horticulturae

MDPI

Research Article

Biogeography, conservation status, and traditional uses of Zingiberaceae in Saraburi Province, Thailand, with *Kaempferia chaveerachiae* sp. nov.

Supplementary Materials:



Figure S1. Bundles of inflorescences of *Globba* spp. and *Curcuma* spp. plants in bottles/buckets are available for purchase along the roadside during the Tak Bat Dok Mai Festival, Phra Phutthabat Temple in Phra Phutthabat District, Saraburi Province, Thailand. August 1, 2023 (Photographs by Thawatphong Boonma).

Table S1: Key to genera of Saraburi' Zingiberaceae plants

1a. Staminodes reduced to small or absent	2
1b. Staminodes well developed	7
2a. Inflorescence position terminal on pseudostem	*Alpinia*
2b. Inflorescence position lateral on leafless shoot	3
3a. Staminal tube present	*Etlingera*
3b. Staminal tube absent	4
4a. Anther crest entire	5
4b. Anther crest trilobed	6

5a. Leafy shoot 1.5–3 m.; fruit smooth	*Meistera*
5b. Leafy shoot less than 1 m.; fruit winged or ridged	*Amomum*
6a. Lateral lobes of anther crest pointing downwards	*Conamomum*
6b. Lateral lobes of anther crest pointing upwards	*Wurfbainia*
7a. Placentation parietal; ovary unilocular	8
7b. Placentation central; ovary trilocular	9
8a. Labellum entire or bifid	*Globba*
8b. Labellum trilobed	*Gagnepainia*
9a. Filament long exerted	*Hedychium*
9b. Filament not long exerted	10
10a. Anther crest shaped like a horn	11
10b. Anther crest shaped not like a horn	12
11a. Pseudostem less than 30 cm tall with 2–3 broadly leaves	*Cornukaempferia*
11a. Pseudostem longer than 30 cm tall with several narrowly leaves	*Zingiber*
12a. Bracts fused together laterally	*Curcuma*
12b. Bracts free from each other	13
13a. Flower form bell-shaped, usually point downward	*Boesenbergia*
13b. Flower does not form bell-shaped, pointing upwards or forwards	*Kaempferia*

Table S2: Key to species of Saraburi' Zingiberaceae plants

1a. Staminodes are prominently developed	2
1b. Staminodes are absent or diminished to small	86
2a. Placentation parietal; ovary unilocular	3
2b. Placentation central; ovary trilocular	19
3a. Labellum tri-lobed	4
3b. Labellum bi-lobed or truncate	5
4a. Flower white with pale orange to yellowish orange	*Gagnepainia godefroyi*
4b. Flower green with yellowish green	*Gagnepainia harmandii*
5a. Flower with dark violet appendages	*Globba geoffrayi*
5b. Flower with white, yellow, or orange appendages	6
6a. Appendages 2, inflorescence erect	7
6b. Appendages 4, inflorescence horizontal or pendent	9
7a. Floral tube and corolla lobes orange	*Globba thorelii*
7b. Floral tube and corolla lobes white	8
8a. Leaf elliptic; bulbils absent	*Globba chrysochila*
8b. Leaf linear; bulbils many	*Globba xantholeuca*
9a. Inflorescence longer than 8 cm	10
9b. Inflorescence 2 to 8 cm	13
10a. Bulbils absent	11
10b. Bulbils present	12
11a. Fruit white; leaf densely pubescent on both sides	*Globba laeta*
11b. Fruit green; leaf glabrous, except pubescent midrib above	*Globba sherwoodiana*

12a. Rachilla up to 2 cm long; bracts typically green	*Globba schomburgkii*
12b. Rachilla longer than 2 cm long; bracts typically white or pink, occasionally green	*Globba williamsiana*
13a. Bracts with pink, red, or violet	14
13b. Bracts green, white with green, or yellow	15
14a. Bulbils absent	*Globba rosea*
14b. Bulbils many, fusiform	*Globba bicolor*
15a. Appendages white	*Globba candida*
15b. Appendages yellow or orange	16
16a. Bulbils present	17
16b. Bulbils absent	18
17a. Cincinni to 3 cm long	*Globba hilaris*
17b. Cincinni sessile	*Globba marantina*
18a. Bracts yellow	*Globba colpicola*
18b. Bracts green	*Globba obscura*
19a. Filament long exerted	20
19b. Filament not long exerted	21
20a. Terrestrial; labellum suborbicular; staminodes white	*Hedychium coronarium*
20b. Epiphytic; labellum narrowly oblong; staminodes orange yellow	*Hedychium longicornutum*
21a. Anther crest shaped like a horn	22
21b. Anther crest shaped not like a horn	34
22a. Leaves broad, 2-3 in number; pseudostem less than 10 cm tall	23
22a. Leaves narrow, numerous; pseudostem more than 50 cm tall	25
23a. Staminodes are glabrous	*Cornukaempferia aurantiiflora*
23b. Staminodes are pubescent	24
24a. Leaves are silvery green	*Cornukaempferia argentifolia*
24b. Leaves are green without silvery	*Cornukaempferia kamolwaniae*
25a. Inflorescence terminal at the distal part of pseudostem	*Zingiber pellitum*
25b. Inflorescence radical on a leafless peduncle	26
26a. Peduncle procumbent	*Zingiber thorelii*
26b. Peduncle erect	27
27a. Leaves linear	28
27b. Leaves lanceolate to oblong	31
28a. Labellum purple mottled cream	*Zingiber officinale*
28b. Labellum yellow or with purple-pink mottling	29
29a. Bracts white or white with pink streaks at flowering	*Zingiber niveum*
29b. Bracts maroon or yellow green at flowering	30
30a. Spike fusiform; bracts maroon with green edges at anthesis	*Zingiber purpureum*
30b. Spick cylindrical oblong; bracts yellow green at anthesis	*Zingiber parishii*
31a. Leaves 12–20 cm long	32
31b. Leaves 25–50 cm long	33

32a. Bracts dull green; labellum white	*Zingiber brachystachys*
32b. Bract yellow; labellum yellow with red streaks	*Zingiber pyroglossum*
33a. Labellum yellow with brown mottling	*Zingiber ottensii*
33b. Labellum yellow without brown mottling	*Zingiber zerumbet*
34a. Bracts fused laterally	35
34b. Bracts not fused laterally	63
35a. Epigynous glands lacking	36
35b. Epigynous glands are evident	45
36a. Coma bracts present	37
36b. Coma bracts absent	43
37a. Labellum featuring red coloration	38
37b. Labellum not featuring red coloration	39
38a. Staminodes purplish with a red line along external margin at base	*Curcuma rhabdota*
38b. Staminodes whitish with 3–4 dark red lines about half of length	*Curcuma saraburiensis*
39a. Coma bracts are pink	40
39b. Coma bracts are white or green	41
40a. Staminodes white	*Curcuma alismatifolia*
40b. Staminodes yellow	*Curcuma myanmarensis*
41a. Bracts tinged with reddish-brown	*Curcuma micrantha*
41b. Bracts not tinged with reddish-brown	42
42a. Labellum deeply divided into two lobes; coma bracts pure white	*Curcuma thorelii*
42b. Labellum not deeply divided, fringed margins; coma bracts white with green distal part	*Curcuma parviflora*
43a. Bracts elongated and narrow	*Curcuma harmandii*
43b. Bracts broad, almost orbicular	44
44a. Labellum featuring two dark yellow spots near the base	*Curcuma charanii*
44b. Labellum without dark yellow spots at the base	*Curcuma puangpeniae*
45a. Coma bracts absent; typically produce open-form flowers	46
45b. Coma bracts present; typically produce a closed-form flowers	52
46a. Floral tube longer than the bracts	*Curcuma supraneeana*
46b. Floral tube shorter than the bracts	47
47a. Anther spurs filamentous	48
47b. Anther spurs cylindrical or conical	49
48a. Staminodes exhibiting purple coloration	*Curcuma pierreana*
48b. Staminodes lacking purple coloration	*Curcuma rosea*
49a. Inflorescence lateral	*Curcuma singularis*
49b. Inflorescence terminal	50
50a. Staminodes white and tinged with reddish purple	*Curcuma sabhasrii*
50b. Staminodes yellow	51
51a. Leaves upper surface glabrous	*Curcuma rangsimae*
51b. Leaves upper surface pubescent	*Curcuma putii*

52a. Rhizome lacking branches	*Curcuma angustifolia*
52b. Rhizome with prominent branching	53
53a. Inflorescence terminal	54
53b. Inflorescence lateral	61
54a. Anther ecalcarate	*Curcuma roscoeana*
54b. Anther calcarate	55
55a. Inflorescence emerging from lateral slits near the base of the pseudostem	56
55b. Inflorescence occurring between the innermost leaf sheaths, situated above the pseudostem	57
56a. Coma bracts not present; fertile bracts red; rhizome creeping	*Curcuma rubrobracteata*
56b. Coma bracts present; fertile bracts ruby pink; rhizome non-creeping	*Curcuma suraponii*
57a. Peduncle red	*Curcuma phrayawan*
57b. Peduncle green	58
58a. Ovary glabrous	*Curcuma petiolata*
58b. Ovary pubescent	59
59a. Leaf midrib on adaxial side tinged reddish-purple.	*Curcuma wanenlueanga*
59b. Leaf midrib on adaxial side coloured green	60
60a. Rhizome aromatic, deep orange yellow internally, aromatic	*Curcuma longa*
60b. Rhizome non-aromatic, yellowish white to pale yellow internally	*Curcuma rangjued*
61a. Petioles reddish brown	*Curcuma rubescens*
61b. Petioles green	62
62a. Leaf midrib on the upper side green; rhizome white with pale yellow core internally	*Curcuma mangga*
62b. Leaf midrib on the upper side red or reddish-purple; rhizome bluish green internally	*Curcuma aeruginosa*
63a. Flower form a bell shaped, usually point downward	64
63b. Flower open form, usually point upward	69
64a. Inflorescence lateral	65
64b. Inflorescence terminal	66
65a. Flower yellow	*Boesenbergia collinsii*
65b. Flower white	*Boesenbergia maxwellii*
66a. Leaves usually with silvery pattern	*Boesenbergia parvula*
66b Leaves without silvery pattern	67
67a. Anther crest present	*Boesenbergia rotunda*
67b. Anther crest absent	68
68a. Bases of leaves are cordate	*Boesenbergia petiolata*
68b. Bases of leaves are cuneate	*Boesenbergia thorelii*
69a. Inflorescence lateral	70
69b. Inflorescence terminal	73

70a. Staminodes lie flat horizontally on the same plain of labellum	71
70b. Staminodes erect and perpendicular to the labellum	72
71a. Pseudostem buried in ground; leaves 3–4, orbicular to ovate	*Kaempferia lopburiensis*
71b. Pseudostem erect; leaves 5–7, elliptic	*Kaempferia takensis*
72a. Labellum with two yellow stripes	*Kaempferia simaoensis*
72b. Labellum without two yellow stripes	*Kaempferia rotunda*
73a. Leaves oriented horizontally near the ground	74
73b. Leaves directed upwards from the ground	79
74a. Staminodes light purple with white spot at base	*Kaempferia nigrifolia*
74b. Staminodes white	75
75a. Labellum purple	76
75b. Labellum white	77
76a. Staminodes erect to slightly arcuate, perpendicular to labellum	*Kaempferia saraburiensis*
76b. Staminodes arranged in the same plane of labellum	*Kaempferia marginata*
77a. Leaves upper surface without dark spots or blotches	*Kaempferia galanga*
77b. Leaves upper surface with dark spots or blotches	78
78a. Labellum white with two purple blotches	*Kaempferia pardi*
78b. Labellum white without purple blotch	*Kaempferia napavarniae*
79a. Lamina narrower than 4 cm	*Kaempferia larsenii*
79b. Lamina wider than 4 cm	80
80a. Staminodes lying on the same plane as the labellum	81
80b. Staminodes perpendicular to the labellum plane	83
81a. Leaves upper surface with dark green spots; staminodes white	*Kaempferia maculifolia*
81b. Leaves upper surface without spots as above; staminodes purple	82
82a. Stigma dark purple; leaves base subcordate	*Kaempferia elegans*
82b. Stigma white; leaves base attenuate	*Kaempferia sakonensis*
83a. Peduncle sessile; petiole subsessile < 1 cm long	84
83b. Peduncle not sessile; petiole 2–3 or up to 20 cm long	85
84a. Leaves green with white margin	*Kaempferia gilbertii*
84b. Leaves plain green, or with silver stripes	*Kaempferia angustifolia*
85a. Rhizome moniliform, dark purple; petiole 2–3 cm long;	*Kaempferia parviflora*
85b. Rhizome sympodial, yellowish; petiole 3 to 20 cm long;	*Kaempferia chaveerachiae*
86a. Inflorescence terminal	87
86b. Inflorescence lateral	95
87a. Bracts absent	88
87b. Bracts present	90
88a. Inflorescence pendulous	*Alpinia zerumbet*
88b. Inflorescence erect	89
89a. Bracteole persistent	*Alpinia macroura*
89b. Bracteole not persistent	*Alpinia mutica*
90a. Fruit with longitudinally ribs	*Alpinia oxymitra*
90b. Fruit without longitudinally ribs	91

91a. Flower longer than the bract	92
91b. Flower shorter than the bract	94
92a. Bracteoles not tubular, open to the base	*Alpinia galanga*
92b. Bracteoles in a tubular form	93
93a. Labellum scarlet with yellow	*Alpinia laosensis*
93b. Labellum white with reddish veins	*Alpinia siamensis*
94a. Bracts green with white; leaves with white variegation	*Alpinia vittata*
94b. Bracts pink or red; leaves without white variegation	*Alpinia purpurata*
95a. Staminal tube present (genus *Etlingera*)	96
95b. Staminal tube absent	97
96a. Peduncle erect above the ground	*Etlingera elatior*
96b. Peduncle embedded in the ground	*Etlingera araneosa*
97a. Anther crest entire	98
97b. Anther crest trilobed	102
98a. Leafy shoot 1.5–3 m.; fruit glabrous or glabrescent	99
98b. Leafy shoot less than 1 m.; fruit winged or ridged	100
99a. Ligule less than 5 mm; labellum rhomboid	*Meistera koenigii*
99b. Ligule longer than 5 mm; labellum orbiculate	*Meistera tomrey*
100a. Bracteoles absent	*Amomum repoeense*
100b. Bracteoles present, split to base on one side	101
101a. Leaves prominently veined	*Amomum foetidum*
101b. Leaves not prominently veined	*Amomum wandokthong*
102a. Lateral lobes of anther crest pointing downwards	*Conamomum pierreanum*
102b. Lateral lobes of anther crest pointing upwards	*Wurfbainia uliginosa*

Table S3. Species Diversity and Methods of Utilizing Zingiberaceae Plants as Food in Saraburi Province.

No	Species	Method of Uses
1	*Alpinia galanga* (L.) Willd.	Young rhizome, young pseudostem and young inflorescence eat fresh or boiling
2	*Alpinia laosensis* Gagnep.	Young rhizome, young pseudostem and young inflorescence eat fresh or boiling
3	*Alpinia oxymitra* K.Schum.	Young pseudostem and young inflorescence eat fresh or boiling
4	*Alpinia siamensis* K.Schum.	Young rhizome, young pseudostem and young inflorescence eat fresh or boiling
5	*Boesenbergia rotunda* (L.) Mansf.	Young rhizome, young pseudostem eat fresh or boiling, served with chilly paste
6	*Curcuma aeruginosa* Roxb.	Young rhizome and young inflorescence eat fresh or boiling
7	*Curcuma angustifolia* Roxb.	Young inflorescences eat fresh or boiling, or served as a side dish vegetable
8	*Curcuma longa* L.	Young inflorescences eat fresh or boiling, , or served as a side dish vegetable
9	*Curcuma mangga* Valeton & Zijp	Young rhizome and young inflorescence eat fresh or boiling
10	*Curcuma singularis* Gagnep.	Young inflorescences eat fresh or boiling, or served as a side dish vegetable
11	*Etlingera araneosa* (Baker) R.M. Sm.	Young pseudostem and young inflorescence eat fresh or boiling
12	*Etlingera elatior* (Jack) R.M.Sm.	Slice bracts into small pieces, eat fresh or boiling, mix with other ingredient as spicy salad
13	*Kaempferia marginata* Carey ex Roscoe	Young rhizome and young curled leaf eat fresh or boiling, served with chilly paste or making spicy salad
15	*Kaempferia nigrifolia* Boonma & Saensouk	Young curled leaf eat fresh or boiling, served with chilly paste or making spicy salad
16	*Zingiber officinale* Roscoe	Young rhizome slide into short lines usually eaten with rice porridge; or slice into thin layer eat fresh or preserved in vinegar and salt filled a little with lemon juice usually served with Isan sausage, fermented pork fried or grilled; young pseudostem eaten fresh with chilly paste; young inflorescence eats fresh or boiling, or served as a side dish vegetable

No	Species	Method of Uses
17	*Zingiber thorelii* Gagnep.	Young inflorescences eat fresh or boiling, served with chilly paste, or served as a side dish vegetable
18	*Zingiber zerumbet* (L.) Roscoe ex Sm.	Young rhizome, young pseudostem, and young inflorescence boiling and eat with chilly paste, or served as a side dish vegetable

Table S4. Species Diversity and Methods of Utilizing Zingiberaceae Plants as spices in Saraburi Province.

No	Species	Method of Uses
1	*Alpinia galanga* (L.) Willd.	Pound the rhizomes together with other ingredients, such as dried chili, red shallots, lemongrass, kaffir lime peels, garlic, shrimp paste, and salt, to make red curry paste. When red chili is replaced with green chili and coriander seeds, cumin, and coriander root are added, the mixture results in green curry paste. Altering or adding certain ingredients to the mixture will give the curry paste a specific and distinct name. Fresh rhizomes can be thinly sliced, mashed, and used sparingly in curry paste to avoid overpowering the flavor. Older rhizomes are ground and roasted until they turn yellow, then used in fish porridge to reduce its fishy flavor and smell. They are also sliced and used in a variety of spicy and aromatic soups, including hot and sour Thai soup, coconut milk-based chicken soup (Tom Kha Gai), and tangy soup featuring smoked fish
2	*Alpinia laosensis* Gagnep.	Use as same as *Alpinia galanga*
3	*Alpinia siamensis* K.Schum.	Use as same as *Alpinia galanga*
4	*Amomum foetidum* Boonma & Saensouk	Whole plant uses to replacement for stink bugs (*Tessaratoma papillosa* Drury) in the preparation of 'Mangkang chili paste.' Despite its strong odour, many villagers favour it
5	*Boesenbergia rotunda* (L.) Mansf.	Roots and rhizomes are crushed to flavour 'Nam Ya,' a Thai curry sauce, and 'Nam Ya Pa,' an Isan curry sauce commonly paired with Thai rice noodles called 'Khanom Jeen'
6	*Curcuma longa* L.	Rhizome is used in Thai curry pastes to provide a yellow color. For stir-fried dishes, a pinch of rhizome's powder boosts the flavour and aroma of vegetables or meat, harmonizing with other ingredients such as *Zingiber officinale* Roscoe, garlic, and lemongrass. The rhizome powder also used to add flavour and a pleasant golden color to steamed or fried rice. And the powder from the rhizome of this species is one of the main ingredients of curry powder which usually mix with seeds of *Coriandrum sativum* L., *Cuminum cyminum* L., and seeds of *Trigonella foenum-graecum* L.
7	*Curcuma mangga* Valeton & Zijp	Thin slices of rhizome are employed to counteract the fishy odour, e.g. in fish curry, and spicy stir-fried eel
8	*Etlingera araneosa* (Baker) R.M. Sm.	Rhizomes sliced used to adding aromatic qualities to food e.g. Meat Noodles
9	*Wurfbainia uliginosa* (J.Koenig) Giseke	Rhizomes sliced used to adding aromatic qualities to food
10	*Zingiber officinale* Roscoe	Rhizomes are employed as spices, typically sliced into strips for dishes such as stir-fried ginger with chicken

Table S5. Diversity of Zingiberaceae Species Found in Saraburi Province, that uses as herbal medicine.

No	Species	Used parts	Preparation	Method of uses	Group of symptoms
1	*Alpinia galanga* (L.) Willd.	Roots	Boiling and filter to get only liquid	Drink the liquid	Cardiovascular system, Nutrition and blood, Respiratory system
		Rhizomes	Boiling and filter to get only liquid	Drink the liquid	Antipyretics, Gastro-intestinal, Respiratory system
			Grind into a fine powder/or slice thinly and soak in ethyl alcohol 40%	Use externally	Skin system
			Grind and mix with lime juice	Use externally	Poisoning and toxicology
			Boil with the leaves of *Tamarindus indica* L., *Citrus* × *aurantiifolia* (Christm.) Swingle, *Bridelia ovata* Decne., *Senegalia rugata* (Lam.) Britton & Rose, and *Allium ascalonicum* L., then filter to obtain only the liquid.	Drinking	Obstetrics, gynaecology and urinary disorders
		Pseudostems	Pound and mix with coconut oil	Use externally	Musculoskeletal and joint diseases
		Leaves	Boiling	Bath	Skin system
		Inflorescence/Flowers	Grind and mix with grinded rhizome, and rice whisky	Use externally	Skin system
		Fruits	Eat fresh or boiling	Eating	Gastro-intestinal

No	Species	Used parts	Preparation	Method of uses	Group of symptoms
2	*Alpinia laosensis* Gagnep.	Roots	Boiling and filter to get only liquid	Drink the liquid	Cardiovascular system, Nutrition and blood, Respiratory system
		Rhizomes	Boiling and filter to get only liquid	Drink the liquid	Antipyretics, Gastro-intestinal, Respiratory system
		Leaves	Boiling	Bath	Skin system
		Fruits	Eat fresh or boiling	Eating	Gastro-intestinal
3	*Alpinia mutica* Roxb.	Rhizomes	Boiling and filter to get only liquid	Drink the liquid	Gastro-intestinal
4	*Alpinia oxymitra* K.Schum.	Roots	Boiling and filter to get only liquid	Drink the liquid	Cardiovascular system, Nutrition and blood, Respiratory system
		Pseudostems	Pound and mix with coconut oil	Use externally	Musculoskeletal and joint diseases
		Leaves	Boiling	Bath	Skin system
		Fl	Grind and mix with grinded rhizome, and rice whisky	Use externally	Skin system
		Fr	Boiling and filter to get only liquid	Drink the liquid	Antipyretics
5	*Alpinia siamensis* K.Schum.	Rhizome	Boiling and filter to get only liquid	Drink the liquid	Antipyretics, Gastro-intestinal, Respiratory system
			Grind into a fine powder/or slice thinly and soak in ethyl alcohol 40%	Use externally	Skin system
		Pseudostems	Boiling or eat fresh	Eat the young pseudostems	Cardiovascular system, Gastro-intestinal
		Leaves	Boiling	Bath	Skin system
		Inflorescences/Flowers	Grind and mix with grinded rhizome, and rice whisky	Use externally	Skin system
			Boiling or eat fresh	Eating	Gastro-intestinal, Skin system
6	*Alpinia vittata* W.Bull	Rhizomes	Grind and mix with lime water	Use externally	Skin system
7	*Alpinia zerumbet* (Pers.) B.L.Burtt & R.M.Sm.	Rhizomes	Boiling and filter to get only liquid	Drink the liquid	Gastro-intestinal
		Pseudostems	Pound and mix with coconut oil	Use externally	Musculoskeletal and joint diseases
		Leaves	Boiling	Bath	Skin system
8	*Boesenbergia rotunda* (L.) Mansf.	Roots	Grind to dry powder, mix with honey and shape into small round balls	Eating	Cardiovascular system, Nutrition and blood,
			Grind and mix with coconut oil	Use as shampoo	Skin system
		Rhizomes	Boiling and filter to get only liquid, or mix with honey	Drink the liquid	Antipyretics, Gastro-intestinal, Respiratory system, Obstetrics, gynaecology and urinary disorders
		Leaves	Eat fresh	Eating	Nutrition and blood
9	*Curcuma aeruginosa* Roxb.	Rhizomes	Slice into pieces, use fresh or dry, boiling and filter to get only liquid	Drinking	Gastro-intestinal, Obstetrics, gynaecology and urinary disorders, Poisoning and toxicology
10	*Curcuma longa* L.	Rhizomes	Slice into pieces, use fresh or dry, boiling and filter to get only liquid	Drinking	Antipyretics, Cardiovascular system, Gastro-intestinal, Infections, Musculoskeletal and joint diseases, Obstetrics, gynaecology and urinary disorders, Poisoning and toxicology, Respiratory system
			Grind into powder, and dry it	Use externally	Poisoning and toxicology, Skin system
11	*Curcuma mangga* Valeton & Zijp	Rhizomes	Eat fresh	Eating	Gastro-intestinal
12	*Curcuma phrayawan* Boonma & Saensouk	Rhizomes	Grind and mix with rice whisky	Use externally	Skin system
13	*Curcuma rangjued* Saensouk & Boonma	Rhizomes	Slice into pieces, use fresh or dry, boiling and filter to get only liquid	Drinking	Nutrition and blood, Poisoning and toxicology
			Grind and mix with rice whisky	Use externally	Skin system
14	*Curcuma rubescens* Roxb.	Rhizomes	Slice into pieces, boiling and filter to get only liquid	Drinking	Musculoskeletal and joint diseases
15	*Curcuma wanenlueanga* Saensouk, Thomudtha & Boonma	Rhizomes	Slice into pieces, boiling and filter to get only liquid	Drinking	Musculoskeletal and joint diseases, Obstetrics, gynaecology and urinary disorders
16	*Kaempferia angustifolia* Roxb.	Rhizomes	Over a fire until slightly charred, then soak them in rice whisky for 3 days, strain to obtain only the liquid, mix in 2–3 grains of borneol	Drops to the eyes	Eyes

No	Species	Used parts	Preparation	Method of uses	Group of symptoms
			Soak in rice whisky or boil in water, and filter to get only the liquid	Drinking	Gastro-intestinal, Nutrition and blood, Obstetrics, gynaecology and urinary disorders
			Grind and mix with rice whisky	Use externally	Skin system
17	*Kaempferia galanga* L.	Rhizomes	Slice into pieces, use fresh or dry, boiling and filter to get only liquid	Drinking	Antipyretics, Gastro-intestinal, Nutrition and blood, Obstetrics, gynaecology and urinary disorders, Respiratory system
			Over a fire until slightly charred, then soak them in rice whisky for 3 days, strain to obtain only the liquid, mix in 2–3 grains of borneol	Drops to the eyes	Eyes
			Grind and mix with rice whisky	Use externally	Skin system
		Pseudostems	Grind and mix with grinded rhizome and rice whisky	Use externally	Skin system
		Leaves	Grind and mix with grinded rhizome and rice whisky	Use externally	Skin system
			Eat fresh young–curled leaves	Eating	Gastro-intestinal
		Inflorescences	Grind and mix with grinded rhizome and rice whisky	Use externally	Skin system
18	*Kaempferia marginata* Carey ex Roscoe	Rhizomes	Slice into pieces, use fresh or dry, boiling and filter to get only liquid	Drinking	Antipyretics, Gastro-intestinal
19	*Kaempferia parviflora* Wall. ex Baker	Rhizomes	Slice into pieces, use fresh or dry, boiling and filter to get only liquid	Drinking	Gastro-intestinal, Musculoskeletal and joint diseases, Nutrition and blood
			Grind and mix with grinded rhizome and rice whisky	Use externally	Skin system
20	*Kaempferia rotunda* L.	Rhizomes	Slice into pieces, use fresh or dry, boiling and filter to get only liquid	Drinking	Antipyretics, Gastro-intestinal, Nutrition and blood
			Over a fire until slightly charred, then soak them in rice whisky for 3 days, strain to obtain only the liquid, mix in 2–3 grains of borneol	Drops to the eyes	Eyes
		Leaves	Eat fresh	Eating	Gastro-intestinal
21	*Wurfbainia uliginosa* (J.Koenig) Giseke	Roots	Slice into pieces, grind, boiling and filter to get only liquid	Drinking	Gastro-intestinal, Obstetrics, gynaecology and urinary disorders, Respiratory system
		Leaves	Grind and mix with rice whisky	Use externally	Skin system
		Inflorescences	Eat fresh or boiling	Eating	Gastro-intestinal
		Fruits	Eat fresh or boiling	Eating	Gastro-intestinal
22	*Zingiber officinale* Roscoe	Roots	Grind and mix with grinded rhizome and rice whisky	Use externally	Skin system
		Rhizomes	Slice into pieces, use fresh or dry, boiling and filter to get only liquid or eat all	Drinking or eating all	Antipyretics, Cardiovascular system, Gastro-intestinal, Infections, Nutrition and blood, Poisoning and toxicology, Eyes
			Grind and mix with grinded roots and rice whisky	Use externally	Skin system
		Pseudostems	Eat fresh or boil	Eating	Gastro-intestinal
		Leaves	Eat fresh or boil	Eating	Gastro-intestinal
		Inflorescences	Eat fresh or boil	Eating	Gastro-intestinal
23	*Zingiber ottensii* Valeton	Rhizomes	Slice into pieces, boiling and filter to get only liquid or eat all	Drinking or eating all	Gastro-intestinal, Musculoskeletal and joint diseases, Nutrition and blood, Poisoning and toxicology
24	*Zingiber purpureum* Roscoe	Roots	Slice into pieces, boiling and filter to get only liquid or eat all with rhizomes	Drinking or eating all	Antipyretics, Cardiovascular system, Gastro-intestinal, Musculoskeletal and joint diseases, Nutrition and blood, Respiratory system
		Rhizomes	Slice into pieces, boiling and filter to get only liquid or eat all	Drinking or eating all	Antipyretics, Cardiovascular system, Gastro-intestinal, Musculoskeletal and joint diseases, Nutrition and blood, Respiratory system
		Pseudostems	Eat fresh or boil	Eating	Gastro-intestinal
		Leaves	Eat fresh or boil	Eating	Gastro-intestinal

No	Species	Used parts	Preparation	Method of uses	Group of symptoms
		Inflores-cences	Eat fresh or boil	Eating	Gastro-intestinal
25	*Zingiber zerumbet* (L.) Roscoe ex Sm.	Rhizomes	Slice into pieces, boiling and filter to get only liquid or eat all	Drinking or eating all	Antipyretics, Central nervous system, Gas-tro-intestinal, Obstetrics, gynaecology and urinary disorders
		Pseudostems	Eat fresh or boil	Eating	Gastro-intestinal
		Leaves	Eat fresh or boil	Eating	Gastro-intestinal
		Inflores-cences	Eat fresh or boil	Eating	Gastro-intestinal