

Local knowledge of edible flowers used in Mizoram

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Received 04 April 2018; revised 21 June 2019

The edible flowers consumed by indigenous people of Mizoram were assessed from Aizawl and Champhai districts of Mizoram during 2015-2016. Altogether, 59 species of edible flowers under 50 genera and 29 families are recorded. Dominant families include Apiaceae, Lamiaceae and Leguminosae with 9% followed by Brassicaceae and Zingiberaceae scoring 7% each. Based on habit and occurrence, plants are categorized into wild (30), cultivated (21) and semi-cultivated (8). Among these plants, 30 species are marketable and 29 species are non-marketable. The study envisaged to highlight the importance of edible flowers in local cuisines of Mizo people and its potential as an additional source of food. It also attempted to document a first-hand report on the traditional knowledge on plant usage for consumption by the people of Mizoram.

Keywords: Edible flowers, Mizo people, Wild edible plants

IPC Code: Int. Cl.¹⁹: A01H 5/02, A23B 9/00

Since centuries, people have gathered plant resources with the uses of different plant parts as a source of food, drink and medicine to fulfill their daily requirements. Different parts of the plants like leaves, tubers, rhizomes, shoots, fruits etc. are consumed to meet the daily nutritional requirements of human beings since prehistoric times which include the cultivated and wild forms^{1,2}. Among these different parts of the plants, flowers and flower buds of some plants are found to be edible and consumed in different ways forming a part of delicacies in several dishes. The use of flowers in human diet for cookery are well highlighted from various regions including Asia, Greece, Rome, France, Europe, etc³. Varieties of edible flowers are being served as salads, used to prepare cakes and drinks in different parts of Europe and Asia^{4,5}. One of the greatest contributions on edible flowers was made by Lu *et al.* in 2016⁶ that documented as many as 180 species of edible flowers from all over the world, most of which are cultivated ones. The traditional use of flowers as a source of food supplement was earlier reported from different regions. The flowers of *Madhuca indica* is used as a source of staple food in peninsular India during summer and monsoon¹. An Indian patent has been filed for antioxidant liquid sweetener from fresh *M. indica* flowers and this show the importance of edible flowers

as a source of human food⁷. In Assam, the flowers of *Oroxylum indicum* (L.) Vent. and *Sesbania grandiflora* (L.) Pers. are taken as vegetable mainly by the Bodo tribes⁸.

India being the mega-diverse region harbours rich biodiversity including the edible flowers⁹. The edible flowers commonly form part of the regular dish in Assam and Manipur and are consumed after boiling or frying, preparing curry or as raw which vary according to the floral species as well as the tribes and communities who use the items^{10,11}. In Mizoram, one of the north eastern states of India, houses many ethnic communities and they have rich knowledge regarding the use of various plants. They seek a lot of food items from the wild plants and one of such item is the edible flowers which are usually considered as one of the favorite dietary item among the vegetables. Although there have been sporadic reports on the wild edible foods of Mizoram¹²⁻¹⁸, there is no specific documentation on the edible flowers found in the state. The present study is an attempt to document the edible flowers both found in wild as well as cultivated ones specifically used by the indigenous people of Mizoram.

Materials and methods

Study Area

Mizoram is a hilly state lying in North-East India (Latitude 21°58'/24°35'N and longitude 92°15'/93°29'E) and forms a part of Indo-Burma hotspot. The

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state is considered as a corridor zone that bridges India with other South East Asian countries, and harbours unique flora due to its phytogeographical location. It is inhabited by different communities like *Mizos, Maras, Lais, Pangs, Bawms, Hmars, Paites, Brus, Chakmas, Mogs* etc. and forms the highest percentage of tribal population (94.8%) in India¹⁹. Forest coverage of the state is highest in India with 88.93% and supports great diversity of biological resources²⁰. Two districts were selected for the study, Aizawl (12, 588 km²) and Champhai (3,185 km²) districts of Mizoram (Fig. 1).

Survey, Interview and Plant Collection

Intensive survey programmes were conducted during 2015-2016. During the present study, 45 informants were selected from 10 villages of Aizawl and Champhai district and data on edible flowers collected based on semi-structured questionnaire. A free, prior and informed consent was solicited from each informant explaining the objectives of the study. Information was gathered through face-to-face interviews guided by the semi-structured questionnaire. The survey was primarily based on information gathered from the people with the age of informants range from 30 to 80 years that include both male and female respondents. Market values of plants with edible flowers are taken into consideration in the present study by following the market survey method by Singh *et al.* (1988)²¹. The specimens collected were identified, documented and were then deposited in the Herbarium, Department of Botany, Mizoram University (MZUH) following Jain and Rao (1977)²² herbarium methods.

In the present study, a plant with edible flower maybe a cumulative term including various parts like flowers, flower buds, whole inflorescence, tender shoots, stems, leaves, bracts and tendrils etc. or simply the flowers. This is because some flowers are consumed along with

other vegetative parts or sometimes the whole plant. Market surveys on the market price of marketable edible flowers were carried out in the Bara Bazaar of Aizawl city taken as reference point. Thirty market vendors of different age groups (30 years – 60 years) were taken as the sample group for the study and consulted for the information with respect to type of edible flowers, sources and their uses along with the market price. Local terms have been used while describing the mode of uses of the flowers. These terms are ‘*Bai*’ a form of mix boiling and ‘*Tauh*’ a form of dish prepared with oil and condiments after boiling. These terms represent the common traditional mode of preparation of dishes by the Mizo. All the findings are summarized in a table with their botanical name, family, vernacular names in Mizo, voucher no., market value, mode of uses and their life form, wild or cultivated form and Relative Frequency Citation (RFC) index value. Photographs of most of the edible flowers are also given in Fig. 2 & Fig 3.

Calculation

RFC index shows the local importance of each species without considering the use-categories^{23,24}. The RFC of reported species was calculated by using the following index:

$$RFC = FC/N \quad (0 < RFC < 1)$$

Where, FC is the number of informants mentioning the use of the species and N is the total number of informants participating in the survey.

Results and Discussion

Demographic data and cultural background of Informants

Out of the total 45 informants, 73.53% were women and 26.47% were men. This is an indication that women are far more knowledgeable regarding the usage of edible flowers as compare to men. Most of the informants were aged between 30 years - 50 years (47.05%) followed by 51 years - 65 years (35.29%) and above 65 years contributing only 14.70%. It is evident that the younger generations are more actively involved in housekeeping tasks like cooking, menu making of kitchen, shopping of household items including vegetables, harvesting/collection of wild flowers for consumption or their domestication in kitchen gardens. This agrees with the role of women with great knowledge in many indigenous societies to provide uninterrupted supply of healthy food by making arrangements of the daily needs of their families. Women’s traditional knowledge

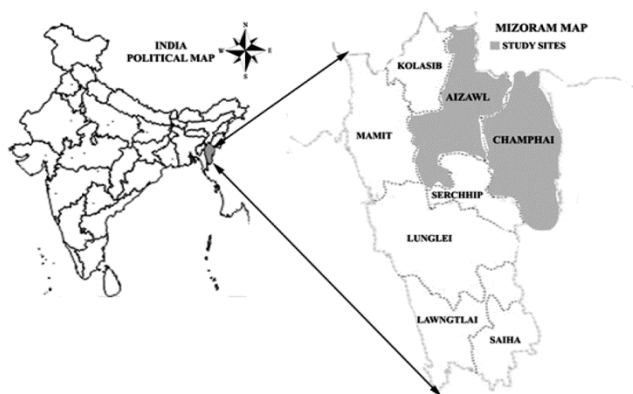


Fig. 1 — Location map of Mizoram showing study areas



Fig. 2 — Edible flowers (inflorescence) of Mizoram: – (a & b) *Acmella paniculata* (Wall. ex DC.) R. K.Jansen; (c) *Allium chinense* G. Don.; (d & e) *Allium hookerii* Thwaites; (f) *Alocasia fornicata* (Roxb.) Schott; (g) *Amomum dealbatum* Roxb.; (h) *Bauhinia purpurea* L.; (i) *B. variegata* L.;(j) *Begonia longifolia* Blume;(k) *Callicarpa arborea* Roxb.; (l) *Carica papaya* L.; (m) *Chenopodium album* L.; (n) *Clerodendrum glandulosum* Lindl.; (o) *Crassocephalum crepidioides* (Benth.) S. Moore; (p) *Crotalaria tetragona* Andrews; (q) *Cucurbita maxima* Duchesne; (r) *Curcuma angustifolia* Roxb.; (s) *C. longa* L.; (t) *Dendrocnide sinuata* (Blume) Chew; (u) *Dysoxylum excelsum* Blume

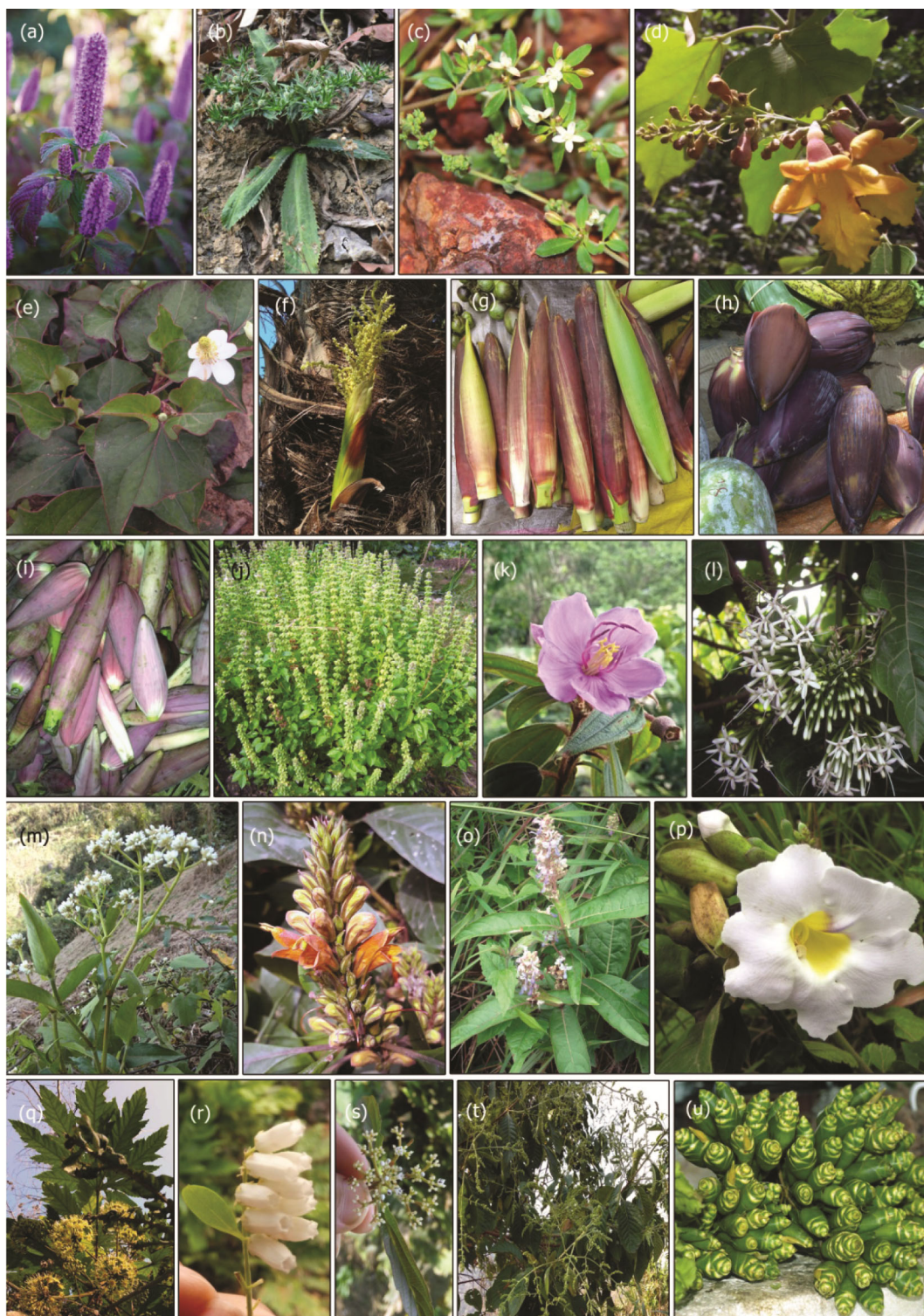


Fig. 3 — Edible flowers (inflorescence) of Mizoram : (a) *Elsholtzia griffithii* Hook.f.; (b) *Eryngium foetidum* L.; (c) *Glinus opositifolius* (L.) Aug. DC.; (d) *Gmelina arborea* Roxb.; (e) *Houttuynia cordata* Thunb.; (f) *Livistona chinensis* (Jacq.) Pers. R.Br.ex Mart.; (g) *Musa balbisiana* var. *liukuensis* (Matsum.) Häkkinen; (h) *M. x paradisiaca* L.; (i) *M. ornata* Roxb.; (j) *Ocimum americanum* L.; (k) *Osbeckia stellata* Buch.-Ham. ex Ker Gawl.; (l) *Pavetta crassicaulis* Bremek.; (m) *Persicaria chinensis* (L.) H. Gross; (n) *Phlogacanthus pubinervius* T. Anderson; (o) *Rotheca serrata* (L.) Steane & Mabb.; (p) *Thunbergia grandiflora* (Roxb. ex Rottl.) Roxb.; (q) *Trevesia palmata* (Roxb. ex Lindl.) Vis.; (r) *Vaccinium sprengelii* (G.Don) Sleumer; (s) *Viburnum* sp.; (t) *Wendlandia budleioides* Wall.ex Wight & Arn.; (u) *Zingiber officinale* Roscoe

originated from the actual needs, problems, interests and aspirations at home and in the communities that make her role as plant gatherer to plant selector, plant

domesticator to conservator and food provider to nutritionist^{25,26}. There is also a primary concern for women in maintaining the sustainability of the household economy. During the market survey, it was found that women take active part as vegetable vendors and played a significant role in maintaining a stable socio-economic status of the society. All the informants were found to be literate, however primary and middle education dominated (79.41%) (Table 1).

Table 1 — Demographic data of informants

Variable	Categories	Percentage (%)
1 Gender	Female	73.53
	Male	26.47
2 Age	30-50 years	47.05
	50-65 years	35.29
	More than 65 years	14.70
3 Education Level	Illiterate	Nil
	Primary and Middle Education	79.41
	Secondary Education	17.64
	Graduate (Higher education)	2.94

Edible Flora

Altogether 59 species of edible flowers belonging to 50 genera and 29 families are reported in the present study (Table 2). Families like Apiaceae,

Table 2 — List of the plants with edible flowers in Mizoram with scientific name, family name, local name, voucher no., plant form, flowering period, mode of consumption, market value and RFC value.

Sl. No	Plant Name/Family/Vernacular Name	Voucher No.	Plant form /WS/CS	Flowering time	Mode of Consumption	Market Value	RFC
1	<i>Acmella oleracea</i> (L.) R.K. Jansen./Asteraceae / <i>Ansapui</i>	LF-0001	H/CS	TY	Inflorescence are eaten boiled green or in dried forms	Rs 20-30/ bundle	0.64
2	<i>A. paniculata</i> (Wall. ex DC.) R.K. Jansen /Asteraceae / <i>Ansa-te</i>	LF-0003	H/WS	TY	Boiled as 'Tauh' or cooked with rice	Rs 20-30/ bundle	0.47
3	<i>Aeschynanthus parviflorus</i> (D.Don) Spreng./ Gesneriaceae/ <i>Bawlte-hlan-tai</i>	LF-0015	E/WS	Jun-Aug	Acidic flower is eaten raw	NM	0.06
4	<i>Allium cepa</i> L./Amaryllidaceae / <i>Purunsen</i>	LF-0063	H/CS	Jan-Apr	Flowers are ground and eaten	NM	0.22
5	<i>A. chinense</i> G. Don./Amaryllidaceae / <i>Purunvar</i>	LF-0097	H/CS	Aug-Nov	Fried flowers are eaten, eaten ground	Rs 20/bundle	0.47
6	<i>A. hookerii</i> Thwaites/Amaryllidaceae/ <i>Mizo-Purun</i>	LF-0055	H/CS	TY	Fried flowers are eaten, condiment, eaten ground	Rs 20/bundle.	0.67
7	<i>Alocasiaformicata</i> (Roxb.) Schott/Araceae/ <i>Baibing</i>	LF-0051	H/SCS	Aug-Nov	Upper portion of spadix eaten boiled or ground after steaming	Rs 20-50/bundle	0.78
8	<i>Anomum dealbatum</i> Roxb./Zingiberaceae/ <i>Aidu</i>	LF-0047	H/SCS	Apr-May	Young inflorescence are eaten boiled or fried	Rs 20-every 30 pieces	0.78
9	<i>Anethum graveolens</i> L./Apiaceae/ <i>Masala</i>	LF-0039	H/SCS	Oct-Mar	Inflorescence along with leaves are used as chutneys	NM	0.11
10	<i>Bauhinia purpurea</i> L. /Leguminosae / <i>Vau-fa-vang</i>	LF-0104	T/WS	Aug-Nov	Flowers are eaten raw or fried	NM	0.27
11	<i>B. variegata</i> L./Leguminosae / <i>Vaube</i>	LF-0054	T/WS	Jun-Sep	Flowers are eaten raw or fried	NM	0.4
12	<i>Begonia longifolia</i> Blume /Begoniaceae/ <i>Sekhupthur</i>	LF-0061	H/WS	TY	Acidic flower is eaten raw	NM	0.08
13	<i>Brassica oleracea</i> var <i>botrytis</i> L./Brassicaceae / <i>Parbawr</i>	LF-0052	H/CS	TY	Leaves along-with inflorescence head is eaten fried, boiled or 'Tauh'	Rs 50-150/ Kg	1
14	<i>B. oleracea</i> var <i>italica</i> L./Brassicaceae / <i>Broccoli</i>	LF-0024	H/CS	TY	Flower buds and leaves are eaten fried or as a salad	Rs 80-160/ Kg	0.96
15	<i>Brassica juncea</i> (L.) Czern/Brassicaceae/ <i>Antam</i>	LF-0025	H/CS	TY	Flowers and leaves are eaten fried or as a salad	Rs 20-60/ bundle.	1
16	<i>Callicarpa arborea</i> Roxb./Lamiaceae/ <i>Hnah-kiah</i>	LF-0108	T/WS	May-Oct	Flowers are cooked with meat	NM	0.06
17	<i>Carica papaya</i> L. /Caricaceae/ <i>Thingfanghma</i>	LF-0037	T/CS	TY	Male flower is eaten fried	NM	0.11
18	<i>Centella asiatica</i> (L.) Urb./Apiaceae / <i>Lambak/Darbengbur</i>	LF-0044	H/WS	TY	Leaves with inflorescence is eaten boiled or as chutney	Rs 10-20/ bundle	0.27

(Contd.)

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Sl. No	Plant Name/Family/Vernacular Name	Voucher No.	Plant form /WS/CS	Flowering time	Mode of Consumption	Market Value	RFC
19	<i>Chenopodium album</i> L./ Amaranthaceae / <i>Kawlbu</i>	LF-0038	H/WS	Dec-May	Inflorescence with leaves and tender shoots are eaten 'Tauh'	NM	0.11
20	<i>Clerodendrum glandulosum</i> Lindl./Lamiaceae / <i>Phuihn</i>	LF-0041	S/SCS	Jul-Oct	Leaves with inflorescence is eaten boiled	Rs 10-20/ bundle	0.51
21	<i>Coriandrum sativum</i> L./Apiaceae/ <i>Dhania/ Nannan</i>	LF-0043	H/CS	TY	Leaves with inflorescence are taken as culinary herb	Rs 10/ bundle	0.89
22	<i>Crassocephalum crepidioides</i> (Benth.) S. Moore/Asteraceae / <i>Buar</i>	LF-0087	H/WS	TY	Inflorescence chewed and the tender shoots along with flowers are eaten steamed	NM	0.06
23	<i>Crotolaria juncea</i> L. / Leguminosae / <i>Tumthang</i>	LF-0102	S/WS	Oct-Feb	Flowers are cooked with meat and fish	NM	0.11
24	<i>C. tetragona</i> Andrews / Leguminosae / <i>Tumthang</i>	LF-0009	S/WS	Oct-Mar	Flowers are cooked with meat	Rs 10-20/ bundle	0.69
25	<i>Cucurbita maxima</i> Duchesne/Cucurbitaceae / <i>Mai</i>	LF-0011	C/CS	Jun-Nov	Flowers are eaten fried with egg	Rs 20/packet.	0.87
26	<i>Curcuma angustifolia</i> Roxb. /Zingiberaceae/ <i>Ai chhia</i>	LF-0018	H/WS	Apr-Sep	Flowers are eaten fried	Rs 20/ bundle	0.06
27	<i>C. longa</i> L./Zingiberaceae / <i>Aieng</i>	LF-0023	H/CS	Apr-Sep	Flowers are eaten fried	NM	0.04
28	<i>Dendrocnide sinuata</i> (Blume) Chew/Urticaceae / <i>Thakpui</i>	LF-0067	S/WS	Oct-Jan	Flowers are eaten boiled	NM	0.06
29	<i>Dysoxylum excelsum</i> Blume/ Meliaceae / <i>Thingthupui</i>	LF-0004	T/SCS	Apr-Jul	Flowers along with leaves is eaten boiled	Rs 30- 50/bundle	0.47
30	<i>Elsholtzia griffithii</i> Hook.f. / Lamiaceae / <i>Lengser</i>	LF-0068	H/CS	Sep-Jan	Fresh and dried inflorescence used for Chutney and flavouring agent	Rs 30- 50/bundle	0.87
31	<i>Eryngium foetidum</i> L. /Apiaceae/ <i>Bakhhawr</i>	LF-0027	H/WS	TY	Inflorescence used for chutney and flavouring agent	Rs 10-20/ bundle	0.69
32	<i>Glinos opositifolius</i> (L.) Aug. DC./ Molluginaceae / <i>Bakkhate</i>	LF-0084	H/WS	TY	Whole plant with inflorescence is eaten fried	Rs 10-20/bundle	0.18
33	<i>Gmelina arborea</i> Roxb. /Lamiaceae/ <i>Thlam-Vawng</i>	LF-0100	T/WS	Feb-May	Flowers are eaten fried	NM	0.04
34	<i>Hibiscus sabdariffa</i> L./ Malvaceae/ <i>Lakher anthur</i>	LF-0046	S/CS	Jun-Oct	Sour persistent calyx is eaten raw or cooked as vegetable	NM	0.51
35	<i>Houttuynia cordata</i> Thunb./ Saururaceae/ <i>Uithinthang</i>	LF-0089	H/CS	Apr-Oct	Flowers with stem used as condiment	Rs 20-30/ bundle	0.06
36	<i>Livistona chinensis</i> (Jacq.) Pers. R.Br.ex Mart. /Arecaceae / <i>Buarpui</i>	LF-0032	T/CS	Mar-May	Inflorescence boiled alone or with meat or fried	Rs 10-20/bundle	0.42
37	<i>Mollugo pentaphylla</i> L. / Molluginaceae / <i>Vahmim bung</i>	LF-0019	H/WS	Aug-Oct	Whole plant with inflorescence eaten as bitter vegetable	NM	0.04
38	<i>Momordica charantia</i> L./ Cucurbitaceae / <i>Changkha</i>	LF-0006	C/CS	July-Sep	Flower along with leaves are eaten boiled	Rs 20/ bundle	0.27
39	<i>Musa balbisiana</i> var. <i>liukiuensis</i> (Matsum) Häkkinen /Musaceae / <i>Tumbu</i>	LF-0031	H/WS	TY	Inflorescence eaten boiled or fried and used as pickle	Rs 30- 50/bundle inflorescence	0.62
40	<i>M. x paradisiaca</i> L. /Musaceae/ <i>Lairawk tumbu</i>	LF-0095	H/SCS	TY	Spadix is eaten as 'Bai' or fried	Rs 10-20/ inflorescence	0.69
41	<i>M. ornata</i> Roxb./Musaceae/ <i>Changvandawt</i>	LF-0035	H/SCS	TY	Inflorescence is eaten as 'Bai'	Rs 30-50/bundle inflorescence	0.29
42	<i>Ocimum americanum</i> L./Lamiaceae/ <i>Runhmui</i>	LF-0029	H/SCS	Aug-Jan	Inflorescence is used as condiment, chutney and flavouring agent	Rs 10-20/bundle	0.73
43	<i>Osbeckia stellata</i> Buch.-Ham. ex Ker Gawl./ Melastomataceae/ <i>Builukham</i>	LF-0022	S/WS	May-Nov	Flowers are eaten raw by local children	NM	0.04
44	<i>Pavetta crassicaulis</i> Bremek./Rubiaceae/ <i>Thai-nu rual</i>	LF-0111	S/WS	Oct-Jun	Flowers are eaten fried	NM	0.27

(Contd.)

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45	<i>Persicaria chinensis</i> (L.) H. Gross/ Polygonaceae/ <i>Taham</i>	LF-0014	H/WS	Jul-Nov	Acidic flower are eaten raw	NM	0.06
46	<i>Pisum sativum</i> L. /Leguminosae / <i>Chana</i>	LF-0016	H/CS	Oct-Mar	Flower along with tender shoots and leaves are eaten as 'Tauh'	Rs 20-30/ bundle	0.37
47	<i>Phlogacanthus pubinervius</i> T. Anderson /Acanthaceae/ <i>Va te zu</i>	LF-0114	S/WS	Jan-May	Flowers are cooked with meat	NM	0.27
48	<i>Raphanus sativus</i> L./Brassicaceae/ <i>Mula</i>	LF-0013	H/CS	Jun-Aug	Flower with tender shoots and leaves are eaten boiled	Rs 10-20/bundle	0.42
49	<i>Rhododendron arboreum</i> Sm./Ericaceae/ <i>Chhawkhlei par sen</i>	LF-0072	T/WS	Mar-May	Acidic flower is eaten raw or ground	NM	0.18
50	<i>Rothea serrata</i> (L.) Steane & Mabb. /Lamiaceae/ <i>Phuinhamshak</i>	LF-0105	S/WS	May-Jul	Flowers with tender shoots are eaten fried	NM	0.27
51	<i>Smilax perfoliata</i> Lour./Smilacaceae/ <i>Kaiha</i>	LF-0091	C/WS	Jul-Nov	Flower is eaten raw by local children	NM	0.04
52	<i>Solanum nigrum</i> L./Solanaceae/ <i>Anhling</i>	LF-0017	S/WS	Sep-May	Flowers along with tender shoots and leaves are eaten boiled	Rs 10-20/ bundle	0.42
53	<i>Thunbergia grandiflora</i> (Roxb. ex Rottl.) Roxb. / Acanthaceae / <i>Vako</i>	LF-0115	C/WS	Jul-Nov	Flowers are eaten fried	NM	0.06
54	<i>Trachyspermum roxburghianum</i> (DC.) H. Wolff/Apiaceae/ <i>Par-di</i>	LF-0094	H/SCS	Dec-Jan	Flowers along with leaves are eaten in chutney and as flavouring agent	Rs 10-20/ bundle	0.64
55	<i>Trevesia palmata</i> (Roxb. ex Lindl.) Vis. /Araliaceae/ <i>Kawhtebe</i>	LF-0020	T/CS	Apr-Jul	Flower buds are eaten fried, boiled or 'Bai'	Rs 20-50/ bundle	0.62
56	<i>Vaccinium sprengelii</i> (G.Don) Sleumer./Ericaceae / <i>Sir-kam</i>	LF-0040	S/WS	May-Jun	Flowers are eaten raw	NM	0.27
57	<i>Viburnum</i> sp/Caprifoliaceae / <i>Vai seh sen'</i>	LF-0034	S/WS	May-Jun	The inflorescence are chewed by local children	NM	0.06
58	<i>Wendlandia budleoides</i> Wall.ex Wight & Arn. /Rubiaceae / <i>Ba-ting</i>	LF-0048	T/WS	Feb-Apr	Inflorescence are eaten as 'Tauh'	NM	0.29
59	<i>Zingiber officinale</i> Roscoe/Zingiberaceae / <i>Sawhthing</i>	LF-0050	H/CS	Aug-Nov	Inflorescence eaten as soup	Rs 20-30/ bundle	0.96

CS-Cultivated Species; WS-Wild Species; SCS- Semi Cultivated Species; C-Climber; E- Epiphyte; H-Herb; S-Shrub; T-Tree; NM-Non Marketable; TY: Throughout Year 'Tauh' is a form of traditional Mizo salad; 'Bai' is a form of traditional Mizo boiled food

Lamiaceae and Leguminosae recorded maximum 9% each followed by Brassicaceae and Zingiberaceae contributing 7% each, Asteraceae and Musaceae with 5% and the remaining families contribute $\leq 3\%$ (Fig. 5). The plants are dominated by herbs (54%) followed by shrubs (18%), trees (18%), climbers (7%) and epiphytes (2%) (Fig. 4). From the listed plants, 21 species are cultivated, 30 species are collected from wild and the other 8 species are found as semi-cultivated which means that although found in wild, local people have started domestication and subsequent cultivation due to their socio economic importance. Out of the 59 plants, more than half are found to be in wild form. This shows the importance of wild edible plants in Mizoram. Many of the edible flowers are found to be marketable although collected from wild. It was observed that 30 species are marketable and the

remaining 29 species are non-marketable. Some of these marketable edible flowers always fetch good market value for their limited production in the state or their availability only in a particular season like *Livistonia chinensis* (Rs. 50-100/ inflorescence) (Fig. 3f), *Alocasia fornicata* (Rs. 20-50/bundle) (Fig. 2f), *Trevesia palmata* (Rs. 20-50/ bundle) (Fig. 3q), *Zingiber officinale* (Rs. 20-30/bundle) (Fig. 3u) and some for their high demand like the cultivated *Brassica oleracea* var. *botrytis* (Rs. 50-150/kg) and *Brassica oleracea* var. *italica* (Rs. 80-160/kg).

These edible flowers are consumed in different forms as they are taken as raw, boiled, fried or as culinary herb. Some of flowers are taken for their unique acidic taste and preferred as raw flowers (*Aeschynanthus parviflora*, *Begonia longifolia*, *Osbeckia stellata*) etc. The inflorescences of

Elsholtzia griffithii (Fig. 3a) are used from immemorial times either in green or dried form and is one of the most preferred flavoring agents. Other common wild edible flowers include spadix of *Musa* sp. (Fig.3 g-i) and *Alocasia fornicata* (Fig. 2f), flowers of *Crotolaria tetragona* (Fig. 2p) and *Amomum dealbatum* (Fig. 2g) are served as a favorite vegetable item. Besides this, agricultural crops like inflorescence of *Brassica* sp. and *Zingiber officinale* (Fig. 3u) are also widely consumed.

Phytochemical contents in edible flowers

There are various studies dealing with the phytochemistry, dietary elements and bioactive components found in the edible flowers²⁷⁻³³. Reports on the phytochemical studies on some edible flowers show that they have rich source of minerals, nutritional compounds with antioxidant and

hypoglycemic properties^{32,34,35}. Some flowers also constitute as an important source of food supplement, and used as natural food colourant and even for other medicinal purposes^{36,37}. However, most of the biochemical studies on edible flowers are related to the cultivated ornamental plants^{28,38,39}. Literature on phytochemical contents of most of the edible flowers listed above is meager and still remains as a big void. Edible flowers of few species like *Hibiscus safdariffa*, *Begonia sempervirens*, *Alocasia fornicata*, *Acmella oleracea* and some cultivated ones have gained the attention of some researchers and contributed worthwhile contributions on the phytochemistry of edible flowers. Flowers of *Hibiscus safdariffa* has various phenolic compounds like flavonols, flavones, anthocyanins, phenolic acids, flavanols etc. leading to its antioxidant, anti-cancer, anti-inflammatory, anti-obesity properties, and also possess neuro-protective effect^{6,27}. It has also displayed many other health benefits like nephroprotective and hepatoprotective effect^{40,41}. Fixed oils extracted from spadix of *Alocasia fornicata* possess antioxidant and antibacterial property⁴². The fully mature and flowering plants of *Acmella oleracea* was analyzed and found to contain phytosterols and tannins. In addition to that, it was found to have total phenol content of 1.38 GAE mg/g and total flavonoid content of 28.7 QE mg/g⁴³.

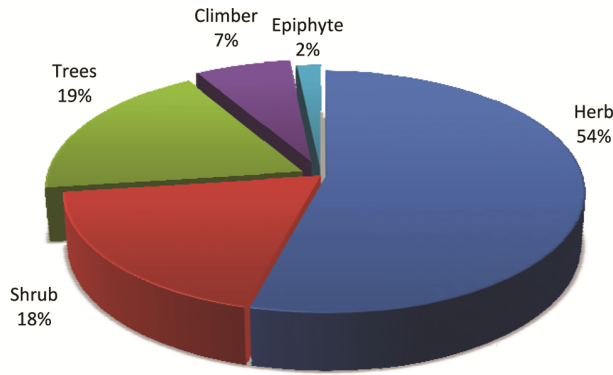


Fig. 4 — Chart showing the percentage of different life forms contributing to edible flowers of Mizoram

Key findings

Many of the edible flowers presented above were already reported from other regions and are eaten by

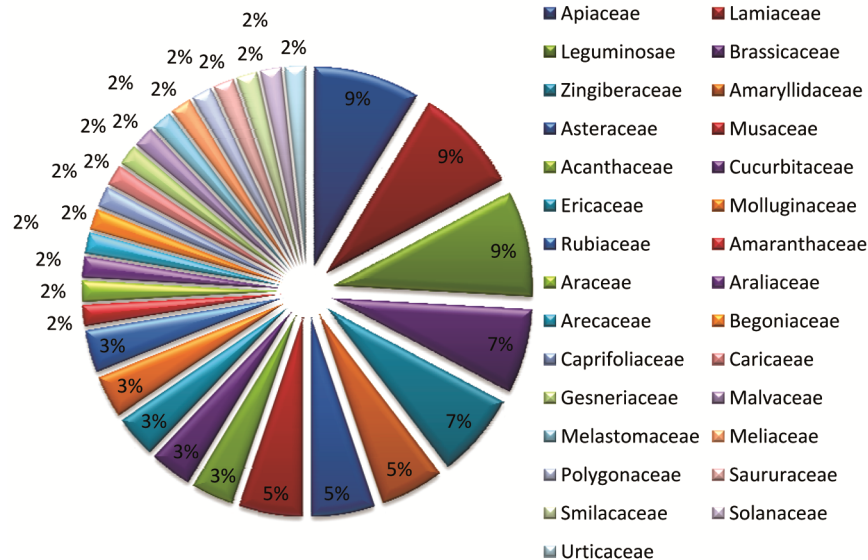


Fig. 5 — Chart showing percentage diversity in families of edible flowers found in Mizoram

different indigenous people of India^{10,11}. However during our investigation, we came across few unique wild edible flowers from Mizoram that are consumed only in the state and not reported earlier from any other areas or by any community. These plants include flowers of *Aeschynanthus maculata*, *Begonia longifolia* (Fig. 2j), *Livistonia chinensis* (Fig. 3f), *Mollugo pentaphylla*, *Osbeckia stellata* (Fig. 3k), *Trevesia palmata* (Fig. 3q), *Vaccinium sprengelii* (Fig. 3r) and *Viburnum* sp. (Fig. 3s), etc. Most of these 08 species are harvested from wild and only 03 of them are marketed. Some of the edible flowers are quite popular for the ethnic people of Mizoram that they form an indispensable part of their diet. Many of the edible flowers are originated from Asia with their wide distribution in tropical and subtropical regions of the world⁶. As Mizoram enjoys both tropical and subtropical climate, with further deeper studies in the remaining districts, we can expect more interesting wild edible flowers from Mizoram in near future.

Data analysis

During data analysis, RFC which is a measure of the relative importance of the plants known locally ranges from 1-0.04 with maximum value found to be 1 in the cultivated marketable plants like *Brassica juncea*, *B.oleracea* var. *botrytis* as they were mentioned by all the informants. This shows the importance of these edible flowers which is an important food crop all over the world and have been cultivating for several thousand years for their high economic values. After analyzing the RFC values, many of the edible flowers are known and used by the Mizo people. However, some of the edible flowers are less commonly used by the Mizo people with RFC value of 0.04 (*Curcuma longa*, *Gmelina arborea*, *Mollugo pentaphylla* and *Smilax perfoliata*).

Conclusion

The paper documents 59 edible flowers used by the indigenous people of Mizoram. Although some of the edible flowers are found to be cultivated because of their high demand in human diet (*Brassica* sp.) with RFC value of 1 showing their cultural importance, most of them are collected from wild. During food shortages and occurrence of 'Mautam' a famine, the wild edible plants including the edible flowers diversify the food providing source and even stabilized the security of the local people during odd times. Many of the marketable edible flowers also provide potential good market value due to limited supply and great

demand. The present study also revealed that women hold more knowledge than men with regard to the edible flowers in Mizoram. In one sense, the role of women as traditional knowledge keepers or as plant conservationists and their socio-economic contribution within the community needed to be acknowledged. Commercial exploitation of these edible flowers with proper management under a system for their sustainable use can help in generating income for the indigenous people. The present finding is only the primary data and supplements the existing genetic resources on edible flowers of the world, both wild and cultivated species. Henceforth, an elaborative exploration programme is further needed to document the potential edible flowers in the remaining population of the state which is formed by several ethnic tribes.

Acknowledgements

We are thankful to the local informants of Aizawl and Champhai district, market vendors of Bara Bazaar of Aizawl for their participation in the study and for sharing their valuable knowledge.

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