RESEARCH ARTICLE

QUANTITATIVE ETHNOBOTANICAL DOCUMENTATION OF THE MEDICINAL PLANTS USED BY THE INDIGENOUS *MARING* TRIBE OF CHANDEL DISTRICT OF MANIPUR, INDIA.

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Manuscript Info	*Abstract*
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Introduction:-

Quantitative ethnobotanical study in Manipur:-

Ethnobotany and ethno-medicinal plant studies are recognized as the most viable method for identifying new medicinal plants and refocusing on those earlier reported for bioactive constituents (Abujam *et al*., 2012). Therefore, studies and documentation on ethnobotanical and traditional knowledge on medicinal plant uses has been considered as a high priority sometimes leading to the discovery of crude drugs (Cox and Ballick, 1994; Cox and Ballick, 1996; Dutta and Dutta, 2005; Hamil *et al*., 2000; Pieroni, 2000). Ethnobotanical knowledge of a particular community which includes all its socio-cultural activities of healthcare, food, timber, shelter, clothing as well as resource management & conservation pattern was endemic and unique to that specific community only. The ethnic people are depended on the plants around him, made him to acquire knowledge of economic and medicinal properties of many plants by trial and error. Consequently, he became the storehouse of knowledge of many useful as well as harmful plants accumulated and enriched through generations and passed on from one generation to another without any written documents (Sur and Halder, 2002).

Quantitative methods in ethnobotany dated back to 1986 when Trotter and Logan for the first time used the informant consensus factor to the study of the relationship between the efficacy of the claimed herbal plants and their bio-activity. The concept of Use Value evaluating the significance of the particular plants was further developed by Phillips and Gentry (1993). Over the year interest in the application of quantitative methods to ethnobotanical data, testing different hypothesis to the relationship between plants and human has shown a steady growth and more researchers are focusing on incorporating varied quantitative methodology for data collection (Phillips *et al*., 1994; Reyes – Garcia *et al*., 2006)

Despite the advancement in ethnobotanical studies in recent years, the region lacks behind the documentation of such organized and quantitative ethnobotanical study. Therefore, an attempt has been made here and this can serve as baseline for future pharmacological studies.

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Indigenous *Maring* tribe:-
The *Maring* are among the oldest tribes of Manipur and settled in present Tengnoupal sub-division of Chandel district of Manipur, India. The name *Maring* was derived from two words *'Mi'* (corrupted to Ma) meaning *fire* and *'Ring'* meaning *to start or produce*. They are considered as one of the major tribes but taking the tribal as a whole this is one of the minor group considering their population. According to Census, 2011 report, the total population of *Maring* in the state stands as 26,424 while Chandel district alone record for 14,4182 *Maring* population. They are very skilled particularly in cane and bamboo work and the entire Manipur depend on them for beautiful yet useful items like *Phiruk* etc. Among the many distinctiveness and peculiarities of the tribe- "Blacken teeth" (*Ha-sang* in local term) was common amongst the elderly people and youth of the time. Knotted hairs or *Murshoom* on the front side of all the men-folk's forehead with several lines of hard red beads strings- *Rulshum* around their *Murshoom* is another peculiarity that set aside this tribe from the rest. They keep their hair long, gathered in a bunch somewhat like a horn rising from the front of the head. A tuft of frontal hair is tied into a knot. In the light of Christianity entering the community and modern education however, such practices are no longer encouraged and practiced. Gradually long hair of men-folk's for knotted hair or *Murshoom* are replaced today with plastic woven headgear. Therefore, such practices remain as oral traditional knowledge transferred from generation to generation.

The *Maring* are still predominantly shifting cultivators. The land on the steep hills called *Pamlou* was used for different types of cultivation. They are mainly forest dwellers and depend on available biodiversity in and around their settlement areas for food, medicine and comfort. Thus the ethnic *Maring* tribe was well acquainted with the role played by the plants and harbor a rich treasure on their utilization. This unwritten information was well transmitted and trapped through oral tradition from generation to generation often intermingling with their cultures, customs, traditions and taboos.

Materials And Methods:-
Study site:-
The state of Manipur is located in North Eastern part of India (23˚83ʹ–25˚68ʹ N/ 93˚ 03ʹ–94˚78ʹ E) and covers a total geographical area of 22, 327 km^2. An oval–shaped valley (1, 843 sq. km) lies in the centre and is surrounded by series of mountains accounting to 90% of the total area. The state is divided into nine (9) administrative districts, *viz* Bishenpur, Imphal East, Imphal West, Thoubal in valley region and Churachandpur, Chandel, Senapati, Tamenglong, Ukhrul in hill region.

Chandel district with a total geographical area of 3,313 km^2 lies in between 23˚49' –24˚28' N/ 94˚09'–94˚31' E in the south- eastern part of the state of Manipur. This border district of the state neighbors Myanmar on the south, Ukhrul district on the east, Churachandpur district on the south and west, and Thoubal on the north. It is about 64 km from Imphal, the state capital. Formerly known as Tengnoupal district, the district is inhabited by several communities - Anal, Lamkang, Kukis, Moyon, Monsang, Chothe, Thadou, Paite and Maring are the prominent tribes scattered all over the district.

Fig. 1:-Maps showing the study site- Chandel District of Manipur

Data Collection:-
The present study was conducted during June 2012 to December 2016 in Manipur. Data collection and analysis was done through frequent survey programme based on semi–structured questionnaire. Prior informant consent (PIC) was obtained from local healers (*Thim*, *Maibas*), village chiefs, old folks, housewives etc. The age group of the informants falls between 30–80 years. Thirteen (13) sites were selected through random sampling. Informants totaling to 250 individual informants (176 males; 74 females) and twenty (20) key informants who have immense/ profound knowledge on plants were selected purposively for data analysis. This selection was aided by the village headman, *Thim* and other authorities.

Parameter	Informant group	Number
Gender	Male	176
	Female	74
Age	Young (≤40 years)	154
	Senior (≥40 years)	96
Educational status	Literate	68

	Illiterate	182
Informants	Key informants	20
	General informants	230

Table 1:- Break-wise tabulation data of Informants (*Maring* group) of Chandel district, Manipur.

Biological parameters, Species Description & Classification:-
Detailed morphological description of the documented plants was studied from mature vegetative and reproductive parts. All related data (synonyms, distribution, propagation and mode/ method of application, other uses) were also studied briefly. The scientific names along with their respective families, local name, parts used and mode of usage were recorded and highlighted. Identification was done based on available literatures (Hooker, 1875; Hooker, 1882; Deb, 1961; Li and Hedge, 1994; Singh *et al*., 2000). Classification, author citation and updated nomenclature are provided based on Brummit and Powell (1992), the Plant List (www. plantlist. org), the International Plant Names Index (http://www.ipni. org.), Bendiksby *et al.,* (2011) and Angiosperm Phylogeny Group, APG III (2009). Specimens were collected, processed, identified and deposited in triplicates to Herbarium, Laboratory of Ethnobotany & Medicinal Plant Conservation (AUS, Assam University, Silchar) and Manipur University Museum of Plants (MUMP).

Data analysis:-
Disease categories;-
The documented data of medicinal plants was grouped into 18 disease categories based on Cook (1995).

Table 2:-Ailments categories based on Cook (1995)

Ailment Categories	Biomedical terms	Local terms
Liver problems (LP)	Jaundice, hepatic complaint	Machu shang
Circulatory System Disorders (CSD)	Blood clotting, blood purification, blood pressure	Hi dui
Antidote (Ad)	Snake bite, Dog bite, bee sting	Thrul lei chik, Ui yei chik
Endocrinal Disorder (ED)	Diabetes	Shim duilaknei
Respiratory System Disorders (RSD)	Asthma, bronchitis, cough, cold, tuberculosis	Nilso tok, Bur chu
Fever (Fr)	Fever	Shabang leh Reileh
Skeleton Muscular System Disorders (SMSD)	Bone fracture, body ache, swellings, headache	Thru dikur, Luu kana
Gastro intestinal disorders (GID)	Dysentery, diarrhea, indigestion, stomachache, constipation, ulcer, intestinal worm	Uuk phe, uuk na
Ear, Nose, Throat problem (ENT)	Sinusitis, earache, epistaxis (Nose bleeding), eye diseases, tonsillitis, sore throat	Nahi da, dang na
Dermatological infection (DI)	Boils, scabies, rashes, inflammation & burns, ringworm	Yek, Mai thrai, Mei yei pok
Kidney Stone (KS)	Kidney stone	Kaal rei lung lei
Genito-urinary disorders (GUD)	Urinary bladder stone, menstrual disorder, leucorrhoea, Dysuria, abortion, labor pain, pregnant complicacies	Ae lakai dipur na
Oral Care (OC)	Toothache, gum complaints, mouth ulcer	Ha chik nei
Oncogenes (Og)	Cancer, tumors	Cancer, Porbang
Piles (P)	Piles	Dirang pum
Deworming (Dw)	Worm Expulsion	-
Smallpox (Sp)	Smallpox	-
General Health (GH)	Blood tonic	-

Use Report:-
When a plant was claimed to be effective in curing a particular ailment it was recorded as one use – report. A multiple use – reports can be recorded when more than one informants claimed the same plant for the same ailment.

Use – Value (UV):-
Use-Value or UV demonstrates the relative importance of species known locally (Phillips *et al*., 1994) which is based on the number of uses of a particular plant species and the number of informants that claimed the uses of the given plant. UV is calculated using the formula:
UV = $\sum$ U/N, where UV is the use value of a species, U is the number citations per species; N is the number of informants.

High UVs signify the importance of the particular plant to the community and recorded when there many use-reports for the plant while low UVs are recorded when there are few use- reports.

Informant Consensus factor (F_{ic}):-
Informant Consensus factor or F_{ic} was employed to identify the uniformity of the informants on the reported cures for the group of ailments. This method was based along the Informant Agreement Ratio (IAR) of Trotter and Logan (1986) and consequently known today as Informant Consensus factor. It was calculated using the following formula:
F_{ic} = Nur – Nt/ (Nur – 1), where Nur is the number of use citations in each category and Nt is the number of species used.

F_{ic} illustrates the degree of agreement among the informants to the use of a particular plant species and ranges between 0 and 1. This criterion can effectively sort out interesting plants for the search of novel drugs (Canales *et al*., 2005). High F_{ic} values approaching to 1 was obtained when the documented plants are used by a wide proportion of the informants for a selective disease category while low F_{ic} shows disagreement among the informants which may be due to lack of knowledge sharing (Heinrich *et al*., 1998; Grazzaneo *et al*., 2005).

Fidelity Level (FL):-
The percentage of informants claiming the use of a certain plant for the same major purpose was calculated for the most frequently reported diseases by the Fidelity Level. It was developed by Friedman *et al*., (1986) and calculated using the following formula:

FL (%) = Np/N x 100, where Np is the number of informants claiming a use of a plant species to treat a particular disease and N is the number of informants that use the plants as a medicine to treat any given disease.

Fidelity level are accounted as highest when the value nearly approaches 100 % where the particular plant species are reported as the most preferred for a certain ailment while low FLs denotes the usage of the plants in many different ailments and are least preferred by the informants.

Results And Discussion:-
The ethnobotanical data collected, identified and documented from various sites of *Maring* inhabiting areas of Chandel district of Manipur were analyze critically. The study documented 144 medicinal plant species in 66 families categories across 18 ailments. The family Asteraceae was the most represented with 14 plant species followed by Lamiaceae with 10 species, Zingiberaceae, Cucurbitaceae and Verbenaceae with 7 species while Fabaceae was represented with 6 species (Fig. 2).

The most used plant parts was found to be leaves with 54 %, Whole plant with 12 %, Root – 9 %, Fruit- 7 % and Rhizome with 5 % (Fig. 3).

Table 3:-Informant consensus factor of the medicinal plants documented from the Maring tribe of Chandel district

Ailments categories	No. of Use Report (*Nur*)	Number of taxa (*Nt*)	Informant consensus factor (*Fic*)
Liver Problem (LP)	29	6	0.79
Circulatory System Disorder (CSD)	126	21	0.84

Antidote (Ad)	41	9	0.80
Endocrinal Disorder (ED)	18	6	0.73
Respiratory System Disorders (RSD)	45	11	0.77
Fever (Fr)	50	15	0.71
Skeleton Muscular System Disorders (SMSD)	79	8	0.91
Gastro intestinal disorders (GID)	54	18	0.67
Ear, Nose, Throat problem (ENT)	30	13	0.58
Dermatological infection (DI)	43	16	0.64
Kidney Stone (KS)	21	6	0.75
Genito-urinary disorders (GUD)	176	32	0.82
Oral Care (OC)	50	6	0.89
Oncogenes (Og)	25	5	0.71
Piles (P)	18	5	0.76
Deworming (Dw)	4	2	0.66
Smallpox (Sp)	5	2	0.75
General Health (GH)	14	4	0.76
Total	**828**	**185**	

Table 4:-Number of Use-report (citation), Use-value, mode of administration and other ingredients added for the medicinal plants and herbal therapy used by the Maring

Scientific Name (with family)	Parts used	Ailments category : No. of use-report	Use-value (UV)	Administration and preparation	Other ingredients
Achyranthes aspera L. (Amaranthaceae)	Lf	GID:3 (stomachache) Ad:4	0.70	Oral/topical (decoction, paste)	-
Acmella paniculata (Wall. ex DC.) R. K. Jansen (Asteraceae)	Lf	OC: 8 (tooth cavities)	0.80	Oral (paste)	-
Acorus calamus L. (Acoraceae)	Rh	Fr:7 (fever)	0.70	Inhalation (raw)	-
Aegle marmelos (L.) Corr. (Rutaceae)	Fr	GID:2 (stomachache)	0.20	Oral (Roasted)	-
Adiantum philippense L. (Adiantaceae)	Wh	ED: 2 (diabetes)	0.20	Oral (Decoction)	-
Agave americana L. (Asparagaceae)	Lf	Fr:1 (fever) RSD:2 (cold)	0.30	Oral (Juice)	-
Ageratum conyzoides L. (Asteraceae)	Lf	CSD:6 (blood clot) GUD: 4 (pregnant complicacies)	1	Topical (paste/decoction)	Rice water
Allium hookeri L. (Amaryllidaceae)	Lf	CSD:7 (blood pressure) SMSD: 3 (headache)	1	Oral (steamed/raw)	-
Allium tuberosum Roxb. (Amaryllidaceae)	Lf	GUD:4 (dysuria)	0.40	Oral (decoction/ raw)	-
Alocasia macrorrhiza Schott. (Araceae)	Cm	DI:3 (burns)	0.30	Topical (paste)	-
Aloe vera Mill Gard. (Aphodelaceae)	Lf	GID: 2 (stomach ulcer) DI: 6 (burns)	0.80	Oral/topical (raw)	-
Alpinia galanga Willd. (Zingiberaceae)	Rh	ENT : 2 (sore throat) RSD: 4 (cough)	0.60	Oral (raw)	-
Amaranthus viridis L. (Amaranthaceae)	Lf	GID: 2 (constipation)	0.20	Oral (cooked)	-

Ananas comosus (L.) Merr. (Bromeliaceae)	Lf	Fr: 1 (fever) DI: 2 (skin infection)	0.30	Oral/topical (Juice/roasted)	-
Andrographis paniculata Nees (Acanthaceae)	Lf	OC: 2 (mouth ulcer)	0.20	Oral (decoction)	Sugar candy
Anotis foetida (Dalz.) Benth. & Hook.f. (Rubiaceae)	Rt	SMSD: 3 (fracture bone) DI: 1 (boils)	0.40	Topical (paste)	-
Ardisia colorata Roxb. (Myrsinaceae)	Fr/Bk/Lf	ENT: 1 (sore throat) GID: 2 (dysentery, diarrhea)	0.30	Oral (decoction/raw)	-
Artimisia nilagirica (C.B. Clarke) Pamp. (Asteraceae)	Lf	GUD: 3 (pregnant complicacies)	0.30	Topical (decoction)	-
Arundo donax L. (Poaceae)	Sh	Fr: 1 (fever) Dw: 1 (worm expulsion)	0.20	Topical/Oral (paste/decoction)	-
Azadirachta indica A. Juss. (Meliaceae)	Lf	Sp: 2 (smallpox) Fr: 3 (fever) ENT: 1 (sore throat)	0.60	Topical/Oral (Decoction/raw)	-
Bambusa nutans Wall. (Poaceae)	Sh	Ad: 3 (Dog/snake bites)	0.30	Topical (paste)	-
Bauhinia purpurea L. (Caesalpiniaceae)	Fl	GUD: 2 (menstrual disorder, leucorrhoea)	0.20	Oral (paste)	-
Benincasa hispida (Thunb.) Cogn. (Cucurbitaceae)	Fr	Ad: 2 (food poisoning)	0.20	Oral (raw)	-
Blumeopsis flava (DC.) Gagnep (Asteraceae)	Lf	ENT: 2 (sinuses)	0.20	Inhalation (paste/smoked)	-
Brugmansia sauveolens (Humb. & Bonpl. ex. Willd.) Bercht. & J. Presl. (Solanaceae)	Lf	Ad: 5 (snake/dog bites)	0.50	Topical (paste)	-
Bryonopsis lociniosa Naud. (Cucurbitaceae)	Lf	RSD: 2 (asthma)	0.20	Inhalation (smoked)	-
Butea minor (Lam.) Kunze. (Fabaceae)	Bk	Ad: 1 (snake/dog bites)	0.10	Topical (paste)	-
Cajanus cajan (L.) Millsp. (Fabaceae)	Lf/Rt	Og: 1 (cancer)	0.10	Oral (decoction)	-
Cannabis sativa L. (Cannabinaceae)	Lf	SMSD: 4 (bodyache)	0.40	Topical (decoction)	-
Carica papya L. (Caricaceae)	Rt	GUD: 2 (leucorrhoea)	0.20	Oral (decoction)	Sugar candy
Cassia fistula L. (Caesalpiniaceae)	Lf	DI: 1 (skin rashes)	0.10	Topical (paste)	-
Celosia argentea L. (Amaranthaceae)	Lf	CSD: 2 (blood clot)	0.20	Topical (paste)	-
Cissus adnata Roxb. (Vitaceae)	Lf	KS: 4 (kidney stone)	0.40	Oral (decoction)	-
Cissus discolor Blume (Vitaceae)	Lf	KS: 5 (kidney stone)	0.50	Oral (decoction)	-
Clerodendrum	Lf	CSD: 4 (blood pressure)	0.40	Oral (decoction)	-

colebrookianum Walp. (Lamiaceae)					
Clerodendrum indicum (L.) Kuntze (Lamiaceae)	Lf/Rt	GUD: 1 (Dysuria)	0.10	Oral (decoction)	-
Clerodendrum philippinum Schauer (Lamiaceae)	Lf	SMSD: 1 (bodyache)	0.10	Topical (decoction)	-
Clerodendrum serratum Spreng. (Verbenaceae)	Lf	GH: 2 (blood tonic)	0.20	Oral (decoction)	-
Coix lachrymal jobi L. (Poaceae)	Lf	GUD: 4 (Dysuria)	0.40	Oral (decoction)	-
Costus speciosus (Koening) Sm. (Costaceae)	Lf	Fr: 2 (fever) CSD: 2 (blood clot)	0.40	Oral/topical (paste)	-
Crassocephalum crepidioides S. Moore (Asteraceae)	Lf	GID: 2 (stomach ulcer)	0.20	Oral (decoction)	-
Crataeva magna (Lour.) DC. (Capparidaceae)	Lf	SMSD: 5 (bodyache)	0.50	Topical (decoction)	-
Crotolaria juncea L. (Fabaceae)	Lf	GH: 2 (blood tonic)	0.20	Oral (raw/cooked)	-
Cucurma angustifolia Roxb. (Zingiberaceae)	Rh	GID: 2 (indigestion)	0.20	Oral (raw)	-
Cucurma caesia Roxb. (Zingiberaceae)	Rh	GID: 4 (stomachache)	0.40	Oral (raw/dried)	-
Cucurma domestica Val. (Zingiberaceae)	Rh	CSD: 6 (blood clot)	0.60	Topical (raw)	-
Cuscuta reflexa Roxb. (Convolvulaceae)	Wh	LP: 5 (jaundice) CSD: 2 (blood clot)	0.70	Oral (decoction)	-
Cymbopogon citrates Stapf (Poaceae)	Lf	Fr: 1 (fever)	0.10	Oral (decoction)	-
Cynodon dactylon (L.) Pers. (Poaceae)	Rt	GUD:3 (Dysuria) GID: 1(stomachache)	0.40	Oral (juice)	-
Dalbergia stipulacea L. (Fabaceae)	Bk	OC: 9 (tooth cavities)	0.90	Topical (juice)	-
Datura stramonium L. (Solanaceae)	Lf	DI: 1(boils) Ad: 3 (snake bites)	0.40	Topical (paste)	-
Daucus carota L. (Apiaceae)	Rt/Sd	GUD: 2 (irregular menstruation) ENT:3 (eye infection)	0.50	Oral (decoction/ raw)	-
Dicrocephala integrifolia Kuntz (Asteraceae)	Lf	GID: 1 (indigestion) GUD: 2 (labor pain)	0.30	Topical/oral (decoction)	-
Dioscorea alata L. (Dioscoreaceae)	Tb	LP: 1 (jaundice) GID: 2 (stomachache)	0.30	Oral (juice)	*Saccharum officinale, Centella asiatica, Cucurma aromatica* and Jeera
Drymaria cordata Willd. (Caryophyllaceae)	Wh	RSD: 3(asthma) ENT: 1 (night blindness)	0.40	Inhalation/ oral (smoked/ decoction)	-
Duranta repens L.	Lf	Og: 4 (tumors)	0.40	Topical (paste)	-

(Verbenaceae)					
Eclipta prostrata L. (Asteraceae)	Lf	Fr: 2 (fever)	0.20	Oral (decoction)	Honey
Elsholtzia blanda Benth. (Lamiaceae)	Lf/If	ENT: 2 (tonsilites)	0.20	Oral (raw)	-
Elsholtzia communis (Coll. & Hemsl.) Diels (Lamiaceae)	Wh	ENT: 1(tonsilites)	0.10	Oral (decoction)	-
Enhydra fluctuans Lour. (Asteraceae)	Sh	ED: 5 (diabetes) GUD: 2 (leucorrhoea)	0.70	Oral (decoction)	Sugar candy
Entada pursaetha DC. (Mimosaceae)	Lf	ED: 1 (diabetes)	0.10	Oral (decoction)	-
Equisetum ramosissimum Desf. ssp. Debile (Roxb.) Hauhe (Equisetaceae)	Wh	ENT: 2 (epistaxis)	0.20	Inhalation (smoked)	-
Eryngium foetidum L.(Apiaceae)	Wh	CSD: 1 (blood pressure)	0.10	Oral/inhalation (decoction/paste)	-
Eupatorium adenophorum Spreng. (Asteraceae)	Lf	CSD: 3 (blood clot)	0.30	Topical (paste)	-
Eupatorium birmanicum DC. (Asteraceae)	Lf	GID: 1 (stomach ulcer) OC: 3 (mouth ulcer)	0.40	Oral (decoction)	-
Eupatorium odoratum L. (Asteraceae)	Lf	CSD: 4 (blood clot)	0.40	Topical (paste)	-
Euphorbia hirta L. (Euphorbiaceae)	Wh	GUD: 1 (leucorrhoea)	0.10	Oral (decoction)	Prawn
Ficus assamica Miq. (Moraceae)	Rt	GUD: 1 (leucorrhoea)	0.10	Oral (decoction)	-
Ficus benghalensis L. (Moraceae)	Bk	GUD: 3 (irregular menstruation)	0.30	Oral (paste)	-
Ficus hispida L.f. (Moraceae)	Lf	ED: 1 (diabetes)	0.10	Oral (decoction)	-
Fragaria nillgerensis Schlecht. ex. J. Gay (Rosaceae)	Lf	GUD: 5 (Dysuria)	0.50	Oral (decoction)	-
Garcinia pedunculata Roxb. ex Buch. (Clusiaceae)	Fr	ENT: 1 (sore throat) RSD: 2 (cough)	0.30	Oral (boiled)	-
Glochidion coccineum Forst (Phyllanthaceae)	Lf	CSD: 3 (blood clot)	0.30	Topical (paste)	-
Gmelina arborea Roxb. (Verbenaceae)	Lf	Ad: 3 (snake bites)	0.30	Topical (paste)	-
Hedychium greenii Smith. (Zingiberaceae)	Rt	GUD: 1 (leucorrhoea)	0.10	Oral (decoction)	-
Hedychium spicatum Rao & Verma (Zingiberaceae)	Rh	GUD: 1 (leucorrhoea)	0.10	Oral (decoction)	-
Hibiscus sabdariffa L. (Malvaceae)	Lf/Sc	CSD:2 (blood purification) GUD: 3 (Pregnant complicacies)	0.50	Topical/oral (decoction/raw)	-
Holmskioldia sanguinea Retz. (Verbenaceae)	Lf	GUD: 1 (irregular menstruation)	0.10	Oral (decoction)	-
Houttuynia cordata Thunb. (Sauraceae)	Wh	ENT: 4 (tonsillitis)	0.40	Oral (decoction)	-

| *Hydrocotyl javanica* Molkenboer ex. C.B. Clarke (Apiaceae)	Lf	GUD: 1 (Dysuria)	0.10	Oral (decoction)	-
Impatiens balsamina L. (Balsaminaceae)	Lf	CSD: 1 (blood clot) DI: 2 (skin infection)	0.30	Topical (paste)	-
Justicia adhatoda L. (Acanthaceae)	Lf	RSD: 8 (bronchitis) Fr: 3 (fever)	1.1	Oral (decoction)	*Zingiber officinale*
Justicia gendarussa N.L. Burman (Acanthaceae)	Lf	SMSD: 8 (bodyache)	0.80	Topical (decoction)	-
Lagenaria siceraria (Molina) Standl. (Cucurbitaceae)	Fr	KS: 3 (kidney stone) Ad: 1 (bee sting)	0.40	Oral (juice)	-
Lantana camara L. (Verbenaceae)	Wh	CSD: 5 (blood clot)	0.50	Topical (paste)	-
Lindernia ruellioides (Colsm.) Pennell (Linderniaceae)	Wh	KS: 1 (kidney stone) GUD: 9 (Dysuria)	1	Oral (decoction)	-
Litsea monopetala (Roxb.) Pers. (Lauraceae)	Rt	SMSD: 5 (bodyache) RSD: 2 (cough)	0.70	Topical (paste)	Animal oils (preferably pig)
Luffa cylindrical (L.)Roem. (Cucurbitaceae)	Lf	DI: 5 (burns)	0.50	Topical (paste)	-
Lygodium flexuosum (L.) Sw. (Lygodiaceae)	Wh	LP: 3 (jaundice)	0.30	Oral/topical (decoction)	-
Lysimachia parvifolia Baker (Primulaceae)	Wh	P: 4 (piles)	0.40	Oral (boiled)	-
Melastoma malabathricum L. (Melastomaceae)	Rt	GUD: 2 (leucorrhoea)	0.20	Oral (decoction)	Sugar candy
Mentha spicata L. (Lamiaceae)	Lf	GID: 3 (stomach ulcer)	0.30	Oral (juice)	-
Messua ferrea L. (Clusiaceae)	Lf	Fr: 1 (fever)	0.10	Oral (juice)	-
Meyna spinosa Robyns. (Rubiaceae)	Sd	Dw: 3 (worm expulsion)	0.30	Topical (paste)	-
Mikania micrantha Kunth. (Asteraceae)	Lf	Fr: 1 (fever) CSD: 3 (blood clot)	0.40	Oral/topical (decoction/paste)	-
Mimosa pudica L. (Fabaceae)	Rt	GID: 3 (dysentery)	0.30	Oral (decoction)	-
Momordica charantia L. (Cucurbitaceae)	Lf	Fr: 2 (fever)	0.20	Oral (decoction)	-
Mucuna nigricans (Lour.) Steud. (Fabaceae)	Sd	DI: 1 (boils)	0.10	Topical (paste)	-
Musa paradisiaca L. (Musaceae)	Rt	GUD: 4 (Pregnant complicacies)	0.40	Oral (decoction)	Red sugar
Mussaenda glabra Vahl. (Rubiaceae)	Lf	DI: 2 (skin rashes)	0.20	Topical (boiled)	-
*Neptunia prostrata*Bail. (Mimosaceae)	Wh	ENT: 3 (earache)	0.30	Topical (decoction)	-
Nerium indicum Mill. (Apocynaceae)	Rt	GUD: 2 (abortifacient)	0.20	Oral (decoction)	-
Ocimum basilicum L. (Lamiaceae)	Wh	CSD: 1 (blood pressure)	0.10	Oral (raw/steamed)	-
Ocimum gratissimum L. (Lamiaceae)	Lf	LP: 1 (jaundice)	0.10	Oral (juice)	Honey

Ocimum sanctum L. (Lamiaceae)	Lf	RSD: 2 (asthma) DI: 1 (skin problem)	0.30	Oral/topical (decoction/paste)	-
Opuntia stricta (Haw.) Haw. var. *dillenii* (Ker-Gawler) Benson (Cactaceae)	Rt	GUD: 2 (leucorrhoea)	0.20	Oral (decoction)	Sugar candy
Oroxylum indicum Vent. (Bignoniaceae)	Fr	RSD: 3 (tuberculosis) Og: 6 (cancer)	0.90	Oral (roasted)	-
Oxalis corniculata L. (Oxalidaceae)	Wh	LP: 4 (jaundice) GUD: 3 (pregnant complicacies)	0.70	Oral/topical (decoction)	Salt
Paederia foetida L. (Rubiaceae)	Lf	CSD: 2 (high blood pressure) RSD: 2 (tuberculosis)	0.40	Oral (decoction)	-
Passiflora edulis Sims. (Passifloraceae)	Lf	ED: 2 (diabetes)	0.20	Oral (decoction)	-
Phaseolus lunatus L.(Fabaceae)	Lf	Fr: 2 (fever)	0.20	Topical (paste)	Mustard oil/kerosene
Phlogacanthus thyrsiformis (Roxb. ex. Hardw.) Mabb. (Acanthaceae)	LF	Fr: 5 (fever) Sp: 5 (smallpox)	1	Oral (decoction)	-
Pholidota articulata Lindley (Orchidaceae)	St	CSD: 1 (blood clot)	0.10	Topical (paste)	-
Phyllanthus urinaria L. (Euphorbiaceae)	Wh	ED: 2 (diabetes) DI: 1 (skin infection)	0.30	Oral/topical (decoction/paste)	-
Pinus kesiya Royle (Pinaceae)	St	GUD: 3 (pregnant complicacies) DI: 2 (ringworm)	0.50	Topical (resin/decoction)	-
Piper longum L. (Piperaceae)	Sd	GUD: 2 (menstrual disorder)	0.20	Oral (decoction)	-
Plantago erosa Wall. (Plantaginaceae)	Lf	CSD: 1 (blood clot)	0.10	Topical (paste)	-
Plumbago zeylanica L. (Plumbaginaceae)	Lf	Fr: 3 (fever)	0.30	Oral (decoction)	-
Polygonum chinense L. (Polygonaceae)	Lf	KS: 1 (kidney stone)	0.10	Oral (decoction)	-
Polygonum plebeium R.Br. var. *plebeium* R.Br. (Apocynaceae)	Lf	GUD: 1 (Dysuria)	0.10	Oral (decoction)	-
Polygonum posumba Buch. Ham. ex. D. Don. (Polygonaceae)	Lf	CSD: 3 (blood pressure) P: 5 (piles)	0.80	Oral (raw/cooked)	-
Portulaca oleracea L. (Portulacaceae)	Wh	GUD: 3 (pregnant complicacies)	0.30	Topical (decoction)	-
Potentialla canadensis L. (Rosaceae)	Lf	KS: 5 (kidney stone)	0.50	Oral (decoction)	-
Psidium guajava L. (Myrtaceae)	Lf	GID: 5 (dysentery)	0.50	Oral (raw)	-
Ricinus communis L. (Euphorbiaceae)	Lf	CSD: 4 (blood clot)	0.40	Topical (paste)	-
Sapindus emarginatus Vahl. (Sapindaceae)	Fr	GID: 2 (intestinal worm)	0.20	Topical (soaked)	-
Schima wallichii Choisy (Theaceae)	Lf	GUD: 3 (Dysuria)	0.30	Oral (decoction)	-

Scoparia dulcis L. (Scrophulariaceae)	Lf	ENT: 5 (epistaxis)	0.50	Oral (juice)	Honey
Scutellaria discolor Colebr. (Lamiaceae)	Lf	P: 1 (piles) GUD: 1 (menstrual problem)	0.20	Oral (decoction)	-
Sida rhombifolia L. (Malvaceae)	Wh	GUD: 2 (Dysuria)	0.20	Oral (decoction)	-
Solanum anguivi Lam. (Solanaceae)	Fr	RSD: 3 (cough/cold)	0.30	Oral (decoction)	-
Solanum torvum Sw. (Solanaceae)	Fr	OC: 4 (tooth cavities)	0.40	Topical (smoked)	-
Tamarindus indica L. (Caesalpinaceae)	Sd	Ad: 4 (snake/dog bites)	0.40	Topical (paste)	-
Tectona grandis L. (Verbenaceae)	Lf	DI: 1 (ringworm) GH: 3 (blood tonic)	0.40	Oral (decoction)	-
Terminalia arjuna (Roxb.) Wight and Arn. (Combretaceae)	Bk	GID: 2 (dysentery)	0.20	Oral (decoction)	-
Terminalia citrina Roxb. (Combretaceae)	Fr	OC: 3 (mouth ulcer)	0.30	Oral (raw)	-
Toona cilliata M. Roem. (Meliaceae)	Lf	SMSD: 4 (headache)	0.40	Oral (juice)	-
Trichosanthes bracteata (Lam.) Voigt. (Cucurbitaceae)	Fr	Og: 8 (dermal tumor)	0.80	Topical (paste)	-
Vitex trifolia L. (Verbenaceae)	Wh	DI: 2 (skin rashes)	0.20	Topical (decoction)	-
Xanthium strumarium L. (Asteraceae)	Lf	Og: 4 (dermal tumor)	0.40	Topical (decoction)	*Oroxylum indicum, Drymaria quercifolia, Schefflera elata, Artemisia parviflora, Mangifera indica*
Xanthosoma violaceum Schott (Araceae)	St	GH:2 (blood tonic)	0.20	Oral (decoction)	-
Xylosma longifolia Clos. (Flacourtiaceae)	Lf	P: 1 (piles)	0.10	Oral (decoction)	-
Zanthoxylum acanthopodium DC. (Rutaceae)	Lf	DI: 3 (boils)	0.30	Topical (paste)	*Coriandrum sativum*
Zehneria scabra (L.f.) Sonder (Cucurbitaceae)	Lf	LP: 4 (jaundice)	0.40	Oral (decoction)	*Imperata cylindrica*
Zingiber montanum Link. ex. A. Dietr. (Zingiberaceae)	Rh	P: 3 (piles)	0.30	Oral (ground)	*Centella asiatica, Scutellaria discolor*

Lf: Leaf; Rh: Rhizome; Fr: Fruit; Wh: Whole plant; Cm: Corm; Rt: Root; Bk: Bark; Sh: Shoot; Fl: Flower; Sd: Seed; Tb: Tuber; If: Inflorescence; St: Stem.

Table 11:-Fidelity level (FL) values of some medicinal plants as claimed by the Maring healers against different ailments.

Ailment category	Most preferred species	N_P	N	FL (%)
Liver Problem	*Cuscuta reflexa* (Jaundice)	5	9	55.55
	Oxaliscorniculata (Jaundice)	6	12	50
Circulatory System Disorder	*Ageratum conyzoides* (Blood clot)	12	20	60
	Allium hookeri (Blood pressure)	14	21	66.66
	Curcuma domestica (Blood clot)	12	20	60
Endocrinal Disorder	*Enhydra fluctuans* (Diabetes)	7	12	58.33
Respiratory System Disorders	*Justicia adhatoda* (Bronchitis)	8	11	72.72
Fever	*Acorus calamus*	9	20	45
	Phlogacanthus thyrsiformis	6	9	66.66
Skeleton Muscular System Disorders	*Justicia gendarussa* (Bodyache)	18	20	90
	Litsea monopetala (Bodyache)	10	14	71.42
Gastro intestinal disorders	*Psidium guajava* (Dysentery)	6	20	30
	Cucurma caesia (Stomachache)	6	20	30
Dermatological infection	*Aloe vera* (Burns)	6	8	75
Kidney Stone	*Cissus discolor*	6	20	30
Genito-urinary disorders	*Fragaria nillgerensis* (Dysuria)	10	20	50
	Lindernia ruellioides (Dysuria)	18	20	90
	Musa paradisiaca (Pregnant complaints)	8	20	40
Oral Care	*Acmella paniculata* (Tooth cavities)	8	20	40
	Dalbergia stipulacea (Tooth cavities)	18	20	90
Oncogenes	*Trichosanthes bracteata* (Dermal tumor)	16	20	80
Piles	*Polygonum posumba*	4	10	40
Smallpox	*Phlogacanthus thyrsiformis*	3	9	33.33
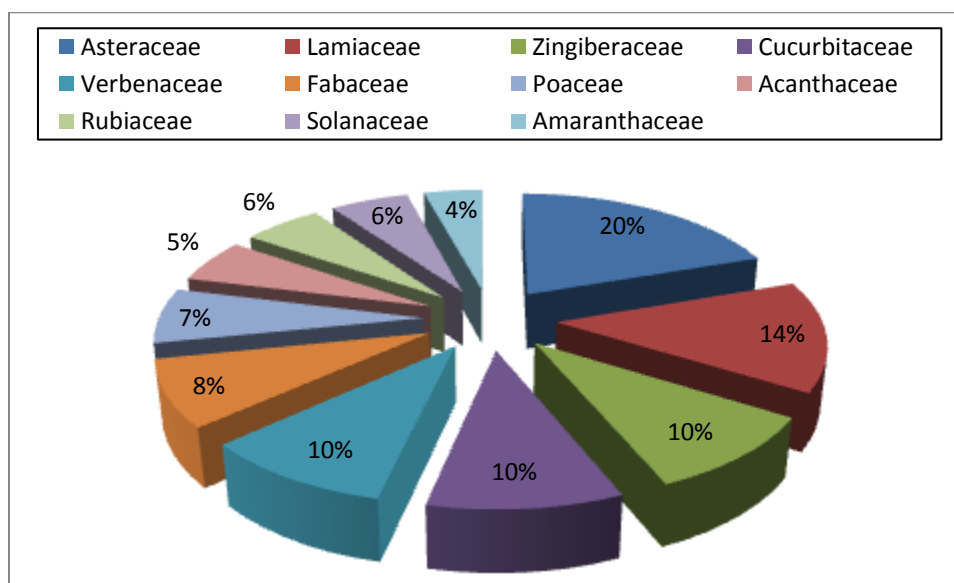
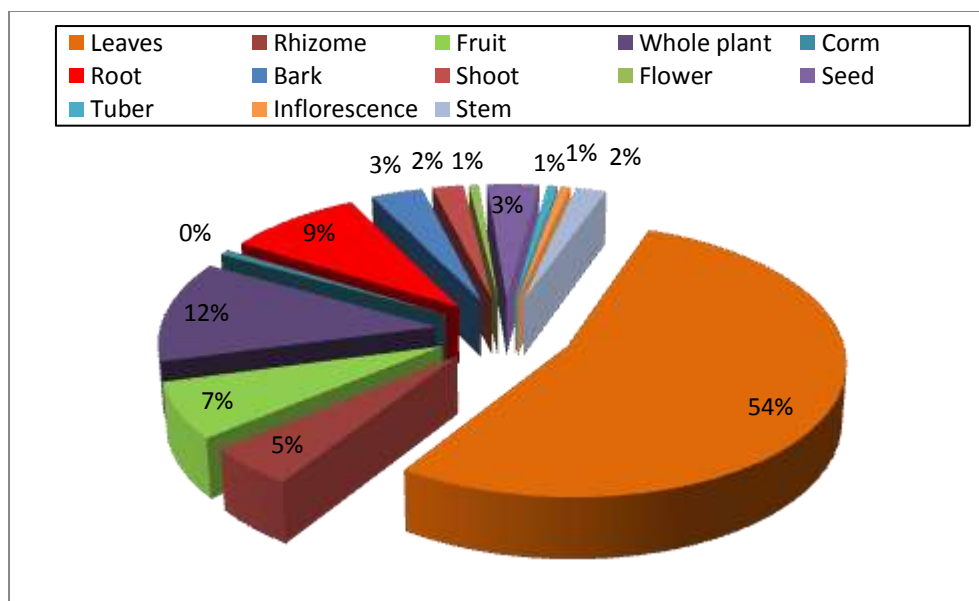**Fig 2:-**Percentage of dominant families documented from the study sites.

Fig 3:- Percentage of plant parts used by the Maring tribe as medicine

The Informant Consensus Factor or *Fic* values ranges from 0.91 to 0.58 in the present findings. Skeleton muscular system disorder (SMSD), Oral care (OC) and Circulatory system disorder (CSD) had the highest *Fic* of 0.91, 0.89 and 0.84 respectively. Higher the value of *Fic* (close to 1) higher the degree of agreement between the informants of the selected taxa to be used in treatment within a category of ailments while low *Fic* represents disagreement among the informants (Ragupathy *et al.,* 2008). The highest use reports were recorded from Genito-urinary disorders (GUD) with 176 use reports & 32 plant species, Circulatory system disorder (CSD) 126 use report & 21 species, Skeleton muscular system disorder (SMSD) with 79 use report, 8 species. This indicates that there is a good amount of knowledge sharing among the inhabitants regarding the use of plants in the treatment of these ailments. The least agreements among the informant was found in Ear, Nose, Throat (ENT) with *Fic* of 0.58 followed by Dermatological infection (DI) with a *Fic* value of 0.64. Dermatological infection had low *Fic* but this ailment category was ranked fourth and seventh in the number of taxa attributed to the category and number of use report respectively. These indicts that there is lack of knowledge sharing and miscommunication among the informants of the study area on the treatment of these particular ailment categories (Rokaya *et al.*, 2010).

Highest use value was recorded from *Allium hookeri* L. with 14 use reports by 20 informants giving the value of 1.05. *Allium hookeri* L. has been well recognized as blood pressure controlling plant in the study areas and also in the treatment of various other diseases, consuming in different form of either raw or cooked. It is included in one of the compulsory plant to be grown in kitchen garden of the *Maring* tribal community. Other plants with high use value were *Ageratum conyzoides* L. with 12 use reports by 20 informants giving the value of 1, *Lindernia ruellioides* (Colsm.) Pennell with 18 use reports by 20 informants, *Dalbergia stipulacea* Roxb. with 18 use reports by 20 informants giving value of 0.90 and *Justicia gendarussa* N.L. Burman with 18 use reports by 20 informants. The major agreements within the ailments categories highlighting the most important species were listed in the table 10.

Lowest use value was recorded from *Cymbopogon citrates* Stapf which is reported by only one informant with a UV of 0.05 and the particular informant was regularly using this plant during fever. This may be attributed to the widespread use of this plant as health drink as in tea leaf which divert attention on its marketability rather than its medicinal potentiality. The plants with low UV documented in the present study (2 use reports by 20 informants) were *Arundo donax* L., *Blumeopsis flava* (DC.) Gagnep, *Cajanus cajan* (L.) Millsp., *Crassocephalum crepidioides* S. Moore, *Curcuma angustifolia* Roxb., *Elsholtzia blanda* Benth., *Eryngium foetidum* L., *Xylosma longifolia* Clos.

The major agreement to determine the most important plants in each ailment category was analyzed using fidelity level. Of the overall total 144 medicinal plants documented, 23 species were selected for all the categories which were used in the treatment of single or more than one ailment with multiple informants. The plants with less than three use reports were not considered for the analysis. The plant species with highest fidelity of 90 % in single

ailment were *Justicia gendarrussa* N.L. Burman, *Lindernia ruellioides* (Colsm.) Pennell and *Dalbergia stipulacea* Roxb.. Other plants with high fidelity level are *Trichosanthes bracteata* (Lam.) Voigt. with 80%, *Aloe vera* Mill Gard. with 75%, *Justicia adhatoda* L. with 72.72%. Plants species with less than 3 use report were not considered for these analysis. Maximum FL indicated high preference and potential of healing among the informants for treating a particular ailment. The calculation also agrees with the *Fic* value of the present study. The frequently reported ailment Skeleton Muscular System Disorder (SMSD) had the highest *Fic* and *Justicia gendarussa* N.L. Burman used in the treatment of this particular ailment category also recorded the highest fidelity level of 90 %.

The plants with the highest fidelity level, use value and high informant consensus factor from the present findings indicates the possibility of high rate of occurrence of potential phytochemical compounds and therefore priority should be given to these plants to carry out phytochemical assays to study its efficacies.

Conclusion:-
Result of the present investigation advocates on the sustainable utilization of the plants so as to conserve the plant resources and also to blend the traditional knowledge with scientific findings. Such investigations need to be conserved as there are no written records and is passed on from their forefathers through orally. Further priority should be given to the plants with high use- value and fidelity level in developing novel drugs through detail clinical study.

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