

1 **Documentation of ethnobotanical plant species used in the preparation of Apong, a**
2 **traditionally prepared rice beer by Mishing tribal community of Majuli District.**

3
4
5 **Abstract:**

6 The main objective of this article is to document ethnobotanical plant species used in the
7 preparation of a traditionally prepared rice beer,apong within the Mishing community of
8 Majuli District.Apong in Mishing community is basically of two types -Po:ro Apong and
9 Nogin Apong.A total of 48 ethnobotanical plants species is documented from three Mishing
10 inhabitant villages of Majuli district and quantitative ethnobotanical indices such as relative
11 frequency of citation (RFC)and Use value (UV) were used to determine the cultural
12 importance and utilization pattern of the recorded plant species. Quantitative indices revealed
13 that *Oryza sativa* L. hashighestRFC (1.0) and UV(1.6) followed by*Dryopteris filix-mas* (L.) Schott
14 RFC (1.0) and UV (1.5) indicating its greater cultural and utilization significance in starter cake
15 preparation.

16
17 **Keywords:** Apong, Mishing community, ethnobotany, Quantitative indices.

18 **Introduction:**

19 From time immemorial Mishing tribal community dwelling mostly in parts of Assam and
20 Arunachal Pradesh,has a record of producing and consuming homemade alcoholic beverages
21 known as Apong (Mili &Sundriyal 2023; Yein et.al,2022).Mishing being the second largest
22 tribal community residing in Assam basically settled in the upper Brahmaputra valley.
23 Apong,a traditionally prepared rice beer,plays an pivotal role in the socio-cultural life of
24 Mishing tribal community in Assam(Gogoi,2013).Apong, a traditional alcoholic rice beer is
25 being commonly used by tribal communities across Northeast India mainly Arunachal
26 Pradesh and Assam(Gogoi , 2013).Mishing being the earliest tribal community in Assam to
27 use Apong as traditional alcoholic beverage(Baruah2007,Tanti ,2010).Apong is viewed as an
28 social legacy among the Mishing. Women folk mostly takes part in its preparation. It is
29 prepared from fermented rice and E'pob as the strarter cake. Apong is used in everyday
30 occasion from birth to death, marriage or in any type of joyous occasion. In public occasion it
31 is used as a refreshing beverage. Any religious customs are seen to be incomplete without

32 offering Apong to the respective gods. Apong in Mishing community is of two types-Po:ro
33 Apong and Nogin Apong and the differentiation is based on its colour and Processing
34 (Lalmuanpuii et.al.2021).Nogin Apong is considered to be nutritious and energy drink while
35 Po:roapong is seen as a drink of great cultural importance(Garh,2022).Po:roApong is
36 traditionally known as Sai mod as it is prepared from fermented sticky variety of rice, later
37 mixed with ash of rice husk and straw and mixed uniformly with Apo pitha known as E'pob.
38 Nogin apong is however prepared with fermented rice and uniformly mixed with E'pob.It is a
39 whitish liquor extracted by hand from fermented rice. Three main glutinous rice varieties are
40 used to prepare Apong viz., bao, amdang and guni (Mili,2023).The present study aims in
41 identification of plant species incorporated in preparation of E'pob as starter cake which is
42 essential in initiating the process of fermentation in Apong preparation.

43 **Study area**

44 Majuli lies in the alluvial tracts created by river Brahmaputra and Luit.It lies between
45 longitude of 93°37' to 94°50' North and latitude 23°40' to 27°10' East. The average rainfall of
46 the area is 1783 mm. It is a newly formed district of Assam. The total area of Majuli district
47 is 552.68 Sq Km.(Hazarika et. al., 2020).

48 **Methodology**

49 **Field survey and data collection**

50 Ethnobotanical field survey has been conducted in 3 randomly selected villages of Majuli
51 district from April 2024-October 2024.Data were collected using key informants with especial
52 emphasis on elderly women that plays pivotal role in apong preparation within the Mishing
53 community.Information regarding plant species used,parts used,their role,preparation
54 techniques of starter cake were documented through semi-structured interview,informal
55 discussions and transect field walks. Data from 28 informants were documented during the
56 survey of age group between 40-70 years. Prior informant consent was taken before the
57 interview.Ethical guidelines were strictly followed,confidentiality of respondents were
58 maintained and documentation of the ethnobotanical information were done respectfully
59 without any intention of commercial exploitation.

60 **Plant collection and identification**

61 Plant species used in the preparation in Apong were collected with the assistance of local key
62 informants from forest, agricultural fields, home gardens. Plant species are identified using

63 relevant taxonomic literature *Flora of Assam* (Kanjilal et .al), *The flora of British India*
64 (Hooker) and *Flora of Majuli*(Islam 1990). The scientific names are authenticated using online
65 databases such as World Flora Online (WFO), Plants of the World Online (POWO) to ensure
66 updated botanical nomenclature. Herbarium sheets were prepared and submitted to herbarium
67 of Jengraimukh college.

68 **Quantitative ethnobotanical analysis**

69 The collected ethnobotanical data are analysed using indices such as Relative Frequency of
70 Citation (RFC) and Use Value (UV) to evaluate the cultural significance and utilization pattern
71 of plant species in Apong preparation. The application of quantitative ethnobotanical indices
72 strengthens ethnobotanical evaluation of traditionally used species.

73 **Relative frequency of Citation**

74 RFC can be calculated using the Formula

$$75 \text{ RFC} = \text{FC} / \text{N}$$

76 Where,

77 FC= Number of informants mentioning a particular plant species.

78 N= Total number of Informant interviewed

79 The RFC range between 0 to1, higher value indicates higher cultural importance and
80 recognition in the community.

81

82 **Use Value**

83 Use Value was calculated to determine the relative importance of each plant species based on
84 the use reports by the informants.

85 Use Value can be calculated by using the formula

$$86 \text{ UV} = \Sigma \text{U} / \text{N}$$

87 Where,

88 ΣU =Total number of use reports of a particular plant species

89 N=Total number of informants interviewed

90 Higher use value indicates wide application of a particular plant species and greater
91 ethnobotanical significance in preparation of Apong.

92 **Data analysis**

93 The documented ethnobotanical data were arranged in the form of table and arranged according
94 to scientific name, family, plant part used, RFC, UV were assessed for their traditional
95 importance in apong preparation and fermentation process.

96 **Preparation Techniques**

97 **Preparation of Starter cake E'pob**

98 E'pob or the starter cake for the preparation of the alcoholic beverage is prepared from rice
99 preferably glutinous. At first the rice is cleaned and soaked in cold water for about 2-3 hours.
100 The soaked rice is pounded to fine powder in a wooden pestle and mortar known in
101 vernacular language as *Ki:perandE'gi*. E'pob acts a microbial culture for fermentation of rice
102 to produce alcoholic beverage. Preparation of apong is mainly confined to the women mass
103 of the community. The process of preparation takes time. Rice is the key ingredient of the
104 process along with it involves many plant species. In early days more than 50 plant species
105 were used but now the number is reduced 20-30. The leaves of various plants species are first
106 collected and are cleaned. The leaves are then properly dried in sun or kept over the fire place.
107 Once completely dried the leaves are pounded in wooden pestle and mortar to powder. Rice
108 powder is mixed too and pounded well to a paste like consistency. An old culture E'pob is
109 also added as source of microbial spawn. Oval shaped small size cakes are made. The E'pob
110 can be stored in dry place for 1-2 months. The newly prepared E'pob are then spread on a
111 sieve of bamboo surface covered with paddy straw and leaves of Rukji (*Dryopteris filix-mas*
112 (*L.*) *Schott*). It is then sun dried for 2-3 days. The best starter cakes are then stored in earthen
113 pot plugged with rukji leaves (*Dryopteris filix-mas* (*L.*) *Schott*) to protect it from insects and
114 pest infection.

115

116 **Preparation of Nogin Apong**

117 Apong is an indispensable part in Mishing community and is the locally prepared rice beer. It
118 is basically prepared from cooked rice with number of herbs. Typically, two types of
119 Apong are commonly known among the community i.e., Po:ro and Nogin Apong. The process

120 of preparation of both is different. For preparation of the Nogin Apong, the rice (Mostly non-
 121 glutinous) is cleaned and fully cooked and then it is spread over a bamboo mat till it cools
 122 completely. The cooked rice is smashed properly with hand and considering the amount of
 123 the cooked rice, best quality E'pob or starter cake is crushed and mixed uniformly to the
 124 rice. After mixing, it is transferred to an earthen pot with a banana leaf placed inside. The
 125 mouth of the pot is plugged with paddy straw and is kept undisturbed for at least 6-7 days. It
 126 generally takes 10-15 days for complete fermentation to take place in summer. Nogin apong
 127 preparation process is simpler than po:roapong. Water is poured over the fermented rice and
 128 is later consumed.

129 **Preparation of Po:roApong**

130 Dry paddy straw and paddy husk put over the straw are first burnt partially and the ash
 131 obtained is stored in a container. Cooked rice (Any rice non sticky is mostly preferable) is
 132 spread on a bamboo mat till it completely cools down. The rice is mixed evenly with the
 133 burnt ash and the rice is smashed properly with hands to produce a black mass. E'pob or
 134 starter cake is grounded to fine powder and added to the rice-ash mixture. The mixture is kept
 135 spread in wooden mat overnight or it can be transferred into an earthen pot. The compound is
 136 then stored in an earthen pot. The mouth of the earthen pot is plugged with dried paddy straw
 137 of leaves or rukji. It generally takes 10-15 days for proper fermentation to occur in summer.
 138 Once the fermentation is completed, the po:roapong is separated using a funnel shaped
 139 bamboo strainer known as Ta:suk. The base of the Ta:suk is placed with bunch of straw. The
 140 po:roapong is added over the Ta:suk. and water is poured over it. The filtrate obtained is now
 141 called as apong is collected in a container while the fermented rice grains are collected in the
 142 basket. Po:roapong mostly tastes sweet and bitter and is mostly preferred by Mishing folk.

143

144 **Results**

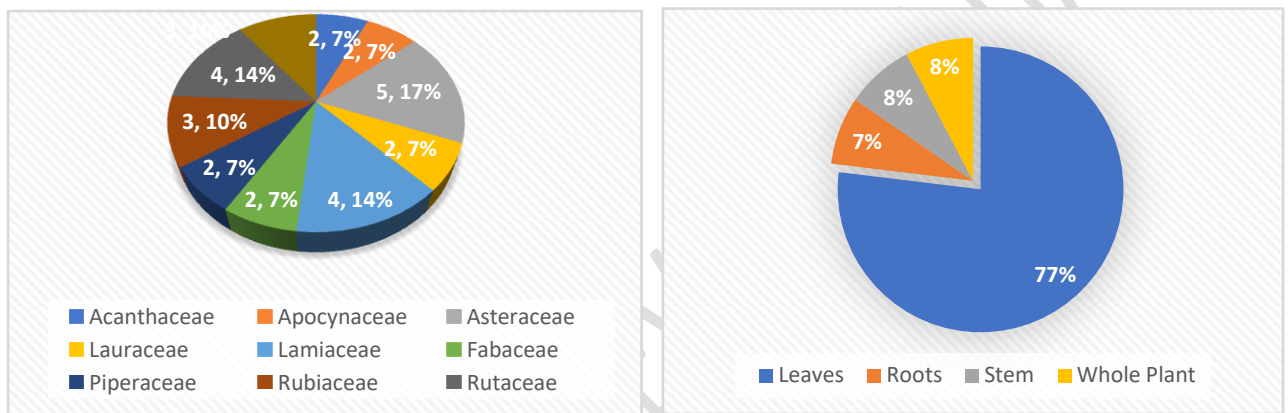
Sl.no.	Scientific Name	Vernacular name	Family	Plant parts used	RFC	UV
2	<i>Paderia foetida</i> L.	Vedailota	Rubiaceae	Whole plant	0.7	1.0
3	<i>Phlogacanthus thyrsoformis</i> (Roxb. ex Hardw.) Mabb.	Titaful	Acanthaceae	Leaves	0.4	1.0
4	<i>Asparagus racemosus</i> Willd	Satmul/Engi	Asparagaceae	Roots	0.8	1.0
5	<i>Artocarpus heterophyllus</i> Lam.	Kothal pat/balang	Moraceae	Leaves	0.9	1.0
6	<i>Saccharum officinarum</i> Linn.	Tabad/kuhiar	Poaceae	Stem	1.0	1.0

7	<i>Tinospora</i> Miers	Nil kof	Menispermaceae	Leaves	0.7	1.0
8	<i>Vitex negundo</i> L.	Posotia	Lamiaceae	Leaves	0.8	1.1
9	<i>Oldenlandiacorymbosa</i> Linn.	Jaluk bon	Rubiaceae	Leaves	0.9	1.2
10	<i>Ananas comosus</i> (L.) Merr.	Anaras Pat/ketekikontal	Bromeliaceae	Leaves	0.9	0.9
11	<i>Chromolaena odorata</i> (L.) R.M.King&H.Rob.	Ram nam	Asteraceae	Leaves	1.0	1.0
12	<i>Piper longum</i> L.	Pipoliguti	Piperaceae	Fruit	0.7	1.1
13	<i>Centella asiatica</i> L.	Dangor Manimuni	Apiaceae	Leaves	0.9	1.2
14	<i>Hydrocotylesibthorpioides</i> Lam.	Horu Manimuni	Araliaceae	Whole plant	0.9	1.3
15	<i>Aschasmaloroglossum</i> (Gagnep.)K.Larsen	Koifur	Scytosiphonaceae	Roots	0.6	0.8
16	<i>Litsea salicifolia</i> (Roxb. ex Nees) Hook.f.	Digloti	Lauraceae	Leaves	0.7	0.9
17	<i>Swertia chirayita</i> (Roxb.) Buch.-Ham. ex C.B. Clarke	Chirota	Gentianaceae	Leaves	0.5	0.3
18	<i>Elsholtziaciliata</i> (Thunb.) Hyl.	Bontulsi	Lamiaceae	Leaves	0.9	1.3
19	<i>Monoonlongifolium</i> (Sonn.) B.Xue&R.M.K.Saunders	Debdaru	Annonaceae	Leaves	0.6	0.7
20	<i>Elettaria cardamomum</i> (L.) Maton	Elachi	Zingiberaceae	Leaves	0.5	0.8
21	<i>Zanthoxylum oxyphyllum</i> Edgew.	Prothoma	Rutaceae	Leaves	0.7	0.6
22	<i>Alstoniascholaris</i> (L.) R. Br.	Chotiyana	Apocynaceae	Leaves	0.7	0.6
25	<i>Leucas aspera</i> (Willd.) Link	Durunbon	Lamiaceae	Whole plant	1.0	1.3
26	<i>Acmella paniculata</i> (Wall. ex DC.) R.K.Jansen	Marsang	Asteraceae	Seed,Leaves	1.0	1.3
28	<i>Drymaria cordata</i> (L.) Willd. ex Schult.	Laijabori	Caryophyllaceae	Leaves	0.8	1.3
29	<i>Ageratum conyzoides</i> L.	Gendhali bon	Asteraceae	Flower,Leaves	0.9	1.3
30	<i>Piper nigrum</i> L.	Jaluk	Piperaceae	Seed,Leaves	0.9	1.2
31	<i>Tabernaemontanadivariata</i> (L.) R.Br. ex Roem. & Schult.	Kothonaphul	Apocynaceae	Leaves	0.7	0.8
32	<i>Codiaeum variegatum</i> (L.) Rumph. ex A.Juss.	Croton	Euphorbiaceae	Leaves	0.6	1.0
33	<i>Cinnamomum tamala</i> (Buch.-Ham.) T.Nees&C.H.Eberm.	Tezpat	Lauraceae	Leaves	0.6	1.2
34	<i>Gomphostemma parviflorum</i> Wall. ex Benth.	Bhedaitita	Lamiaceae	Leaves	0.6	1.1
35	<i>Scoparia dulcis</i> L.	Seni bon	Plantaginaceae	Leaves	0.7	1.2
36	<i>Zanthoxylum nitidum</i> (Roxb.) DC	Tezmoi	Rutaceae	Leaves	0.8	0.8
37	<i>Zanthoxylum oxyphyllum</i> Edgew.	Mejenga	Rutaceae	Leaves	0.9	1.1
38	<i>Flemingiastrobilifera</i> (L.) W.T.Aiton	Makhioti	Fabaceae	Leaves	0.8	1.0
39	<i>Mikania scandens</i> (L.)Willd	Rinji	Asteraceae	Leaves	1.0	1.3
41	<i>Azadirachta indica</i> A.Juss.	Moha neem	Meliaceae	Leaves	0.4	0.9
42	<i>Alpinia nigra</i> (Gaertn.) Burttt	Tora	Zingiberaceae	Leaves	0.7	1.0
43	<i>Guilandianbonduc</i> L.	Leta guti	Fabaceae	Leaves	0.7	1.0

44	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Arjun tree	Combretaceae	Bark	0.8	1.1
45	<i>Hellenia speciosa</i> (J.Koenig) S.R.Dutta	Kustho	Costaceae	Leaves	0.9	0.8
46	<i>Houttuynia cordata</i> Thunb	Mosundari	Saururaceae	Leaves	0.9	1.3
47	<i>Bergerakoenigii</i> L.	Narasingha	Rutaceae	Leaves	0.9	1.3
48	<i>Ocimum tenuiflorum</i> L.	Tulsi	Lamiaceae	Leaves	0.8	1.3
49	<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	Bhatghila/Bhattita	Bignoniaceae	Leaves	0.7	1.0
50	<i>Psidium guajava</i> L.	Madhuriam/Maduri	Myrtaceae	Leaves	1.0	1.3
51	<i>Zingiber officinale</i> L.	Taake /Ada	Zingiberaceae	Leaves	1.0	1.3
52	<i>Oryza sativa</i> L.	Saul	Poaceae	Grain	1.0	1.6
53	<i>Dryopteris filix-mas</i> (L.) Schott	Rukji/Bihlongoni	Dryopteridaceae	Leaves	1.0	1.5

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148 Discussion

149 The present study recorded 53 plant species belonging to 30 families used in the preparation
 150 of E'pob (Starter cake) by the Mishing community of Majuli, Assam. The taxonomic makeup
 151 exhibited uneven family wise distribution. As illustrated in Figure 1, Asteraceae (17%) and
 152 Lamiaceae (14%) were the most dominant families followed by Rutaceae, Zingiberaceae,
 153 Rubiaceae. This pattern represents high taxonomic diversity with low redundancy. Analysis of
 154 plant parts shows highest predominance of leaves followed by roots, bark, whole plant. The
 155 preference of leaves can be attributed to the high availability, easy accessibility, easy to
 156 harvest and rich in phytochemical composition. Quantitative ethnobotanical indices such as
 157 Relative frequency of citation (RFC), Use value (UV), was employed to assess the importance
 158 and utilization of the documented plant species. The RFC value ranged between 0.4 -1.0, that
 159 shows the variation and differences of use of plant species during the preparation
 160 process. Several species such as *Dryopteris filix-mas* (L.) Schott, *Oryza sativa* L., *Zingiber*
 161 *officinale* L., *Psidium guajava* L., *Leucas aspera* (Willd.) Link, *Acmella paniculata* (Wall. Ex
 162 DC.) R.K. Jansen recorded the highest RFC value (1.0). These plant species are therefore

163 widely known and indicates its prominent role in Apong preparation. Use value (UV)
164 indicates the variation in use pattern of the documented plant species. The use value is ranged
165 between 0.3-1.6 and the highest use value is recorded in plant species *Oryza sativa* L.
166 followed by *Dryopteris filix-mas* (L.) Schott. The present study includes ethnobotanical
167 knowledge and environmental observations to document plant species associated with
168 preparation of Apong in the community. Most of the documented plant species are collected
169 from their wild habitat indicating their high dependence on environment. Species such as
170 *Dryopteris filix-mas* (L.) Schott, *Oryza sativa* L shows high RFC and UV value indicating
171 their higher recognition and multiple utility among the informants. Due to higher
172 utility, environmental pressure such as habitat destruction owing to flood and erosion, plant
173 species with higher RFC are mostly vulnerable. Thus, these plant species are not only
174 culturally important but are ecologically sensitive that needs immediate conservation
175 attention.

176 **Conclusion**

177 The present study highlights the utilization of some of the plant species in traditional Apong
178 preparation by Mishing tribal community of Majuli district of Assam indicating the close
179 relationship between indigenous knowledge and local biodiversity. The application of
180 quantitative indices such as use value and relative frequency index also reflects the cultural
181 significance, availability and multiple utility of plant species. A comparative analysis with
182 other tribal communities such as Karbi, Bodo, Ahom reflects the use of some similar plant
183 species (Borah et al., 2021). Most of the plant species documented are procured from their
184 wild habitat that indicates a strong reliance on natural ecosystem. The involvement of various
185 plant species in the fermentation process might have potential roles such as antimicrobial
186 function, fermentation enhancement, flavour. Further phytochemical and microbial validation
187 is needed to ascertain their roles. The documentation of indigenous plant species is necessary
188 for conservation and promotion of sustainable utilization of the local plant
189 resources. However, the gradual decline in knowledge of plant species may pose a threat to the
190 continuity of the tradition. Subsequent documentation will provide scope for its conservation
191 and may contribute to livelihood enhancement while safeguarding cultural heritage

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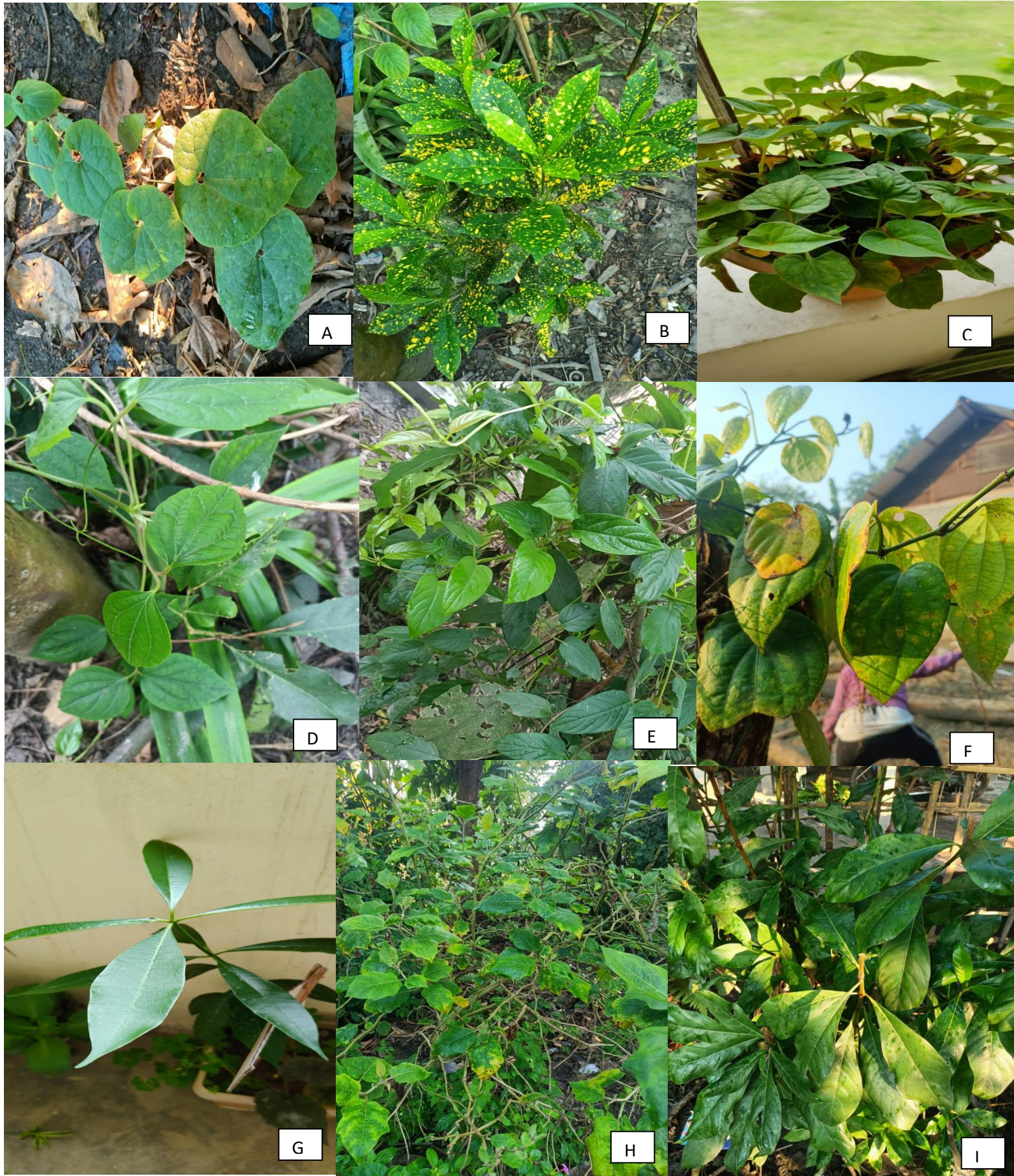
Conflict of interest

The author declares that there is no conflict of interest.

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PHOTOPLATE 1: A) *Tinospora* Miers B) *Codiaeum variegatum* (L.) Rumph. ex A.Juss.
 C) *Houttuynia cordata* Thunb D) *Chromolaena odorata* (L.) R.M.King&H.Rob.
 E) *Paderia foetida* L. F) *Piper nigrum* L. G) *Alstonia scholaris* (L.) R. Br. H) *Solanum nigrum*
 L. I) *Phlogacanthus thyrsiformis* (Roxb. ex Hardw.)



Photoplate 2: Different steps involved in the preparation of traditional rice beer Po:roapong A) Cooking of rice B) Starter cake C) Burning rice husk D) Mixing of cake with rice E) Storing G) Fermentation H) Filtration I) Storage after filtration.

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