can be used for management conservation of *M. casturi* to ensure the availability in the future.

**Keywords:** Banjar, conservation, endemic, ethnobotany, *Kasturi*

### INTRODUCTION

Indonesia is a tropical country characterized by a high diversity of fruit with numerous benefits. Among several regions in the country, Kalimantan, also called Borneo, has been identified as one of the 24 other hotspots of flora diversity globally (Marchese 2015). In the diverse flora Kalimantan, *Mangifera* is an important genus of *Anacardiaceae*, a plant family producing several commercial fruits globally (Fitmawati et al. 2016). *Mangifera* holds the second rank among tropical fruits renowned for their exceptional taste, color, and diversity, following bananas (Singh et al. 2016). Globally, this genus comprises around 69 species, with 30 of them being endemic to Indonesia (Anggraheni and Mulyaningsih 2021). Based on IUCN data (2022), two Borneo-endemic species, *Mangifera casturi* Kosterm. and *M. rubropetala* Kosterm., have already become extinct in their natural habitats.

*Mangifera casturi*, known as *Kasturi*, is a native and endemic plant from Kalimantan, particularly South Kalimantan (Kostermans and Bompard 1993). The species went extinct due to the destruction of its native habitat. The

decline of *Kasturi* mango population is attributed to the felling of various local mango fruit trees, including *Kasturi*, to be used as building materials. This significant population reduction has led to the scarcity or complete disappearance of the plants. Additionally, forest exploitation in the form of illegal logging and clearing forests for settlements and plantations (oil palm) can damage the ecosystem, including the natural habitat of mango fruit plants.

Continued population decline and loss of *Kasturi*'s natural habitat could lead to the species' extinction. One of the efforts for conservation is through revealing the benefits of the species through ethnobotanical studies. Ethnobotany is a study that reveals the relationship between humans and plants and the use of plants by certain ethnicities. The results of ethnobotanical research can be used as basic data for conservation efforts and sustainable utilization of biological resources. Yusro et al. (2014) stated that local knowledge of the community needs to be maintained because it is very valuable for preserving biodiversity in Kalimantan forests. In this context, several biodiversity conservation strategies have been developed, such as the inventory of plant use, cultivation and



conservation through ethnobotany (Supiandi et al. 2019). Hence, the ethnobotanical study is anticipated to play a role in bolstering cultural sustainability in plant utilization. The knowledge within local communities also enhances advancements in science and technology, offering scientific methodologies that can be expanded upon for future sustainable applications (Cao et al. 2020).

*Kasturi* as endangered Kalimantan endemic has fragrant fruit and a sweet taste characterized by small-sized fruit with colors ranging from yellow-orange to purple-black. The Decree of the Minister of Indonesia No. 48 issued in 1989 designated *Kasturi* as the flora identity of South Kalimantan Province (Darmawan 2015). This is due to the popularity of the fruit, leading to rapid market sales during the fruiting season. Kalimantan Island is divided into five provinces, including South Kalimantan Province which majorly consists of the majority of the Banjar tribe. The Meratus Mountains area in South Kalimantan is home to an indigenous group called the Meratus Mountains Dayak or Bukit Dayak tribe. In recent years, ethnobotanical research has significantly increased in the field of pharmaceuticals and conservation programs globally, influencing biodiversity conservation (Pieroni et al. 2014), and the discovery of new food sources, health, and culture (Tamalene et al. 2016). Traditionally, relationship between *Kasturi* and local community has been established as a consume fruit. Thus, ethnobotany of the *Kasturi* can be explored in the form the relationship between humans and plants to provide insights about the traditional local knowledge of the community regarding plants use to become valid information.

The decline of *Kasturi* population, which leads to extinction, may result in the loss of the benefits of *Kasturi*. Therefore, this study aims to reveal the utilization of *Kasturi* by the Banjar tribe and provide recommendations for *Kasturi* conservation strategies as a typical flora of South Kalimantan.

## MATERIALS AND METHODS

### Study area

The research was conducted in December 2022-July 2023 in South Kalimantan. Surveys were conducted in areas that were selected based on having the Banjar tribe, including district Banjar (BN), Tapin (TP), Hulu Sungai Selatan (HS), Hulu Sungai Tengah (HT), Balangan (BL), and Tabalong (Figure 2). The geographic scope of this study includes the area of approximately 1°21'49" S-1°10'14" S and 114°19'33"E-116°33'28"E.

### Data collection and analysis

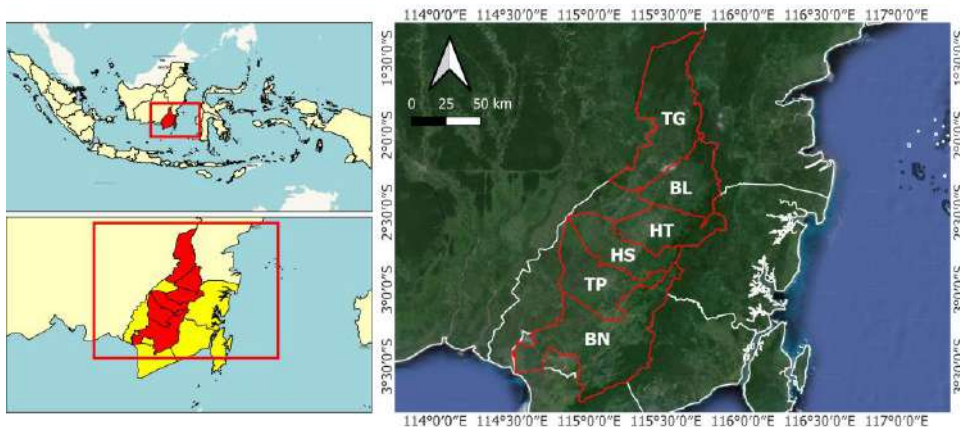
This study was carried out using a qualitative method with an ethnobotanical approach. Qualitative data were collected through open-ended, semi-structured, and structured interviews conducted at the homes of key and additional informants. Key informants were selected through snowball sampling based on information from the village head. Additional informants were selected using a combination of snowball and purposive sampling with the following criteria: (i) informants who have used *Kasturi*

plants; (ii) informants who know about the use of *Kasturi* plants (Al Yamini et al. 2023). Firstly, additional informants were obtained based on the recommendations of previous key informants, and secondly, the informants were screened to ensure that they met the predetermined criteria. The data collection process begins with the identification of key informants and ordinary informants who have knowledge about *Kasturi*.

The analysis included 212 informants, with 35 individuals from each district, representing diverse backgrounds in terms of sex, age, job, marital status, and educational levels (Susiarti et al. 2020). The participants were classified into different age groups, namely teenagers (10-18 years), adults (19-59 years), and the elderly (60+ years), as indicated in Table 1 (Kemenkes 2024). Ethnobotanical information encompassed the identification, habitat characteristics, techniques for obtaining *Kasturi*, cultivation methods, and its various uses (Desti et al. 2019). *Kasturi* specimens were collected in the field. Voucher specimens are kept at the Biosystematics Laboratory of Lambung Mangkurat University. The identification process uses the Mango Book (Kostermans and Bompard 1993) by matching the morphological characteristics of the specimen with the morphological characteristics in the book. The gathered data underwent descriptive analysis and was presented through tables or diagrams (Tallei et al. 2019). Descriptive statistical analysis was also used to describe/analyze parts of the *Kasturi* plant, which were often used for economic, and medical.



Figure 1. Tree and fruit of *Mangifera casturi*



**Figure 2.** Location of study in South Kalimantan: BN: Banjar, TP: Tapin, HS: Hulu Sungai Selatan, HT: Hulu Sungai Tengah, BL: Balangan, TG: Tabalong

The frequency of *Kasturi* plant parts usage was assessed by gauging informant responses using the following formula:

$$F = \frac{S}{N} \times 100;$$

Where :

S : Number of informants with positive responses regarding plant parts used

N : Total number of informants

The formula elucidated by Monteiro et al. (2006) was employed to assess the level of consensus among the informants regarding the plant parts utilized.

The Fidelity Level (FL), employed to understand the specific purposes of using particular plant parts, was computed using the formula recommended by Friedman et al. (1986):

$$FL (\%) = \frac{n}{N} \times 100$$

Where :

n : Number of informants for a specific use

N : Total number of informants

## RESULTS AND DISCUSSION

### Socio-demographic characteristics

A total of 210 informants participated in this study, comprising 135 males and 77 females. The educational background of informants ranged from elementary school to college education, but most informants graduate from high schools. The age range of the informants was 10-60+ years old, with the majority being 19-59 years old and married (Table 1).

### Morphology

The bark of *Kasturi*, has a grayish-white to light brown color, occasionally consisting of small cracks or gaps of  $\pm 1$  cm in the form of dead bark, which is similar to *Mangifera indica*. These plants can reach a height of 25-50 m or even more, with a stem diameter of  $\pm 40$ -115 cm, without buttress roots. When injured, the bark emits sap which is initially clear, reddish, and black within a few hours. The sap contains turpentine and has a strong odor, capable of injuring the skin or causing irritation, particularly for sensitivity. The leaves are singular, glabrous, arranged in a spiral or tight spiral, long-stemmed, elongated lanceolate with a pointed tip. Both sides of the central leaves vein are characterized by 12-25 sides, without support, while the young leaves hang limp, and are dark purple.

*Kasturi* flowers are bisexual compounds, forming coralline flowers in panicles with numerous, actinomorphic, and often covered in dense hairs. The length of the flower stalk is  $\pm 28$  cm with a very short stalk of 2-4 mm, sitting on panicle branches, while the leaves are elongated ovate and 2-3 mm long. The crown leaves are elongated and the flowers smell sweet. The stamens are the same length as the corolla, and the staminodia are very short, resembling stamens stuck to the base of the flower (Rashedy et al. 2014). *Kasturi* mango fruit is round to elliptical, weighing 60-84 g, 4.5-5.5 cm long, and 3.5-3.9 cm wide. Furthermore, the flesh is yellow or orange, stringy, and the texture is slightly rough, the fruit tastes sweet, slightly sour, and has a distinctive aroma. The skin of the fruit when it is young is green, and turns blackish brown at an older age, with a smooth surface. The fruit is oval with a length/width ratio of 1.25-1.53. The thickness of the fruit skin is around 0.24 mm and the seeds are classified as stone seeds with thick walls. A single seed, occasionally with multiple embryos, is enveloped in a hardened, skin-like endocarp shell. At the beginning of the rainy season or around January, this mango bears fruit.

### Habitat

Based on observations at the location, *Kasturi* grows in the yards and fields of the Banjar tribe. Besides that, it is also found growing in secondary forests and on the banks of rivers. From the results of a survey conducted on several owners of *Kasturi*, it is known that the majority of these fruit plants were left over from the owners' parents, many of which grow wild (without cultivation technology), are up to 50 years old, and there has been no effort from the owners to carry out rejuvenation or seeding. Profile habitat of *Kasturi* is at an altitude (35-109 masl), air temperature (27.9-33.1°C), humidity (64.3-86.9%), light intensity (19.442-96.938 lux), soil temperature (27.1-32.8°C), soil moisture (40.6-77.2 %), and soil pH (5.4-6.8) (Gunawan et al. 2022).

### Local knowledge of *Mangifera casturi*

Mangoes have become an integral part of Indonesian life, offering economic, health, and cultural benefits. The Javanese people have also been acquainted with mangoes for more than 10 centuries, as written in the Old Javanese Ramayana (Mulyanto et al. 2023). Similarly, the Banjar tribe in South Kalimantan has been using plants, including mangoes, during the time of their ancestors.

In this study, the values of F observed from the economic use and health aspects of *Kasturi* included: (i) building materials, (ii) food source, (iii) economic, and (iv) medicine. Knowledge values of *Kasturi* as construction materials were found in 12.78% of teenagers, 85.12% of adults, as well as 100% of elderly, with all groups using plants as food sources (100%). Furthermore, knowledge of the economic values of *Kasturi* as fruit that sells in the market was found in 89.19% of teenagers, 100% of adults, and elders. As medicine in Banjarnese ethnic group, a proportion of 5% was observed in the elders age, indicating significant health benefits, particularly as high uric acid.

Resulting Fidelity Level (FL) analysis showed that all age groups had 100% FL in using fruits of *Kasturi* as a local food source. The FL of *Kasturi* bark used was described as follows, 51.34%, 89.54%, and 87.23% among teenager, adult, and elderly respectively. Furthermore, the FL value of leaves had a proportion of 5% among elderly (Table 2).

Based on the results, the parts of the *Kasturi* plant that are widely used by the community include 58% fruits, 37% stems, and 5% leaves (Figure 3). The morphology characteristics show that the fruit flesh is dark orange, has a sweet and delicious taste. Moreover, the exceptional properties of the plant are evident in the fragrant fruit aroma, leading to the high preference by the majority population in South Kalimantan. Local people consume *Kasturi* fruit fresh and as a complement to fruit iced drinks. During the fruit season (November-January), the plant bears abundant fruit, with bunch prices ranging from IDR 20,000 to 25,000. Although the fruit flesh has a high water content (87.2%), acid levels (4.7%), and carbohydrates (12%) several other chemical components are low, such as protein (0.3%), fat (0.04%), starch (1.4%), total sugar (2%), and calories (9.6 cal/100g). The *Kasturi* fruit is a source of medicine due to its useful phytochemicals, including saponins, tannins, triterpenoids, flavonoids, polyphenols, and phenolics (Darmawan 2015).

Harvesting *Kasturi* fruit when ripe is crucial for maintaining aroma and color quality. When harvested prematurely, the thick and hard skin of the fruit cannot be stored for more than six days, experiencing weight loss from 5 to 17%. Furthermore, a decrease in texture is observed during storage, leading to a wrinkled appearance (Antarlina 2009). Another part used by the community is the stem (wood), serving as building material and containers. According to the informants, the wood quality is not excellent for building materials due to its softness, leading to rapid decay. Additionally, only 5% of informants identified the Banjar tribe's use of the leaves as medicine for treating gout.

Every component of the *Mangifera* tree, including flowers, leaves, bark, fruit, peel, pulp, and seeds, possesses vital nutrients that can be utilized. Moreover, *Mangifera* peel comprises minerals, fiber, and antioxidants (such as phenolic compounds like mangiferin, kaempferol, quercetin, and anthocyanins), while the mango seed kernel contains starch, fiber, lipids, sterols (like campesterol, stigmasterol, and  $\beta$ -sitosterol), and tocopherols (Jahurul et al. 2015). *Mangifera* has been used extensively in traditional medicine for the treatment of conditions such as, diabetes, diarrhea, dysentery, rheumatism, high blood pressure, and various skin diseases (Parves 2016). Table 2 demonstrates that *Kasturi* is not only a source of food and materials, but its parts also have medicinal potential. Several previous studies have publicized the potential of *Kasturi* derived from several parts of the *Kasturi* as antioxidant, anticancer, antifungal, and anti-inflammatory properties (Table 3).

Formatted: Font: Italic

Formatted: Font: Italic

**Table 1.** Characteristic of informants

Characteristics	Data	Total	Percentage (%)
Sex	Male	77	36.7
	Female	133	63.3
Age	10-18	35	16.7
	19-59	110	52.4
	60+	65	30.9
Formal education	No educations	20	9.5
	Elementary school	48	22.8
	Secondary school	60	28.6
	High school	76	36.1
Marital status	University	6	3
	Single	27	12.9
	Married	167	79.5
Occupation	Widower	16	7.6
	Farmer	75	35.7
	Trader	25	11.9
	Laborer	46	21.9
	Employee	15	7.2
	Housewife	29	13.8
	Unemployed	20	9.5

**Table 2.** Part use and fidelity level of *Mangifera casturi*

Part use	Used	Fidelity Level (FL) %
----------	------	-----------------------

		Teenagers	Adults	Elderly					
Fruits	Food	100	100	100	Bark	Construction materials	51.34	89.54	87.23
Leaves	Medicine	-	-	5					

Table 3. *Mangifera casturi* content and potential part

Part	Content	Potency
Skin	Saponins, flavonoids, tannins, and steroids (Mutta and Wati 2018; Zulфина et al. 2021), distearil phosphite, Trans-13-octadecenoic acid, Heptadecane (Zulфина et al. 2021)	Anti-infectives, such as antiseptics, antibiotics, chemotherapy, contraception, antiasthmatic, bronchodilator, and medicine for bladder system illness (Zulфина et al. 2021)
Fruit	Methyl gallate (Sutomo et al. 2017), alpha hydroxy acid (Zulфина et al. 2021)	Antioxidants, Speed up the exfoliation of dead skin cells to promote soft and blemish-free skin
Leaf	Terpenoid and polifenol (Darmawan 2015); alkaloid, terpenoid, flavonoid, saponin (Rahim et al. 2017)	Antioxidants and tannins exhibit antibacterial, antiviral, and antitumor activities, antioxidants (Sutomo et al. 2017)
Bark	Terpenoid, steroid, and saponin (Rahim et al. 2017)	Antioxidants (Ramadhan et al. 2021),
Root	Saponin and tannin (Darmawan 2015)	Hypercholesterolemia, antioxidants, hyperglycemia, anticancer, antifungal, and anti-inflammatory properties

Commented [Acer1]: Please mention it at the text

Commented [Acer2]: Please write the reference from this citation

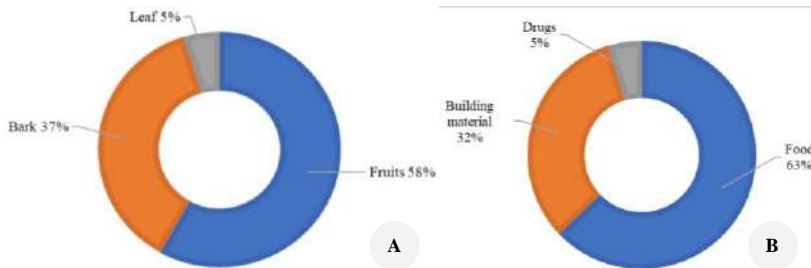


Figure 3. A. Percentage part used of *Kasturi*, B. Percentage useful of *Kasturi* by Banjar tribe

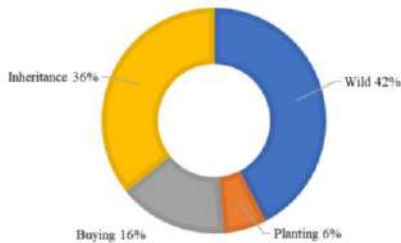


Figure 4. Way to get *Mangifera casturi* by Banjar tribe

The Banjar tribe has not extensively cultivated *Kasturi*, with only a small population planting the seeds in gardens. *Mangifera casturi* ('Kasturi'), *M. caesia* ('Binjai'), *M. foetida* ('Hambawang'), and *M. odorata* ('Kueni') have been cultivated by local farmers. In contrast, others are wild in the forest to obtain the stems and fruit (Ariffin et al. 2015). According to the survey, the Banjar tribe obtained *Kasturi* fruit through planting, inheritance, and purchasing at traditional markets, as well as from wild plants, as shown in Figure 4. The majority of informants reported obtaining the fruit from wild plants in their gardens, while trees were typically passed down from parents to children. The fruit-

bearing capacity was cited as the reason for the *Kasturi*'s existence, with many informants selling the fruit to collectors. Specifically, buyers would climb the trees, and harvest the fruits, which are transported to the local market.

**Conservation strategies of *Kasturi***

*Kasturi* is a fruit plant endemic to South Kalimantan, that faces the threat of extinction due to the absence of local cultivation efforts and loss of *Kasturi*'s natural habitat due to land conversion to plantations and residential areas. Based on the survey conducted on several owners of *Kasturi* trees, it was discovered that most of these fruits were left over from their parents and have been growing wild without cultivation technology for approximately 50 years. However, there has been no effort from the owners to conduct rejuvenation or seeding. The cultivation is only carried out by plant collectors, causing a decline in the *Kasturi* and affecting both individual counts and genetic diversity. According to informants, the lack of cultivating *Kasturi* is attributed to the long fruiting period and thin flesh.

*Kasturi* has been assigned a classification in the IUCN Red List categories. The World Conservation Monitoring Center assessment team decided that *Kasturi* should be listed in the category extinct in situ of extinct in the wild (EW) category. Endemic fruit plants that are wild or have not been cultivated are often threatened by various human activities, such as the expansion of agricultural land, fires, conversion to plantations, and selective harvesting (Suardi

et al. 2020). In the case of Indonesia, mainly in the Kalimantan area, the depletion of forests can be attributed to the conversion of land for agricultural purposes (Busch and Ferretti-Gallon 2017), such as oil palm plantations, and mining. Restoration should be performed for the recuperation of forest ecosystems (Sofiah et al. 2018). According to Yang et al. (2013) habitat degradation, fragmentation, over-exploitation, and a growing human population, are critical factors responsible for species loss worldwide.

Conservation strategies are essential to protect species from extinction. Based on research results, several efforts that can be made to protect the *Kasturi* from extinction include:

#### Network development and collaboration

These conservation efforts require collaboration from various parties, including academics, government companies, private companies, related agencies, and local governments. The success of conservation really depends on the role of each of these parties. Through collaboration, land conversion can be reduced

#### Ex-situ conservation

The development of regional botanical gardens will greatly assist conservation efforts. Botanical gardens are not subject to land conversion, they can protect endemic species that are already highly endangered or extinct in their natural habitat.

#### Socialization and publication the benefit of *Kasturi*

Socializing the benefits of *Kasturi* as a food source, building material, and medicine to the local community will increase the local community's knowledge and information about *Kasturi*. Increased knowledge and information about *Kasturi* is expected to encourage local communities to plant *Kasturi*. Socialization can be conducted by the local government or related agencies.

#### Environmental education

Environmental education can be carried out starting from elementary school, junior high school and senior high school levels. This will increase knowledge and the importance of biological resources for human interests, as well as the importance of conservation efforts towards biological resources, include *Kasturi*.

This study presents insights into the ethnobotanical knowledge of the Banjar tribe regarding the utilization of *Kasturi*. The findings contribute to advancements in science and technology, shedding light on the potential of tropical plants in Borneo, Indonesia. Furthermore, these results serve as a foundation for sustainable conservation efforts, aiming to empower the local community. Traditional knowledge can be used as a means for in-situ conservation. Some site that identified as having *Kasturi* can be protected from logging and prioritized for conserving *Kasturi* in its native habitats.

## ACKNOWLEDGMENTS

For all the support in this research, the authors would like to express their deep appreciation and gratitude to the Rector of Lambung Mangkurat University through *Dosen Wajib Meneliti* program (PDWM Grant No. 064.10/UN8.2/PG/2023). Thanks to all the village officials in the the research site for allowing us to conduct research, as well as the informants in this study. We also pay thanks to all parties involved in this present study.

## REFERENCES

- Al Yamini TH, Djuita NR, Chikmawati T, Purwanto Y. 2023. Ethnobotany of wild and semi-wild edible plants of the Madurese Tribe in Sampang and Pamekasan Districts, Indonesia. *Biodiversitas* 24 (2): 947-957. DOI: 10.13057/biodiv/d240234.
- Angraheni YGD, Mulyaningsih ES. 2021. Diversity assessment of mango (*Mangifera* spp.) plant collection of Cibinong germplasm garden based on leaves morphology and RAPD markers. *IOP Conf Ser: Earth Environ Sci* 715: 012045. DOI: 10.1088/1755-1315/715/1/012045.
- Antarlina SS. 2009. Identifikasi sifat fisik dan kimia buah-buahan lokal Kalimantan. *Buletin Plasma Nutfah* 15: 80-90. DOI: 10.21082/blpn.v15n2.2009.p80-90. [Indonesian]
- Ariffin Z, Sah MSM, Idris S, Hashim N. 2015. Genetic diversity of selected *Mangifera* species revealed by inter simple sequence repeats markers. *Intl J Biodivers* 2015: 458237. DOI: 10.1155/2015/458237.
- Busch J, Ferretti-Gallon K. 2017. What drives deforestation and what stops it? A meta-analysis. *Rev Environ Econ Policy* 11 (1): 3-23. DOI: 10.1093/reep/rew013.
- Cao Y, Li R, Zhou S, Song L, Quan R, Hu H. 2020. Ethnobotanical study on wild edible plants used by three trans-boundary ethnic groups in Jiangcheng County, Pu'er, Southwest China. *J Ethnobiol Ethnomed* 16 (1): 66. DOI: 10.1186/s13002-020-00420-1.
- Darmawan ARB. 2015. Usaha peningkatan kualitas mangga *Kasturi* (*Mangifera casturi*) dengan modifikasi budidaya tanaman. *Pros Sem Nas Masy Biodiv Indon* 1 (4): 894-899. DOI: 10.13057/psnmbi/m010442. [Indonesian]
- Desti, Fitmawati, Yulis PAR, Isda MN. 2019. Local wisdom of Riau mascot flora (*Onchosperma tigillarum* (Jack) Ridl.) in Baganbatu, Bengkalis District Riau Indonesia. In: Chan APC, Hong W-C, Mellal MA, Narayanan R, Nguyen QN, Ong HC, Sachsenmeier P, Sun Z, Ullah S, Wu J, Zhang W (eds). *Advances in Engineering Research: Proceedings of the International Conference of CELSciTech 2019 - Science and Technology track (ICCELST-ST 2019)*. Universitas Muhammadiyah Riau, 2019. DOI: 10.2991/iccelst-st-19.2019.18.
- Fitmawati, Hayati I, Sofiyanti N. 2016. Using ITS as a molecular marker for *Mangifera* species identification in Central Sumatra. *Biodiversitas* 17 (2): 653-656. DOI: 10.13057/biodiv/d170238.
- Friedman J, Yaniv Z, Dafni A, Palewitch D. 1986. A preliminary classification of the healing potential of medicinal plants, based on arational analysis of an ethno pharmacological field survey among Bedouins in the Negev Desert, Israel. *J Ethnopharmacol* 116 (2-3): 275-287. DOI: 10.1016/0378-8741(86)90094-2.
- Gunawan, Muhamat, Siti F, Ana FO. 2022. Habitat characteristics of *Mangifera casturi* kosterm. In banjar district of south Kalimantan, Indonesia. *RJOAS* 10 (130): 83-90. DOI: 10.18551/rjoas.2022-10.10.
- International Union for Conservation of Nature (IUCN). 2022. Available at <https://www.iucnredlist.org/search?taxonomies=10113&searchType=species>. [Date accessed: 13 July 2022]
- Jahurul MHA, Zaidul ISM, Ghafoor K, Al-Juhaimi FY, Nyam K-L, Norulaini NAN, Sahena F, Omar AKM. 2015. Mango (*Mangifera indica* L.) by-products and their valuable components: A review. *Food Chem* 183: 173-180. DOI: 10.1016/j.foodchem.2015.03.046.
- Kostermans AJGH, Bompard J-M. 1993. *The Mangoes: Their Botany, Nomenclature, Horticulture, and Utilization*. Academic Press, Cambridge, Massachusetts. DOI: 10.1016/B978-0-12-421920-5.X5001-X.

- Marchese C. 2015. Biodiversity hotspots: A shortcut for a more complicated concept. *Glob Ecol Conserv* 3: 297-309. DOI: 10.1016/j.gecco.2014.12.008.
- Ministry of Health of the Republic of Indonesia (Kemenkes). 2024. Available at <https://ayosehat.kemkes.go.id/home>. (Date accessed: 4 April 2024).
- Monteiro JM, de Albuquerque UP, de Freitas Lins-Neto EM, de Araújo EL, de Amorim ELC. 2006. Use patterns and knowledge of medicinal species among two rural communities in Brazil's Semi-Arid Northeastern Region. *J Ethnopharmacol* 105: 173-86. DOI: 10.1016/j.jep.2005.10.016.
- Mulyanto D, Supangkat B, Nurseto HE, Iskandar J. 2023. Ethnobotanical identification of mango (*Mangifera indica* L.) and other fruit trees mentioned in Old Javanese Ramayana (10th century Java, Indonesia). *Biodiversitas* 24 (1): 609-616. DOI: 10.13057/biodiv/d240169.
- Parves GMM. 2016. Pharmacological activities of mango (*Mangifera indica*): A review. *J Pharmacogn Phytochem* 5 (3): 1-7.
- Pieroni A, Nedelcheva A, Hajdari A, Mustafa B, Scaltriti B, Cianfaglione K, Quave CL. 2014. Local knowledge on plant and domestic remedies in the mountain village of Peshkopia (Eastern Albania). *J Mt Sci* 11: 180-193. DOI: 10.1007/s11629-013-2651-3.
- Rahim MA, Suartha IN, Sudmartini LM. 2017. Immunostimulatory effect of leaf extract *Kasturi (mangifera casturi)* in mice. *Indonesia Medicus Veterinus* 6 (1): 10-19. DOI: 10.19087/imv.2017.6.1.10. [Indonesian]
- Ramadhan H, Rezky DP, Susiani EF. 2021. Penetapan kandungan total fenolik-flavonoid pada fraksi etil asetat kulit batang *Kasturi (Mangifera casturi* Kosterman). *Jurnal Farmasi dan Ilmu Kefarmasian Indonesia* 8 (1): 58-67. DOI: 10.20473/jfiki.v8i12021.58-67. [Indonesian]
- Rashedy AA, El Kheshin MA, Allatif AMA. 2014. Histological parameters related to dwarfism in some mango cultivars. *World J Agric Sci* 10 (5): 216-222. DOI: 10.5829/idosi.wjas.2014.10.5.1826.
- Singh NK, Mahato AK, Jayaswal PK et al. 2016. Origin, diversity and genome sequence of mango (*Mangifera indica* L.). *Indian J Hist Sci* 51.2.2 (2016): 355-368. DOI: 10.16943/ijhs/2016/v51i2.2/48449.
- Sofiah S, Metusala D, Trimanto T, Nurfadilah S. 2018. Flora diversity, composition and ecology in Besiq Bermai Tropical Forest of Damai District, East Kalimantan. *Biotropia* 25 (2): 85-94. DOI: 10.11598/btb.2018.25.2.724.
- Supiandi MI, Mahanal S, Zubaidah S, Julung H, Ege B. 2019. Ethnobotany of traditional medicinal plants used by Dayak Desa Community in Sintang, West Kalimantan, Indonesia. *Biodiversitas* 20 (5): 1264-1270. DOI: 10.13057/biodiv/d200516.
- Susiarti S, Rahayu M, Kuncari ES, Astuti IP. 2020. Utilization of "Benda" (*Arthocarpus elasticus* Reinw. Ex Blume) in Bogor, West Java, Indonesia: An ethnobotanical case study. *J Trop Biol Conserv* 17: 297-307. DOI: 10.51200/jtbc.v17i.2670.
- Sutomo, Arnida, Yunus R, Wahyuno S, Setywati EP, Riyanto S. 2017. Isolation and identification of active compound of ethylacetate fraction of *Kasturi (Mangifera casturi* Konstern.) fruit from South Kalimantan Indonesia. *Res J Pharm Biol Chem Sci* 8 (1S): 249-254.
- Suwardi AB, Navia ZI, Harmawan T, Syamsuardi, Mukhtar E. 2020. Wild edible fruits generate substantial income for local people of the Gunung Leuser National Park, Aceh Tamiang region. *Ethnobot Res Appl* 20: 11. DOI: 10.32859/era.20.11.1-13.
- Tallei TE, Pelealu JJ, Pollo HN, Pollo GAV, Adam AA, Effendi Y, Karuniawan A, Rahimah S, Idroes R. 2019. Ethnobotanical dataset of local edible fruits in North Sulawesi, Indonesia. *Data Brief* 27: 104681. DOI: 10.1016/j.dib.2019.104681.
- Tamalene MN, Al Muhdhar MHI, Suarsini E, Rahman F, Hasan S. 2016. Ethnobotany of Canarium plant species used by Tobelo Dalam (Togutil) ethnic community of Halmahera Island, Indonesia. *Biodiversitas* 17 (1): 61-69. DOI: 10.13057/biodiv/d170109.
- Yang X-Q, Kushwaha SPS, Saran S, Xu J, Roy PS. 2013. Maxent modeling for predicting the potential distribution of medicinal plant *Justicia adhatoda* L. In Lesser Himalayan foothills. *Ecol Eng* 51: 83-87. DOI: 10.1016/j.ecoleng.2012.12.004.
- Yusro F, Mariani Y, Diba F, Ohtani K. 2014. Inventory of medicinal plants for fever used by four Dayak Sub Ethnic in West Kalimantan, Indonesia. *Kuroshio Sci* 8 (1): 33-38.
- Zulfina S, Fathoni MAN, Poerwanto R, Matra DD. 2021. Characterization of secondary metabolites in *Kasturi* mango (*Mangifera casturi*) using gas chromatography-mass spectrometry. *IOP Conf Ser: Earth Environ Sci* 948: 012059. DOI: 10.1088/1755-1315/948/1/012059.



16591 / GUNAWAN et al. / Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan

Library

Submissions

Workflow

Publication

Submission

Review

Copyediting

Production

Round 1

Round 2

Round 3

Round 4

Round 5

Round 6

Round 5 Status

New reviews have been submitted and are being considered by the editor.

Notifications

[biodiv] Editor Decision

2023-11-27 11:19 PM

[biodiv] Editor Decision

2024-04-01 08:14 AM

[biodiv] Editor Decision


2024-04-14 02:45 AM

No Files

Revisions

Search

Upload File

▶  1114272-1	<a href="#">Article Text, 16591-1109797-1-5-20240219_rev.doc</a>	April 6, 2024	Article Text
---	--	---------------	--------------

Review Discussions

Add discussion

Name	From	Last Reply	Replies	Closed
<a href="#">Uncorrected proof</a>	atriyanto1 2024-04-08 06:11 AM	gunawanulm 2024-04-08 07:03 AM	1	<input type="checkbox"/>
<a href="#">BILLING</a>	dewinurpratiwi 2024-04-08 06:32 AM	dewinurpratiwi 2024-04-22 07:10 AM	3	<input type="checkbox"/>



Platform &  
workflow by  
OJS / PKP

## Participants

Smujo Editors (editors)

DEWI NUR PRATIWI (dewinurpratiwi)

Gunawan Gunawan (gunawanulm)

Aditya Triyanto (atriyanto1)

## Messages

Note

From

Dear Author(s),

atriyanto1

Pls, find the attached file for an uncorrected proof (Copyedited file).

2024-04-08 06:11

The revised manuscript (Corrected proof) is awaited. Do not worry about layout changes due to revision; our staff will fix it again.

AM

Note: Kindly enable Track Changes when you make revisions.

 [atriyanto1, Gunawan\\_Kasturi.doc](#)

▶ Dear editor

gunawanulm

I have finished revising the manuscript and attached it through this system.

2024-04-08 07:03

thank you for your attention

AM

 [gunawanulm, 16591-Article Text-1114472-1-18-20240408\\_rev.doc](#)

Add Message

## Participants

Smujo Editors (editors)

DEWI NUR PRATIWI (dewinurpratiwi)

Gunawan Gunawan (gunawanulm)

Aditya Triyanto (atriyanto1)

## Messages

Note

From

Dear Author(s),

atriyanto1

Pls, find the attached file for an uncorrected proof (Copyedited file).

2024-04-08 06:11

The revised manuscript (Corrected proof) is awaited. Do not worry about layout changes due to revision; our staff will fix it again.

AM

Note: Kindly enable Track Changes when you make revisions.

 [atriyanto1, Gunawan\\_Kasturi.doc](#)

▶ Dear editor

gunawanulm

I have finished revising the manuscript and attached it through this system.

2024-04-08 07:03

thank you for your attention

AM

 [gunawanulm, 16591-Article Text-1114472-1-18-20240408\\_rev.doc](#)

Add Message

## Participants

Smujo Editors (editors)

DEWI NUR PRATIWI (dewinurpratiwi)

Gunawan Gunawan (gunawanulm)

Aditya Triyanto (atriyanto1)

## Messages

Note

From

Dear Author(s),

atriyanto1

Pls, find the attached file for an uncorrected proof (Copyedited file).

2024-04-08 06:11

The revised manuscript (Corrected proof) is awaited. Do not worry about layout changes due to revision; our staff will fix it again.

AM

Note: Kindly enable Track Changes when you make revisions.

 [atriyanto1, Gunawan\\_Kasturi.doc](#)

▶ Dear editor

gunawanulm

I have finished revising the manuscript and attached it through this system.

2024-04-08 07:03

thank you for your attention

AM

 [gunawanulm, 16591-Article Text-1114472-1-18-20240408\\_rev.doc](#)

Add Message



Gunawan Gunawan <gunawan@ulm.ac.id>

---

## [biodiv] New notification from Biodiversitas Journal of Biological Diversity

---

**Aditya Triyanto via SMUJO** <support@smujo.com>

Mon, Apr 8, 2024 at 2:13 PM

Reply-To: Aditya Triyanto <aditya@smujo.id>, Ahmad Dwi Setyawan <editors@smujo.id>

To: Gunawan Gunawan <gunawan@ulm.ac.id>

You have a new notification from Biodiversitas Journal of Biological Diversity:

You have been added to a discussion titled "Uncorrected proof" regarding the submission "Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm) by Banjar Tribe in South Kalimantan, Indonesia".

Link: <https://smujo.id/biodiv/authorDashboard/submission/16591>

Ahmad Dwi Setyawan

---

[Biodiversitas Journal of Biological Diversity](#)

Caution: This e-mail (including attachments, if any) is sent by system and only intended for the recipients listed above. If you are not the intended recipient, then you are not permitted to use, distribute, distribute, or duplicate this e-mail and all its attachments. Please cooperate to immediately notify Smujo International and delete this e-mail and all attachments. This email was sent due to, your email is listed as participant on Biodiversitas Journal of Biological Diversity.



Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;

---

**[biodiv] Editor Decision**

---

**Managers via SMUJO** <support@smujo.com>

Sun, Apr 14, 2024 at 10:45 AM

Reply-To: Managers &lt;managers@smujo.id&gt;

To: GUNAWAN &lt;gunawan@ulm.ac.id&gt;, MUHAMAT &lt;muhamat@ulm.ac.id&gt;, MAGHFIROH &lt;magfiroh.net@gmail.com&gt;

GUNAWAN, MUHAMAT, MAGHFIROH:

We have reached a decision regarding your submission to Biodiversitas Journal of Biological Diversity, "Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan, Indonesia".

Our decision is to: Accept Submission

---

[Biodiversitas Journal of Biological Diversity](#)

Caution: This e-mail (including attachments, if any) is sent by system and only intended for the recipients listed above. If you are not the intended recipient, then you are not permitted to use, distribute, distribute, or duplicate this e-mail and all its attachments. Please cooperate to immediately notify Smujo International and delete this e-mail and all attachments. This email was sent due to, your email is listed as participant on Biodiversitas Journal of Biological Diversity.

16591 / GUNAWAN et al. / Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan

Library

Submissions

Workflow

Publication

Submission

Review

Copyediting

Production

Round 1

Round 2

Round 3

Round 4

Round 5

Round 6

Round 6 Status

Submission accepted.

Notifications

[biodiv] Editor Decision

2023-11-27 11:19 PM

[biodiv] Editor Decision

2024-04-01 08:14 AM

[biodiv] Editor Decision

2024-04-14 02:45 AM

No Files

Revisions

Search

Upload File

No Files

Review Discussions

Add discussion

Name	From	Last Reply	Replies	Closed
<a href="#">Uncorrected proof</a>	atriyanto1 2024-04-08 06:11 AM	gunawanulm 2024-04-08 07:03 AM	1	<input type="checkbox"/>
<a href="#">BILLING</a>	dewinurpratiwi 2024-04-08 06:32 AM	dewinurpratiwi 2024-04-22 07:10 AM	3	<input type="checkbox"/>



Platform &  
workflow by  
OJS / PKP



Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;

---

**[biodiv] New notification from Biodiversitas Journal of Biological Diversity**

---

**DEWI NUR PRATIWI via SMUJO** <support@smujo.com>

Mon, Apr 22, 2024 at 3:10 PM

Reply-To: DEWI NUR PRATIWI &lt;biodiv07@gmail.com&gt;, Ahmad Dwi Setyawan &lt;editors@smujo.id&gt;

To: Gunawan Gunawan &lt;gunawan@ulm.ac.id&gt;

You have a new notification from Biodiversitas Journal of Biological Diversity:

There is new activity in the discussion titled "BILLING" regarding the submission "Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan, Indonesia".

Link: <https://smujo.id/biodiv/authorDashboard/submission/16591>

Ahmad Dwi Setyawan

---

[Biodiversitas Journal of Biological Diversity](#)

Caution: This e-mail (including attachments, if any) is sent by system and only intended for the recipients listed above. If you are not the intended recipient, then you are not permitted to use, distribute, distribute, or duplicate this e-mail and all its attachments. Please cooperate to immediately notify Smujo International and delete this e-mail and all attachments. This email was sent due to, your email is listed as participant on Biodiversitas Journal of Biological Diversity.