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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Abstract

An ethnobotanical programme was conducted in Maring inhabited areas of Chandel district of Manipur state of North-eastern India with an aim to document the indigenous knowledge of the community. Since, the community is mostly located in hilly areas they depend heavily on plant based medicines for curing their diseases. The collected data was quantitatively analyzed through the methods of Use Value (UV), Informant Consensus Factor (Fic) and Fidelity level (FL %). In this study, a total of 144 plant species belonging to 66 families were collected which is used by the tribal community in curing their ailments. The ailments were grouped into 18 disease categories. 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. 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. Highest use value was recorded from Allium hookeri L. with 14 use reports by 20 informants giving the value of 1.05. 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%. A detailed clinical study of these promising plants will bring light in discovering new novel drugs.

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Introduction:

Quantitative ethno botanical 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; Hamlet 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.

**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 tostart 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 14,418 *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°83′–25°68′ N/ 93° 03′–94°78′ E) and covers a total geographical area of 22, 327 km². 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 km² 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.
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.), Bendiksbyet 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, Uiyechik  |
| Endocrinial Disorder (ED)                 | Diabetes                                             | Shim duilaknei            |
| Respiratory System Disorders (RSD)        | Asthma, bronchitis, cough, cold, tuberculosis        | Nilsotok, Bur chu         |
| Fever (Fr)                                | Fever                                                | ShabanglehReileh          |
| 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 | Uukphe, uukna |
| 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 yeipok|
| Kidney Stone (KS)                         | Kidney stone                                         | Kaalrei lung lei          |
| Genito-urinary disorders (GUD)            | Urinary bladder stone, menstrual disorder, leucorrhoea, Dysuria, abortion, labor pain, pregnant complications | Aelakaidipurna |
| Oral Care (OC)                            | Toothache, gum complaints, mouth ulcer              | Ha chiknei                |
| Oncogenes (Og)                            | Cancer, tumors                                       | Cancer, Porbang           |
| Piles (P)                                 | Piles                                                | Dirangpum                 |
| 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 = \( \sum \frac{U}{N} \), 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 (Fic):
Informant Consensus factor or Fic 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:
Fic = \( \frac{Nur - Nt}{(Nur - 1)} \), where Nur is the number of use citations in each category and Nt is the number of species used.

Fic 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 Fic 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 Fic 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 (%) = \( \frac{Np}{N} \times 100 \), 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 AndDiscussion:
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                             |
| 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) | - |
| Acmelella 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) | - |
| Aeglemarmelos (L.) Corr. (Rutaceae) | Fr | GID:2 (stomachache) | 0.20 | Oral (Roasted) | - |
| Adiantumphilipppense 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) | - |
| Alocasiamacrorrhiza 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) | - |
| Alpiniagalanga 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) | - |
| Plant Name                                      | Part Used | Condition | Method | Dosage | Notes |
|------------------------------------------------|-----------|-----------|--------|--------|-------|
| Ananascomosus(L.) Merr. (Bromeliaceae)         | Lf        | Fr: 1 (fever) Di: 2 (skin infection) | 0.30   | Oral/topical (Juice/roasted) | -     |
| Anistrofoetida (Dalz.) Benth. &Hook.f. (Rubiaceae) | Rf        | SMSD: 3 (fracture bone) Di: 1 (boils) | 0.40   | Topical (paste) | -     |
| Ardisiacolorata Roxb. (Myrsinaceae)             | Fr/Bk/Lf  | ENT: 1 (sore throat) GID: 2 (dysentery, diarrhea) | 0.30   | Oral (decoction/raw) | -     |
| Artimisiinanilagirica (C.B. Clarke) Pamp. (Asteraceae) | Lf        | GUD: 3 (pregnant complications) | 0.30   | Topical (decoction) | -     |
| Arundodonax 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) | -     |
| Bambusanutans 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) | -     |
| Benincasahispida (Thunb.) Cogn. (Cucurbitaceae) | Fr        | Ad: 2 (food poisoning) | 0.20   | Oral (raw) | -     |
| Blumeopsisflava (DC.) Gagnep (Asteraceae)       | Lf        | ENT: 2 (sinuses) | 0.20   | Inhalation (paste/smoked) | -     |
| Brugmansia suaveolens (Humb. &Bonpl. ex. Willd.) Bercht. & J. Presl. (Solanaceae) | Lf        | Ad: 5 (snake/dog bites) | 0.50   | Topical (paste) | -     |
| Bryonopsiscociniosa 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. (Cannabinaeae)                | Lf        | SMSD: 4 (bodyache) | 0.40   | Topical (decoction) | -     |
| Caricapapya 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 sadnata Roxb. (Vitaceae)                 | Lf        | KS: 4 (kidney) | 0.40   | Oral (decoction) | -     |
| Plant Name | Part | Use | Dose | Formulation |
|------------|------|-----|------|-------------|
| **Cissus discolor** Blume (Vitaceae) | Lf | KS: 5 (kidney stone) | 0.50 | Oral (decoction) |
| **Clerodendrumcolebrookianum** Walp. (Lamiaceae) | Lf | CSD: 4 (blood pressure) | 0.40 | Oral (decoction) |
| **Clerodendrumindicum** (L.) Kuntze (Lamiaceae) | Lf/Rt | GUD: 1 (Dysuria) | 0.10 | Oral (decoction) |
| **Clerodendrumphilippinum** Schauer (Lamiaceae) | Lf | SMSD: 1 (bodyache) | 0.10 | Topical (decoction) |
| **Clerodendrumserratum** Spreng. (Verbenaceae) | Lf | GH: 2 (blood tonic) | 0.20 | Oral (decoction) |
| **Coix lachrymal jobi** L. (Poaceae) | Lf | GUD: 4 (Dysuria) | 0.40 | Oral (decoction) |
| **Costusspeciosus** (Koening) Sm. (Costaceae) | Lf | Fr: 2 (fever) CSD: 2 (blood clot) | 0.40 | Oral/topical (paste) |
| **Crassocephalumcrepidioides** 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) |
| **Crotolariajuncea** L. (Fabaceae) | Lf | GH: 2 (blood tonic) | 0.20 | Oral (raw/cooked) |
| **Cucurmaangustifolia** Roxb. (Zingiberaceae) | Rh | GID: 2 (indigestion) | 0.20 | Oral (raw) |
| **Cucurmacaesia** Roxb. (Zingiberaceae) | Rh | GID: 4 (stomachache) | 0.40 | Oral (raw/dried) |
| **Cucurmadomestica** Val. (Zingiberaceae) | Rh | CSD: 6 (blood clot) | 0.60 | Topical (raw) |
| **Cuscutareflexa** 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) |
| **Cynodondactylon** (L.) Pers. (Poaceae) | Rt | GUD: 3 (Dysuria) GID: 1 (stomachache) | 0.40 | Oral (juice) |
| **Dalbergiastipulacea** L. (Fabaceae) | Bk | OC: 9 (tooth cavities) | 0.90 | Topical (juice) |
| **Daturastramonium** L. (Solanaceae) | Lf | DF: 1 (boils) Ad: 3 (snake bites) | 0.40 | Topical (paste) |
| **Daucuscarota** L. (Apiaceae) | Rt/Sd | GUD: 2 (irregular menstruation) ENT: 3 (eye infection) | 0.50 | Oral (decoction/raw) |
| **Dicrocephalaintegrifolia** Kuntz (Asteraceae) | Lf | GID: 1 (indigestion) | 0.30 | Topical/oral (decoction) |
| Species                                      | Part  | Condition(s)                                      | Active Ingredient(s)                                                                 |
|----------------------------------------------|-------|-------------------------------------------------|---------------------------------------------------------------------------------------|
| *Dioscoreaalata* L. (Dioscoreaceae)          | Tb    | LP: 1 (jaundice) GID: 2 (stomachache)            | *Saccharum officinarum*, *Centella asiatica*, *Cucumara aromatica* and *Jeera*       |
| *Drymaria cordata* Wild. (Caryophyllaceae)   | Wh    | RSD: 3 (asthma) ENT: 1 (night blindness)         |                                                                                      |
| *Durantarepens* L. (Verbenaceae)             | Lf    | Og: 4 (tumors)                                  |                                                                                      |
| *Eclipta prostrata* L. (Asteraceae)          | Lf    | Fr: 2 (fever)                                   | Honey                                                                                 |
| *Elsholtzia blandana* Benth. (Lamiaceae)     | Lf/lf | ENT: 2 (tonsilites)                             |                                                                                      |
| *Elsholtzia communis* (Coll. & Hemsl.) Diels (Lamiaceae) | Wh | ENT: 1 (tonsilites)                             |                                                                                      |
| *Enhydra fluctuans* Lour. (Asteraceae)       | Sh    | ED: 5 (diabetes) GUD: 2 (leucorrhoea)            | Sugar candy                                                                          |
| *Entada pursa* DC. (Mimosaceae)              | Lf    | ED: 1 (diabetes)                                |                                                                                      |
| *Equisetum ramosissimum* Desf. ssp. Debile (Roxb.) Hauhe (Equisetaceae) | Wh | ENT: 2 (epistaxis)                              |                                                                                      |
| *Eryngium foetidum* L. (Apiaceae)            | Wh    | CSD: 1 (blood pressure)                         |                                                                                      |
| *Eupatorium adenophorum* Spreng. (Asteraceae) | Lf | CSD: 3 (blood clot)                             |                                                                                      |
| *Eupatorium birmanicum* DC. (Asteraceae)     | Lf    | GID: 1 (stomach ulcer) OC: 3 (mouth ulcer)      |                                                                                      |
| *Eupatorium odoratum* L. (Asteraceae)        | Lf    | CSD: 4 (blood clot)                             |                                                                                      |
| *Euphorbia hirta* L. (Euphorbiaceae)         | Wh    | GUD: 1 (leucorrhoea)                            | Prawn                                                                                |
| *Ficus assamica* Miq. (Moraceae)             | Rt    | GUD: 1 (leucorrhoea)                            |                                                                                      |
| *Ficus benghalensis* L. (Moraceae)           | Bk    | GUD: 3 (irregular menstruation)                 |                                                                                      |
| *Ficus hirsuta* Lf. (Moraceae)               | Lf    | ED: 1 (diabetes)                                |                                                                                      |
| *Fragariina nilgerensis* Schlecht. ex J. Gay (Rosaceae) | Lf | GUD: 5 (Dysuria)                                |                                                                                      |
| *Garcinia pedunculata* Roxb. ex Buch. (Clusiaceae) | Fr | ENT: 1 (sore throat) RSD: 2 (cough)             |                                                                                      |
| *Glochidion coccineum* Forst (Phyllanthaceae) | Lf | CSD: 3 (blood clot)                             |                                                                                      |
| Plant Name                                      | Part | Use               | Dosage | Preparation | Notes                           |
|------------------------------------------------|------|-------------------|--------|-------------|---------------------------------|
| Gmelina arborea (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) | 0.50 | Topical/oral (decoction/raw) | -                               |
| Holmskioldiasanguinea 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) | 0.30   | Topical (paste) | -                               |
| Justicia adhatoda L. (Acanthaceae)             | Lf   | RSD: 8 (bronchitis) | 1.1    | Oral (decoction) Zingiber officinale | -                               |
| Justicagendarussa 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 rutioides (Colsm.) Pennell (Linderniaceae) | Wh   | KS: 1 (kidney stone) GUD: 9 (Dysuria) | 1     | Oral (decoction) | -                               |
| Litseamonopetala (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. (Lygodiaeae)       | Wh   | LP: 3 (jaundice) | 0.30   | Oral/topical (decoction) | -                               |
| Lysimachiaparvifolia 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.                      | Lf   | Fr: 1 (fever) | 0.40   | Oral/topical | -                               |
| Plant Name                                           | Genus, Family                  | Part | Condition/Cure/Use                                                                 | Dosage       | Route | Notes       |
|------------------------------------------------------|-------------------------------|------|-----------------------------------------------------------------------------------|--------------|-------|-------------|
| *Mimosa pudica* L.                                  | Fabaceae                      | Lf   | GID: 3 (dysentery)                                                                | 0.30         | Oral   | (decoction) - |
| *Momordica charantia* L.                            | Cucurbitaceae                  | Lf   | Fr: 2 (fever)                                                                     | 0.20         | Oral   | (decoction) - |
| *Mucuna pruriens* (Lour.) Steud.                    | Fabaceae                      | Sd   | DI: 1 (boils)                                                                     | 0.10         | Topical | (paste)     |
| *Musa paradisiaca* L.                               | Musaceae                      | Rt   | GUD: 4 (Pregnant complications)                                                    | 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 sanctum* L.                                 | Lamiaceae                      | Lf   | LP: 1 (jaundice)                                                                  | 0.10         | Oral   | (juice) Honey |
| *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)                                                             | 0.90         | Oral   | (roasted) -  |
| *Oxalis corniculata* L.                             | Oxalidaceae                    | Wh   | LP: 4 (jaundice)                                                                  | 0.70         | Oral   | (topical) 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) | 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)                                                                  | 0.30         | Oral   | (topical) - |
| *Pinus kesteya* Royle                                | St                             | GUD: 3 | Topical (paste) |

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| Plant Family          | Species                              | Part Used     | Common Use                                                                 | Quantity | Application Method          |
|----------------------|--------------------------------------|---------------|----------------------------------------------------------------------------|----------|-----------------------------|
| Pinaceae             | *Piper longum* L. (Piperaceae)       | Sd            | (pregnant complications) Dl: 2 (ringworm)                                  | 0.20     | Oral (decoction)            |
|                      |                                      | Lf            | GUD: 2 (menstrual disorder)                                                | 0.20     | Oral (decoction)            |
|                      |                                      | Wh            | GUD: 3 (pregnant complications)                                            | 0.30     | Oral (decoction)            |
| Plantaginaceae       | *Plantago erosa Wall.* (Plantaginaceae) | Lf            | CSD: 1 (blood clot)                                                       | 0.10     | Topical (paste)             |
|                      |                                      | Lf            | Fr: 3 (fever)                                                             | 0.30     | Oral (decoction)            |
| Plantaginaceae       | *Polygonatum chinense* L. (Polygonaceae) | Lf            | GSD: 1 (kidney stone)                                                     | 0.10     | Oral (decoction)            |
|                      |                                      | Lf            | GID: 5 (dysentery)                                                        | 0.50     | Oral (raw)                  |
|                      |                                      | Fr            | GID: 2 (intestinal worm)                                                   | 0.20     | Topical (soaked)            |
|                      |                                      | Wh            | GUD: 3 (pregnant complications)                                            | 0.30     | Topical (decoction)         |
|                      |                                      | Lf            | KS: 5 (kidney stone)                                                      | 0.50     | Oral (decoction)            |
|                      |                                      | Lf            | GID: 5 (dysentery)                                                        | 0.50     | Oral (raw)                  |
|                      |                                      | Lf            | CSD: 3 (blood clot)                                                       | 0.80     | Oral (raw/cooked)           |
|                      |                                      | Wh            | GUD: 3 (pregnant complications)                                            | 0.30     | Topical (decoction)         |
|                      |                                      | Lf            | KS: 5 (kidney stone)                                                      | 0.50     | Oral (decoction)            |
|                      |                                      | Lf            | GID: 5 (dysentery)                                                        | 0.50     | Oral (raw)                  |
|                      |                                      | Lf            | CSD: 4 (blood clot)                                                       | 0.40     | Topical (paste)             |
|                      |                                      | Fr            | GID: 2 (intestinal worm)                                                   | 0.20     | Topical (soaked)            |
|                      |                                      | Lf            | GID: 5 (dysentery)                                                        | 0.50     | Oral (juice) Honey          |
|                      |                                      | Lf            | ENT: 5 (epistaxis)                                                        | 0.50     | Oral (juice) Honey          |
|                      |                                      | Lf            | P: 1 (piles) GUD: 1 (menstrual problem)                                    | 0.20     | Oral (decoction)            |
|                      |                                      | Wh            | GUD: 2 (Dysuria)                                                          | 0.20     | Oral (decoction)            |
|                      |                                      | Fr            | RSD: 3 (cough/cold)                                                       | 0.30     | Oral (decoction)            |
|                      |                                      | Fr            | OC: 4 (tooth cavities)                                                     | 0.40     | Topical (smoked)            |
|                      |                                      | Lf            | Ad: 4 (snake/dog bites)                                                    | 0.40     | Topical (paste)             |
|                      |                                      | Lf            | DI: 1 (ringworm) GH: 3 (blood tonic)                                      | 0.40     | Oral (decoction)            |
|                      |                                      | Lf            | GID: 2 (dysentery)                                                        | 0.20     | Oral (decoction)            |
|                      |                                      | Bk            | GID: 2 (dysentery)                                                        | 0.20     | Oral (decoction)            |
|                      |                                      | Fr            | OC: 3 (mouth ulcer)                                                       | 0.30     | Oral (raw)                  |
| Ailment category                      | Most preferred species                          | N<sub>p</sub> | N | FL (%) |
|--------------------------------------|-------------------------------------------------|---------------|---|--------|
| Liver Problem                        | Cuscutareflexa (Jaundice)                       | 5             | 9 | 55.55  |
|                                     | Oxalisburnetiana (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                 | Enhydrafluctuans (Diabetes)                     | 7             | 12| 58.33  |
| Respiratory System Disorders        | Justiciaadhatoda (Bronchitis)                   | 8             | 11| 72.72  |
| Fever                               | Acoruscalamus                                    | 9             | 20| 45     |
|                                     | Phlogacanthurysformis                            | 6             | 9 | 66.66  |
| Skeleton Muscular System Disorders  | Justiciagendarussa (Bodyache)                   | 18            | 20| 90     |
|                                     | Litseamonopetala (Bodyache)                     | 10            | 14| 71.42  |
| Gastro intestinal disorders         | Psidiumguajava (Dysentery)                      | 6             | 20| 30     |
|                                     | Curcurmacaesia (Stomachache)                    | 6             | 20| 30     |
| Dermatological infection            | Aloe vera (Burns)                               | 6             | 8 | 75     |
| Kidney Stone                        | Cissus discolor                                  | 6             | 20| 30     |
| Genito-urinary disorders            | Fragariannillgerensis (Dysuria)                 | 10            | 20| 50     |
|                                     | Linderniarellioides (Dysuria)                   | 18            | 20| 90     |
|                                     | Musa paradisiaca (Pregnant complaints)          | 8             | 20| 40     |
| Oral Care                           | Acmellapaniculata (Tooth cavities)              | 8             | 20| 40     |
|                                     |                                                 | 18            | 20| 90     |
| πuλγγενες | Trichosanthesbracteata (Dermal tumor) | 16 | 20 | 80 |
| πυλγγενες | Polygonumposumba | 4 | 10 | 40 |
| Smallpox | Phlogacanthusthyrsiformis | 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 indict 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 Alliumhookeri L. with 14 use reports by 20 informants giving the value of 1.05. Alliumhookeri L. has been well recognized as a 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 Ageratumconyzoides L. with 12 use reports by 20 informants giving the value of 1, Linderniaruellioides (Colsm.) Pennell with 18 use reports by 20 informants, Dalbergiastipulacea Roxb. with 18 use reports by 20 informants giving value of 0.90 and Justiciagendarussa 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 Cymbopogoncitrates 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 Arundodonax L., Blumeopsisflava (DC.) Gagnep, Cajanuscajan (L.) Millsp., Crassocephalumcrepidioides S. Moore, Curcumaangustifolia Roxb., Elsholtziablanda Benth., Eryngiumfoetidum L., Xylosmalongifolia 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 Justiciagendarussa N.L. Burman, Linderniaruellioides (Colsm.) Pennell and Dalbergia stipulacea Roxb.. Other plants with high fidelity level are Trichosanthesbracteata (Lam.) Voigt. with 80%, Aloe vera Mill Gard. with 75%, Justiciaadhatoda 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 ailments Skeleton Muscular System Disorder (SMSD) had the highest Fic and Justiciagendarussa 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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