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Socio-Demographic Characteristics of the Bidayuh Respondents and their Impact on the Utilization of Zingiberaceae Plants

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Abstract. The Bidayuh community in Jagoi and SingaiBau Districts possesses extensive traditional knowledge of Zingiberaceae species. This study documents their uses and examines socio-demographic factors influencing utilization. Gender, age, occupation, income, and religious beliefs significantly impact plant use. Older generations, with their rich traditional knowledge, frequently use medicinal gingers. Women influence plant use in culinary and medicinal practices. The economic status affects the ability to afford these plants. Data from 170 households were collected through structured questionnaires. Pearson correlation and ANOVA analyses were conducted to understand relationships between socio-demographic factors and plant utilization. The results showed a significant positive correlation between age and medicinal ginger use frequency. Additionally, village location impacts collection habits, with Singai residents collecting more frequently. The study underscores the importance of documenting traditional knowledge for biodiversity conservation and cultural heritage preservation.

Keywords: Ethnobotany, Zingiberaceae, Bidayuh community, Traditional medicine, Socio-demographic factors

Introduction

The Bidayuh community in Jagoi and SingaiBau Districts possesses extensive traditional knowledge of Zingiberaceae species, yet comprehensive ethnobotanical documentation is lacking. This study aims to fill this gap by documenting the uses of Zingiberaceae plants and examining the socio-demographic factors influencing their utilization. Ethnobotany, defined by various botanists and researchers, is the study of plant use by indigenous communities. It has evolved over time, with some suggesting it includes understanding plant life in primitive societies and its impact on tribal

customs and history. Schultes (1941), the father of modern ethnobotany, defines it as the study of human-plant relationships (Adnan & Othman, 2012). For example, 80% of Ethiopians are thought to use traditional medicine (about 95% herbal) to treat various human health issues, with medicinal plants being a major source for healthcare, prevention, and treatment (Kidane et al., 2014).

Ethnobotany, the scientific study of human interactions with plants, has applications in many areas of contemporary global concern, such as human health, food security, biodiversity conservation, and climate change. Studies on ethnobotany can shed light on how communities engage with their natural resources on a local level. The goal of achieving biocultural conservation can be advanced through the integration of scientific and local knowledge through ethnobotanical studies (Pei et al., 2020).

Gender roles significantly influence the utilization of Zingiberaceae plants. In many cultures, traditional knowledge about the cultivation, harvesting, and use of these plants is often passed down through generations and can vary based on gender roles (Etkin& Ross, 1982). Women, often responsible for cooking and food preparation, may have significant influence on how these plants are used in culinary dishes and traditional remedies. For example, women in many cultures traditionally handle the preparation of food and medicinal concoctions, which includes the use of Zingiberaceae species for their flavor and health benefits (Cunningham, 2001).

Older generations possess a wealth of traditional knowledge about the uses of these plants, having learned from their parents and grandparents how to grow, harvest, and utilize them for culinary and medicinal purposes. This extensive knowledge is often passed down through oral traditions and hands-on experience, making older adults key repositories of ethnobotanical knowledge (Turner et al., 2000). Experience and exposure to the benefits of Zingiberaceae plants lead older individuals to use them more frequently, particularly for health-related issues such as joint pain, digestive problems, or inflammation. For example, Zingiberofficinale is widely recognized for its anti-inflammatory properties and is commonly used to alleviate arthritis symptoms, a condition more prevalent in older adults (Chrubasik, Pittler, &Roufogalis, 2005).

Religious beliefs can significantly impact the utilization of Zingiberaceae plants. For instance, these plants are often used in religious rituals and ceremonies. Herbal remedies and traditional medicine systems influenced by religious beliefs often recommend the use of these plants for healing and treatment. Traditional cultural beliefs also play a significant role in the utilization of these plants. Certain Zingiberaceae species are believed to have protective or purifying qualities and are used in religious or spiritual contexts. For example, Zingiberofficinale is often used in rituals to cleanse spaces and individuals of negative energies (Turner et al., 2000).

The economic status of individuals can influence the utilization of Zingiberaceae plants. Higher income from certain occupations can affect an individual's ability to afford these plants or related products. Occupational stress and physical demands can also lead individuals to use Zingiberaceae plants such as Zingiberofficinale var. rubrum

and Zingibercassumunar to reduce inflammation or alleviate stress. Additionally, occupations involving higher education or exposure to health-related information can lead to greater awareness and utilization of these plants in respondents' treatment (Smith et al., 2013; WHO, 2019).

This study aims to identify the socio-demographic characteristics of the Bidayuh respondents, including gender, age, occupation, income, and religious beliefs, significantly impacting the utilization of Zingiberaceae plants. Understanding these influences provides insights into the sustainable practices and cultural significance that sustain the use of Zingiberaceae plants in the Bidayuh community. The integration of traditional knowledge with scientific research can promote the conservation of these valuable plant resources and support the cultural heritage of the community.

Objectives

1. To document the ethnobotany of Zingiberaceae species among the Bidayuh community.
2. To examine the socio-demographic characteristics of the respondents and their impact on the utilization of Zingiberaceae plants.

Methodology

Study Site

The study was carried with the 2 Bidayuh communities in Sarawak.The study involved the Bidayuh communities in Sarawak at Mount Sijanjang, Singai, and Mount Jagoi, chosen for their early settlements and traditional use of Zingiberaceae plants (Sayok et al., 2014). These areas, 40 km and 60 km from Kuching, retain green tropical rainforests, rich biodiversity, and provide clean water. The locals collect natural resources for use and sale. Data collection included ethnobotanical documentation, taxonomy, and altitude, covering plant usage, local names, botanical descriptions, habitats, photos, and species identification.

Figure 1: Map of Sarawak

Figure 2: Image of Singai and Jagoi, Bau (Sourcewww.Google Earth Image 2024: Singai)

Species Documentation and Identification

The documentation conducted on the useful gingers among the Bidayuh community of Singai and JagoiBau provides valuable insights into the diversity and applications of Zingiberaceae plants. Critical morphological features of each species were thoroughly examined, including the leafy shoot, petiole, number of flowers, bracteole, flower, calyx, labellum, staminodes, staminal tube, anther crest, and fruit. New species were identified and described. Informants knowledgeable about Zingiberaceae were consulted and included as field guides. Consistent plant collections were conducted to ensure reliable data. Most ginger species were found in moist, shaded undergrowth, with some growing on cliffs. Specimens were identified at the Sarawak Herbarium and deposited at the UNIMAS Herbarium.

Questionnaires Survey

Data were collected through structured questionnaires and interviews with 170 households, focusing on socio-demographic information and Zingiberaceae plant utilization. Purposive sampling was used to select households with permanent village presence and medicinal ginger use, with 89 respondents from Singai and 81 from Jagoi for balanced representation.

Research Hypotheses

The study aims to test the following hypotheses:

1. **Age and Frequency of Medicinal Ginger Use:**
   - H_o: No significant correlation between age and frequency of medicinal ginger use in the Bidayuh community.
   - H_a: Significant positive correlation between age and frequency of medicinal ginger use in the Bidayuh community.

2. **Household Income, Location, and Frequency of Medicinal Ginger Collection:**
   - H_o: No significant correlation between household income or village location and frequency of medicinal ginger collection in the Bidayuh community.
   - H_a: Significant correlation between household income or village location and frequency of medicinal ginger collection in the Bidayuh community.

3. **Differences in Frequency of Medicinal Ginger Collection by Age Group and Village:**

   Age Group:
   - H_o: No significant difference in frequency among different age groups.
   - H_a: Significant difference in frequency among different age groups.

   Village:
   - H_o: No significant difference in frequency between Singai and Jagoi villages.
   - H_a: Significant difference in frequency between Singai and Jagoi villages.

Data Analysis

Data were analyzed using Pearson correlation and ANOVA to examine relationships between socio-demographic factors and plant utilization.

1. **Pearson Correlation Analysis:**
   - Measured the linear relationship between socio-demographic variables (age, income) and Zingiberaceae plant utilization frequency, with significance set at $p < 0.05$.
2. **One-Way ANOVA Analysis:**
   - Determined the impact of independent variables (age group, village) on the frequency of medicinal ginger collection, testing null hypotheses with significance levels set at $p < 0.05$.

Result

1. Documentation of Useful Gingers

A total of 50 species from 22 genera of useful gingers were documented for the Bidayuh of Singai and Jagoi, highlighting their diverse uses in medicine, cuisine,

handicrafts, and ornamentation. Medicinal uses include *Alpiniasonget* for skin diseases and *Boeserbergiapulchella* for conjunctivitis. Culinary uses feature *Etlingeracoccinea* for flavoring. Handicrafts utilize *Geocharisrubra* and Hornstedtiareticulata for weaving. Ornamental plants include *Globbapumila*and*Globbafrancisci*. Preparation methods vary medicinal rhizomes are pounded, culinary parts are cooked, and handicraft materials are woven. The study underscores the importance of documenting traditional knowledge for preservation and sustainable use.

Table 1: List of documented useful Zingiberaceae among the Bidayuh community of Singai and Jagoi

No	Genera	Species	Usage
1	Geocharis	rubraRidl*	String
2	Alpinia	songet Ripen &Meekiong**	The pounded rhizome is applied on skin diseases
3	Boeserbergia	pulchella(Ridl.) Merr*	To treat conjunctivitis
4	Hornstedtia	reticulata(K. Schum.) K. Schum*	Handicraft
5	Sulettaria	longitubaHoltt.	Ritual
6	Globba	astrosanguineaTeijsm. &Binn	To mitigate body pain after childbirth
7	Globba	brachyanthera K. Schun	To treat smallpox
8	Globba	pumilaRidl. *	Ornamental
9	Globba	franciscіRidl	Ornamental
10	Etlingera	brevilabrum(Valeton) R.M Sm*	The pounded rhizome is applied ton skin diseases
11	Plagiostachys	crocydocalyx(K. Schum) B.L Burtt& R.M Sm*	For food and handicraft
12	Scaphochlamys	calcicolaA.D.Poulsen&R .J.Searle*	To wrap the wound
13	Amomum	longipedunculatumR.M. Sm*	For food
14	Etlingera	sp.	To treat skin diseases
15	Zingiber	sp.	To treat headache
16	Hornstedtia	conicaRidl.	Edible fruit and young shoot
17	Sundamomum	borealiborneense (I.M. Turner) A.D Poulsen& M.F Newman*	Edible fruit

18	Sundamomum	laxesquamosum (S.Sakai&nagam.) A.D. Poulsen&M. F Newman*	Edible fruit
19	Alpinia	glabraRidl. *	Edible fruit and young shoot
20	Alpinia	ligulataK. Schum*	Edible fruit and the leaves are for wrapping food
21	Alpinia	havilandii K. Schum*	To treat gastric
22	Alpinia	beamaniiR.M.Sm*	Edible fruit
23	Meistera	gyrolophos(R.M. Sm) Skornick& M.F. Newman*	Edible fruit
24	Etlingera	coccinea (Bl.) Sakai &Nagam.	Food flavouring
25	Alpinia	galanga (L.) Willd.	1. To treat skin diseases 2. Food flavouring for sweet taste 3. To relief fever
26	Etlingera	elatior(Jack) R.M. Sm	Food flavouring
27	Curcuma	longa Val.	1. To treat diarrhoea 2. To treat wound 3. Food flavouring
28	Curcuma	zaedoria Val.	1. To lighten the skin 2. To treat white vaginal discharge 3. For Covid-19 prevention
29	Curcuma	xanthorrhizza	1. To lighten the skin 2. To treat white vaginal discharge 3. For Covid-19 prevention
30	Zingiber	cassumunarRoxb.	1. Used for massage mother after childbirth to improve blood circulation 2. Claimed by community to treat cancer
31	Zingiber	officinale Roscoe	To remove wind from the body
32	Amomum	oliganthumK.Schum	Edible fruit
33	Zingiber	officinalevarrubrum	For slimming
34	Kaempferia	galanga	To remove wind from the body
35	Amomum	sp.	For freshener
36	Plagiostachys	albifloraRidl.	To lower fever in baby
37	Hedychium	coronariumJ. Koenig	To treat headache
38	Costus	speciosus	To treat diabetic and to lower the blood sugar level

39	Curcuma	caesiaRoxb.	For skin care and slimming
40	Amomum	jackliamiiRipen &Meekiong**	For headache
41	Amomum	cerasinum	Edible fruit
42	Amomum	macroglossa K. Schum*	Edible fruit
43	Amomum	sp. nov.ined. **	To remove the bad smell on the hand or any part of the body
44	Boeserbergia	flavoalbaR.M. Sm*	To reduce the pain of toothache (numb agent)
45	Etlingera	sp. nov.ined.**	Food flavouring
46	Sulettaria	suculosa(K.Schum.) A.D. Poulsen*	Food source for animal
47	Zingiber	singaiensisRipen &Meekiong **	Food source for animal
48	Zingiber	sp. nov.ined. **	Food source for animal
49	Globba	rubraRidl*	Ornamental
50	Sulettaria	meekiongiiRipen &Teo**	String

Discussion

The Bidayuh community in both Jagoi and Singai uses single plants or mixes different plants as medicine for various ailments. It is also found that a single plant can treat multiple diseases. Informants identified 16 species as medicinal plants, eight as edible fruits, four for ritual ceremonies, three for food flavoring, two for ornamental purposes, and one each for slimming, wrapping food, skincare, vegetables, and handicrafts (Figure 3).

The Bidayuh community's rich ethnobotanical knowledge and diverse plant utilization patterns reflect the complexity of traditional medicinal systems. The multifunctionality of plants, where a single plant treats multiple diseases, underscores the extensive knowledge the Bidayuh have regarding their local flora. For instance, a plant used for stomach ailments may also heal wounds or reduce fever, demonstrating adaptive strategies of indigenous knowledge systems. Documentation shows these plants' uses in treating 12 human diseases, highlighting the need to preserve traditional plant use for biodiversity conservation and cultural heritage.

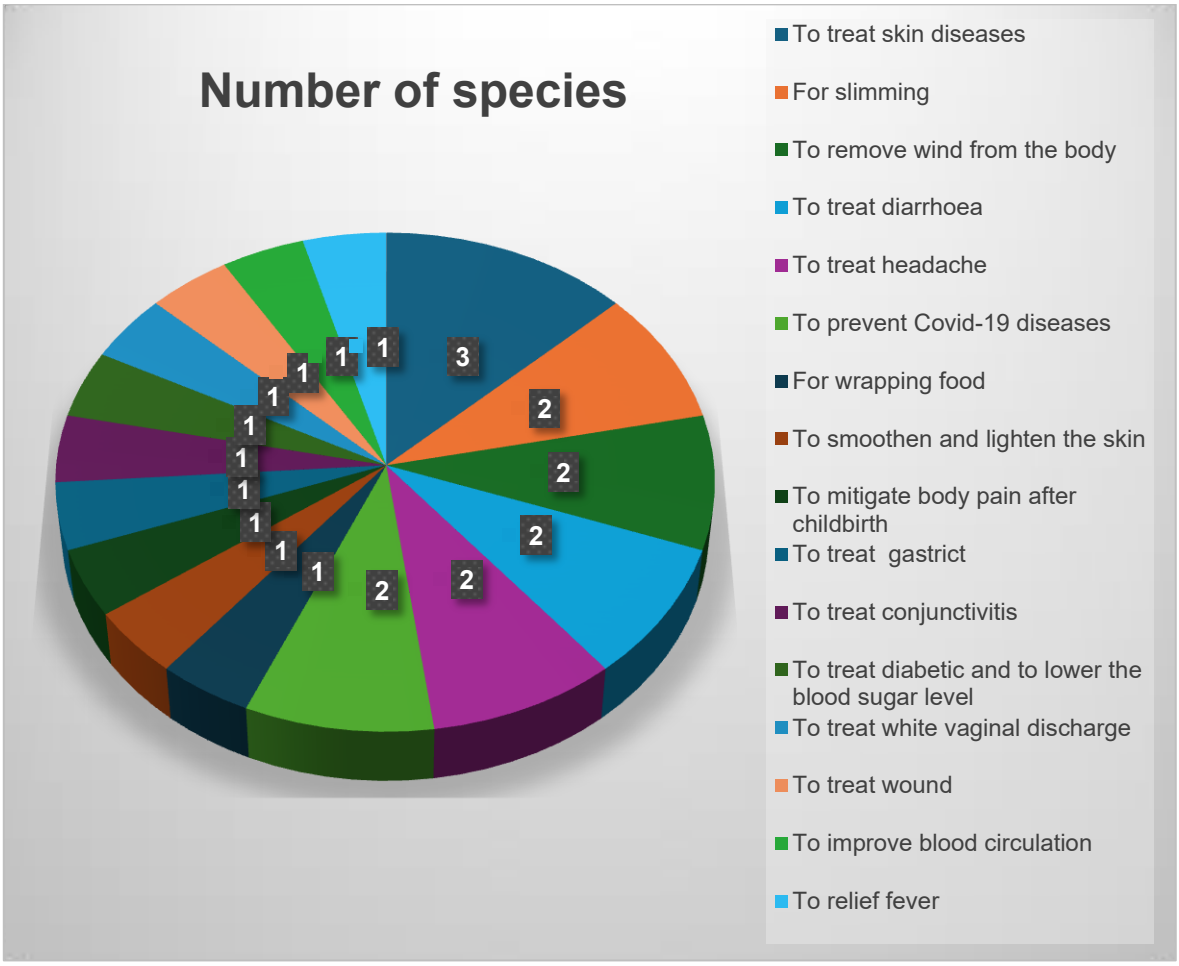

Figure 4: Pattern of Utilization of Zingiberaceae for Medicinal Purposes

2. **Relationship of Use Frequency and Annual Cost of Traditional Medication of Zingiberaceae against Households' Income and Age of Bidayuh community in Singai and Jagoi area**

A Pearson correlation analysis revealed a significant positive relationship (r = 0.363) between respondents' age and the frequency of medicinal ginger use, with older individuals using them more frequently. In contrast, household income and location type showed weak correlations with plant use, indicating that these factors do not significantly influence the decision to use medicinal gingers. This contradicts the belief that poorer community members rely more on wild gingers for medicine. The results also show that both areas still practice traditional Zingiberaceae medicine and share the same culture.

Table 2: Correlation (Pearson's) between the frequency of collecting medicinal gingers in a year against household income, age and village.

	Age	**Household Income**	**Village**
Frequency of collecting medicinal gingers	0.363**	-0.117	-0.238

**. Correlation is significant at the 0.01 level (2-tailed).

Discussion

A correlation analysis (Pearson's r) examined the relationship between the frequency of traditional Zingiberaceae use and household income and age among the Bidayuh community in Singai and Jagoi. The results showed a moderate positive correlation (r = 0.363) between age and use frequency, with older individuals using medicinal gingers more frequently. In contrast, household income and location type had weak correlations, indicating they do not significantly influence medicinal ginger use. This finding contradicts the belief that poorer community members rely more on wild gingers. Both areas still practice traditional Zingiberaceae medicine, highlighting its cultural importance within the Bidayuh community.

3. The Significance Relationship between Frequency of Collection Medicinal Gingers and Value of Medicinal Gingers against Age Group of Bidayuh community in Singai and Jagoi area

In this research, ANOVA was used to investigate differences between groups for a specific parameter. A significant p-value from a one-way ANOVA test indicates differential expression in at least one group but does not specify which groups differ.

The first analysis showed a significant difference in medicinal ginger collection frequency among age groups (p=0.001), with older individuals collecting more.

The second analysis revealed a significant difference in collection frequency between the Singai and Jagoi villages (p=0.005), with Singai residents collecting more frequently.

Table 3: One Way ANOVA test analysis

Null Hypothesis	**F**	**Significant Level***
H_a: There is significant difference between frequency of medicinal plant collection with age group	3.210	0.001
H_{o3}: There is no significant difference between frequency of medicinal plant collection with village	2.579	0.005

* Significance value p<0.005

Discussion

The first analysis observed differences in medicinal ginger collection frequency among age groups, with a one-way ANOVA result of p=0.001 (p<0.005). The null hypothesis (H_0) was rejected, indicating a significant relationship between collection frequency and age. Older individuals used Zingiberaceae plants more due to their cultural knowledge, health needs, and traditional practices. The second analysis identified that Singai residents collected more frequently than those in Jagoi, suggesting village location impacts collection habits, influenced by environmental availability and local traditions (WHO, 2002).

Conclusion

The study highlights the intricate relationship between socio-demographic factors and the utilization of Zingiberaceae plants among the Bidayuh community. The findings underscore the importance of preserving traditional knowledge and cultural practices to

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