Phytoconstituents and Proximate Composition of Clerodendrum Colebrookianum Walp.: A Widely Used Anti High Blood Pressure Medicinal Food Plant in Eastern Himalayas

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ABSTRACT

Clerodendrum colebrookianum Walp. is a medicinal food plant widely used in the North East India. The herb is used as vegetable as well as medicine to control high blood pressure. Minerals and Proximate composition in a food is vital for the proper growth and development of a healthy body and secondary metabolites included in diet act as a nutraceuticals thus help in fighting various health problems. The present study was carried out to discover the Phytoconstituents, Proximate composition and Minerals of the nutraceutical herb, Clerodendrum colebrookianum. Methanol extract of sample was subjected to GCMS to profile the Phyoconstituents while Standard methods including AOAC was followed to study proximate and minerals of the sample under studied. Moisture content was 77.90%, carbohydrate 4.28%, 2.36% crude protein, 4.21% crude fibre and 0.35% crude fat respectively. The minerals concentrations are 0.215mg of Fe/g, 0.105mg/g of Mn, 0.0425mg of Cu/g, 0.056mg Zn/g, 2.55mg of Mangnesia/g, 4.3mg of Na/g and 24.5mg of K per gram of sample. A total of eleven compounds are recorded to be useful for high blood pressure problem and as many as twenty useful phytoconstutuents were recorded from the sample including antioxidant, anti-uric acid formation, anti-tumour, bioabiability of zinc etc. The present study advocates the traditional knowledge on the use of Clerodendrum colebrookianum as a remedy for high blood pressure problem.

Key words: Clerodendrum colebrookianum, North East India, Nutraceutical Herb, Phytoconstituents, Proximate, Minerals.

INTRODUCTION

Let food be your medicine, once said, Hippocrates1. Galen- “the father of observational medicine” believed that the fundamentals of good medicine lay in diet. And, such medicinal food concepts still observable in the indigenous food system practices among indigenous people in various pockets of the world. In the word of Etkin & Ross2, wild plants that are retained in local food cultures are inseparable from traditional therapeutic systems. And, Pieroni and Price3 remarked that it is difficult to draw a line between food and medicine; food may be medicine and medicine may be food. And, in remote rural Villages, Wild edible plants are integral source of food, medicine, shelter and livelihood. Many of wild edible vegetables have medicinal property and can be used to treat common ailments; these are easily available, cheap and also excellent source of nutrients like proteins, carbohydrates, iron, essential minerals and other secondary metabolites. And, regular uses of these vegetables act as an alternative source of medicinal drugs along with nutritional benefits4. There is a vast cornucopia of herbs and foods which stimulate support and nourish our body system. Some have been used by different traditional systems of several countries and are now being evaluated by modern research5. Medicinal and aromatic plants represent an inexhaustible source of life saving drugs for the majority of the world’s population5. The beneficial remedial effects of plant materials are mainly due to the mixture of substances called secondary metabolites of plants6.

Hypertension is one of the major chronic diseases, which affect people around the world. One approach to control hypertension is by using diet containing an adequate amount of phytochemicals; increased intake of phytochemicals is associated with decreased mortality rate from cardiovascular diseases, stroke and injuries secondary to hypertension7. Hypertension or high blood pressure accounts 9.4 million deaths all over the world every year8. The use of plant origin natural compounds as cardio protective and antihypertensive agents rich in a variety of secondary metabolites such as flavonoids, alkaloids, tannins and terpenoids are helpful9. And many have turned their attention to the use of herbal medicines for hypertension treatment in country like Thailand9. And, Clerodendrum colebrookianum Walp.(fig.1.), a medicinal food plants widely used among Indigenous people of North East India as medicinal food to lower down the high blood pressure. Some workers have reported the traditional uses of this herb in high blood pressure related practices from the eastern Himalayan regions of India10,11,12. With the above backdrops, the present research has been designed to study the proximate composition, phytoconstituents and minerals present in C.colebrookianum.

Cite this article: Payum T. Phytoconstituents and Proximate Composition of Clerodendrum Colebrookianum Walp.: A Widely Used Anti High Blood Pressure Medicinal Food Plant in Eastern Himalayas. Pharmacogn J. 2020;12(6)Suppl:1534-40.
MATERIAL AND METHODS

Plant material

*Clerodendrum colebrookianum* Walp., a Verbenaceae family is a shrub of about 15 ft. high with disagreeable smell. Bark shining light grey; Leaves: 3.5-10 by 2.5-8 in., broad, ovate, acute, entire, membranous, almost glabrous; lateral nerves 6-9 on either half, base shallow cordate; petiole 0.5-6.5 in. long with cluter of glands near the apex. Flower is white in broad terminal compact, corymb biform compound cymes; bract caduceus. Calyx: pubescent, often bearing a few glands; calyx: teeth short; Corolla: tube slender, 1-1.25 in. long; style exerted; Fruit: Blush green to deep green when fully ripe, glossy, 0.3 in. across, globose, compressed above, of 4 duprels seated on an accrescent cup-shaped calyx about 0.4 in. Across[14]. The material was collected from Kitchen garden of Mrs Oki Paron of Pasighat Town of East Siang District of Arunachal Pradesh, India.

Preparation of extract for GCMS

The shoot was washed thoroughly in distilled water and dried in shade till the weight did not changed further and pulverized into powder using a mechanical grinder. 500g of plant powder was soaked in ethanol (Merck) for 72 hours with intermittent shaking then filtered through Whatmann No. 41 filter paper and concentrated extract was obtained by using water bath.

Proximate and minerals studies

The shoot was washed thoroughly in distilled water and dried in shade till the weight did not changed further and pulverized into powder using a mechanical grinder, the powder was used in proximate analysis. For moisture study, fresh collected sample was used before drying. The Association of Official Analytical Chemists (AOAC, 1990) were used for the determination of ash, crude lipid, crude fibre, carbohydrate and mineral. Ash was determined in silica crucibles by incinuration in a muffle furnace at 550°C for 5 hrs. Crude lipid was extracted by continuous soxlet methods (AOAC, 1990) with petroleum ether (b.p 40-60°C). Crude fiber was estimated by acid-base digestion with 1.25% H₂SO₄ and 1.25% NaOH solution. Nitrogen was estimated by Kjeldel method with steam distillation and titrated with standard 0.01 M HCl solution. Crude protein was estimated by multiplying the sample per cent Nitrogen content by a factor 6.25. (% protein = % Nitrogen X 6.26). Carbohydrate was estimated by Anthrone Method with an ultraviolet-visible (UV-Vis) spectrophotometer (Lambda-25, Perkin Elmer, Cambridge UK). Minerals were analysed from solution obtained when 1.0g of the samples were digested with concentrated 10ml nitric acid and kept overnight and heated till fumes of HNO₃ and allowed to cool and add 4ml concentrated perchloric acid and heated again till clear solution is obtained and filtered into 100ml ml standard flask and made to mark with distilled water and analysed in atomic absorption spectrophotometer (Buck scientific model 200A).

GC-MS analysis environment

Gas-Chromatography Mass Spectrometry (GC-MS) analysis of the ethanol extracts of *C. colebrookianum* carried out in Shimadzu GCMS-QP-2010 plus system. RTx-5 Sil MS column (30 m X 0.25 mm id X 0.25 film thickness) was used for the analysis. The operating conditions of the column were as follows: Oven temperature program from 80°C to 210°C at 4°C/min with hold time of 2 min and from 210°C to 300°C at 15°C/min with hold time of 5 min, and the final temperature was kept for 20 min. The injector temperature was maintained at 270°C, the volume of injected sample was 0.3μl; pressure 85.4kPa, total flow 76.8mL/min, column flow 1.21 mL/min, linear velocity 40.5 cm/sec, purge flow 0.3 mL/min, split ratio: 60.0; ion source temperature 230°C; scan mass range of m/z 40-600 and interface line temperature 280°C.

The identification of compounds was performed by comparing their mass spectra with data from NIST 11 (National Institute of Standards and Technology, US) and WILEY 8.

RESULTS AND DISCUSSION

A total of forty four phytoconstituents were recorded form the shoot sample of *C. colebrookianum*; out of which most of the phytoconstituents are useful compounds for a healthy growth and development. 14.56% of peak area was 2,2-DIDEUETERO-TRANS-1,3-DIHYDROXY-CYCLOPENTANE, it is Catechol-O-Methyl-transferase-inhibitor, glucosyl-transferase-inhibitor, reverse ranscriptase inhibitor; another 14.02% peak area was 9,12-OCTADECADIENOIC ACID (Z,Z)- it Inhibit Production of Uric Acid, Increase Zinc Bioavailabilty and Hepatoprotective[15]; 10.46% peak area was PENTADECANOIC ACID and it Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc[16]; 4.17% was Squalene, it is Monoxygenase-inhibitor*, antioxidant, antitumour[17]; it also Hepatoprotective, Hypolipidemic, hypoglycemic, hypercholesterolemic, hyperlipidemic, increase alpha-mannosidase activity* Antiphptpertension[18]; 5.08% was (2E)-3,7,11,15-TETRAMETHYL YL-2-HEXADECEN-1-OL, it is Anticancer, Antidote(emetine), endocnoreprotective, endocrine tonic; 11.14% peak area was 9,12-OCTADECADIEN-1, DIMETHYL ACETAL, it is Hepatoprotective[19]; 2.03% peak area was Octadecanoic acid, it Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc[20]; 4.83% was Stigmasterol, it also Antihipercholesterolemic, Antioxidant, antitumour[21]; 0.29% was OCTADECANOIC ACID, ETHYL ESTER, it Inhibit Production of Uric Acid, Increase Zinc[22], Hypocholesterolemic[23]; 0.32% peak area was 14-.BETA.-H-PREGNAS, it is Anticancer, Histidine kinase-inhibitor, Hypercholesterolemic, hypoglycemic, hypolipemic, increase T helper; 0.72% peak area was gamma-Tocopherol, it is Antioxidant, Tocopherol synergist, PPAR-Gamma-Antagonist*, Cardioprotective[24], [25]; 2.10% peak area was 5-Hydroxymethyl furfural, it is Aromatic[26]; 1.04% peak area was 3-[N’-(3H-Indol-3-ylmethylene)-hydrazino]-5-methyl-[1,2,4-triazol-4-ylamine, it is Neurostimulant, Antitumor (Nasopharynx), Nephroprotective, Neurostimulat; 0.08% peak area was 1,2-BENZENDICARBOXYLIC ACID, INDOLYL, DIETHYL ESTER, it Increase Aromatic Acid Decarboxylase Activity, Inhibit Production of uric acid, Increase Zinc[27]; 0.32% peak area was alpha-Terpineol, it is 5-alpha reductase-inhibitor, HIFI alpha-inhibitor; 0.12% peak area was TETRADECANOIC ACID, it Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc[28]; 0.32% peak area was 3-Chloropropanic acid, heptadecyl ester, it inhibit Production of Uric Acid, Increase Zinc; 3.82% peak area was 2,6,10-TRIMETHYL14-ETHYLENYL-14-PENTADECN, it is Antiproliferative[29]; 0.91% peak area was 3,7,11,15-TETRAMETHYHEXADEC-2-EN-1-OL, it is Endoanesthetic, endoprotective*; 1.82% peak area was 2-HEXADECEN-1-OL, 3,7,11,15-TETRAMETHYL-, [R-[R’-R”-R”’-E]], it is 5-Alpha-Reductase-Inhibitor, Benzodiazepine-Receptor Agonist, Endothelium-Derived Relaxing Factor Promoter*; 2.00% peak area was HEXADECANOIC ACID, ETHYL ESTER, it Inhibit Production of Uric Acid, Increase Zinc[30]; 2.24% peak area was ETHYL (9Z,12Z)-9,12-OCTADECADIENIOATE, it Increase zinc bioavailaibility; 1.14% peak area was (R)-(+)-14-Methyl-8-hexadecyn-1-ol, it is Catechol-O-Methyl-transferase-Inhibibor, Free-Radical Scavenging, HIV-RT-Inhibitor, Radioprotective; 0.75% peak area was 10-UNDECEN-1-AL, 2-METHYL, it is Catechol-O-Methyl transferase inhibitor,
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**Figure 1**: Clerodendrum colebrookianum Walp.

**Figure 2**: Chromtogram of C. colebrookianum.
## Table 1: Compound table.

| Peak | R. time | Area     | Area %  | Compound name                                                                 |
|------|---------|----------|---------|--------------------------------------------------------------------------------|
| 1    | 6.477   | 590693   | 1.56    | 2,3-DIHYDRO-3,5-DIHYDROXY-6-METHYL-4H-PYRAN-4-ONE                               |
| 2    | 7.124   | 97225    | 0.26    | 1-DODECENE                                                                     |
| 3    | 7.95253 | 795253   | 2.10    | 5-Hydroxymethylfurfural                                                        |
| 4    | 9.960   | 165693   | 0.44    | 1-TRIDEcene                                                                     |
| 5    | 10.089  | 391550   | 1.04    | 3-[N’-(3H-Indol-3-ylmethylene)-hydrazino]-5-methyl-[1,2,4]triazol-4-ylamine     |
| 6    | 11.053  | 5506326  | 14.56   | 2,2-DIDEUTERO-TRANS-1,3-DIHYDROXY-CYCLOPENTANE                                  |
| 7    | 12.453  | 29341    | 0.08    | 1,2-BENZENEDICARBOXYLIC ACID, DIETHYL ESTER                                    |
| 8    | 12.489  | 63315    | 0.17    | 1-HEXADECENE                                                                   |
| 9    | 13.425  | 120208   | 0.32    | .alpha.-Terpineol                                                              |
| 10   | 14.378  | 46366    | 0.12    | TETRADECANOIC ACID                                                             |
| 11   | 14.755  | 68890    | 0.18    | 3-Chloropropionic acid, heptadecyl ester                                        |
| 12   | 15.221  | 1444503  | 3.82    | 2,6,10-TRIMETHYL-14-ETHYLENE-14-PENTADECNE                                      |
| 13   | 15.474  | 345089   | 0.91    | 3,7,11,15-TRITEMETHYLHEXADEC-2-EN-1-OL                                           |
| 14   | 15.669  | 689193   | 1.82    | 2-HEXADECEN-1-OL, 3,7,11,15-TRITEMETHYL-[-[R-[R*,R*-E]]]-                       |
| 15   | 16.492  | 3957134  | 10.46   | PENTADECANOIC ACID                                                             |
| 16   | 16.787  | 757965   | 2.00    | HEXADECANOIC ACID, ETHYL ESTER                                                  |
| 17   | 17.931  | 1921800  | 5.08    | (2E)-3,7,11,15-TRITEMETH                                                       |
| 18   | 18.133  | 534632   | 1.41    | CYCLODECENE                                                                     |
| 19   | 18.198  | 5301217  | 14.02   | YL-2-HEXADECEN-1-OL                                                             |
| 20   | 18.393  | 767186   | 2.03    | Octadecanoic acid                                                              |
| 21   | 18.430  | 846091   | 2.24    | ETHYL (9Z,12Z)-9,12-OCTADECADIENOATE                                            |
| 22   | 18.659  | 109775   | 0.29    | OCTADECANOIC ACID, ETHYL ESTER                                                  |
| 23   | 18.953  | 431547   | 1.14    | (R)-(.-)-14-Methyl-8-hexadecyn-1-ol                                             |
| 24   | 19.159  | 430293   | 1.14    | 9,12-OCTADECADIENAL, DIMETHYL ACETAL                                            |
| 25   | 19.496  | 283923   | 0.75    | 10-UNDECEN-1-AL, 2-METHYL-                                                       |
| 26   | 19.596  | 119959   | 0.32    | 14-.BETA.-H-PREGNA                                                              |
| 27   | 19.848  | 152281   | 0.40    | 1-(1-HEPTADECNYL)CYCLOPENTANOL                                                  |
| 28   | 20.281  | 267469   | 0.71    | 5-(3,3-DIMETHYL-2-OXIRANYL)-3-METHYL-1-PENTANOL                                  |
| 29   | 21.622  | 349688   | 0.92    | CYCLOOCTADECANOPENTANOIC ACID, 1-NITRO-.BETA.,2-DIOXO., Methyl ESTER             |
| 30   | 22.455  | 88747    | 0.23    | TETRADECANAL                                                                    |
| 31   | 25.878  | 158580   | 0.42    | Isolongifolene, 4,5,9,10-dehydro-                                               |
| 32   | 26.560  | 1577068  | 4.17    | Squalene                                                                        |
| 33   | 27.631  | 148541   | 0.39    | Nonane, 3-methyl-5-propyl-                                                       |
| 34   | 28.235  | 339316   | 0.90    | Tripropylidlyoxy cyclobutane                                                    |
| 35   | 29.830  | 271666   | 0.72    | .gamma.-Tocopherol                                                              |
| 36   | 31.240  | 3046976  | 8.06    | dl-.alpha.-Tocopherol                                                           |
| 37   | 33.882  | 486505   | 1.29    | 26,27-DINORCHELESTA-5,22-DIEN-3-OL, (3.BETA.,22E)-                              |
| 38   | 35.013  | 1826911  | 4.83    | Stigmasterol                                                                    |
| 39   | 35.410  | 644578   | 1.70    | .gamma.-Sitosterot                                                              |
| 40   | 36.795  | 131660   | 0.35    | Phytol, acetate                                                                 |
| 41   | 37.650  | 538888   | 1.42    | 6.beta.Bicyclo[4.3.0]nonane, 5.beta.-iodomethyl-1.beta.-isopropenyl-4.alpha..5. alpha.-dimethyl., |
| 42   | 40.190  | 544847   | 1.44    | 2,4A,8,8-TETRAMETHYL-DECAHYDRO-CYCLOPROP[D]NAPHTHALENE                           |
| 43   | 43.503  | 894709   | 2.37    | Phytol, acetate                                                                 |
| 44   | 44.488  | 541688   | 1.43    | Oxirane, hexadecyl-                                                             |

**Legend:**
- **Peak**: Number of peak.
- **R. time**: Retention time.
- **Area**: Area of peak.
- **Area %**: Area percentage.
- **Compound name**: Name of the compound.
### Table 2: Useful Compound table.

| Peak | Area % | Compound name                                                                 | Important of compound                                                                 |
|------|--------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 1    | 1.56   | 2,3-DIHYDRO-3,5-DIHYDROXY-6-METHYL-4H-PYRAN-4-ONE                             | Catechol-O-Methyl-transferase-inhibitor, 11B-HSD-inhibitor, 5-HETE-INHIBITOR, Anti-HIV-integrase, antidote(heavy metals)Hormone balancing, Hepatoprotective ** |
| 2    | 2.10   | 5-Hydroxymethyl furfural                                                       | Anti-Aromatic Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc |
| 3    | 1.04   | 3-[(N-3H-Indol-3-ylmethylene)-hydrazino]-5-methyl-[1,2,4]triazol-4-ylamine     | Neurostimulant, Antitumor (Nasopharynx), Nephroprotective, Neurostimulant **            |
| 4    | 14.56  | 2,2-DIDEUTERO-TRANS-1,3-DIHYDROXY-CYCLOPENTANE                               | Catechol-O-Methyl-transferase-inhibitor, reverse ranscriptase inhibitor, transdermal ** |
| 5    | 0.08   | 1,2-BENZENEDICARBOXYLIC ACID, DIETHYL ESTER                                  | Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc |
| 6    | 0.32   | 3-hydroxypropiononic acid, heptadecad ester                                  | 5-alpha reductase-inhibitor, HIF1 alpha-inhibitor, IkappaB-alpha-phosphorylacion-inhibitor, TNF-alpha inhibitor |
| 7    | 0.12   | TETRADECANOIC ACID                                                            | Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc |
| 8    | 0.18   | 3-Chloropropionic acid, heptadecad ester                                     | Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc |
| 9    | 3.82   | 3,6,10-TRIMETHYLETHYLENE-14-PENTADECANE                                        | Antiproliferative **                                                                  |
| 10   | 0.91   | 3,7,11,15-TETRAMETHYLEXADEC-2-EN-1-OL                                          | Endoanesthetic, endoprotective, endothelium derived relaxing factor promoter, endocrine tonic ** |
| 11   | 1.82   | 2-HEXADECEN-1-OL, 3,7,11,15-TETRAMETHYLEYL-[R-[R*,R*-(E)]]-                   | Respirative, 5-Alpha-Reducectase-Inhibitor, Benzodiazepine-Receptor Agonist **         |
| 12   | 10.46  | PENTADECANOIC ACID                                                             | Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc |
| 13   | 2.00   | HEXADECANOIC ACID, ETHYL ESTER                                                 | Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc |
| 14   | 5.08   | (2E)-3,7,11,15-TETRAMETHYL-12-EN-1-OL                                          | Anticancer(?)Dephagous, Antidote(emetine), endoanesthetic, endocrineprotective **      |
| 15   | 14.02  | 9,12-OCTADECADIENOIC ACID (Z,Z)-                                             | Inhibit Production of Uric Acid, Increase Zinc Bioavailability **; Hepatoprotective ** |
| 16   | 2.03   | Octadecanoic acid                                                             | Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc, Hypocholesterolemic ** |
| 17   | 2.24   | ETHYL (9Z,12Z)-9,12-OCTADECADIENOATE                                           | Increase zinc bioavailability                                                        |
| 18   | 0.29   | OCTADECANOIC ACID, ETHYL ESTER                                                 | Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc, Hypocholesterolemic ** |
| 19   | 1.14   | (R)-(-)-14-Methyl-8-hexadecyn-1-ol                                            | Catechol-O-Methyl-Transferase-Inhibitor, 5-Alpha-Reductase-Inhibitor, Free-Radical Scavenging ** |
| 20   | 0.72   | ETHYL (9Z,12Z)-9,12-OCTADECADIENOATE                                           | Increase zinc bioavailability                                                        |
| 21   | 0.72   | OCTADECANOIC ACID, ETHYL ESTER                                                 | Increase Aromatic Amino Acid Decarboxylase Activity, Inhibit Production of Uric Acid, Increase Zinc, Hypocholesterolemic ** |
| 22   | 1.70   | .gamma.-Tocopherol                                                             | Antioxidant, Tocopherol synergest, PPAR-Gamma-Antagonist, Cardioprotective **         |
| 23   | 1.43   | Squalene                                                                       | Antioxidant, 5-alpha- reductase-inhibitor, Tocopherol synergest, TNF-alpha inhibitor * Antihypertension ** |
| 24   | 1.43   | Oxirane, hexadecyl-                                                            | Antihypercholesterolemic, Antioxidant, antitumour ** |

** Dr.Duke's Phytochemical and Ethnobotanical Databases.
Table 3: Proximate composition of C. colebrookianum.

| Sample name       | Moisture (%) | Carbohydrate (%) | Total ash (%) | Crude protein (%) | Crude fibre (%) | Crude fat (%) |
|-------------------|--------------|------------------|---------------|-------------------|-----------------|---------------|
| C. colebrookianum | 77.90 ± 0.08 | 4.28 ± 1.08      | 11.15 ± 0.63  | 2.36 ± 0.04       | 4.21 ± 1.03     | 0.35 ± 0.03   |

Table 4: Mineral composition.

| Sample            | Fe  | Mn   | Cu  | Zn  | Mg  | Na  | K  |
|-------------------|-----|------|-----|-----|-----|-----|----|
| C. colebrookianum | 0.215 | 0.105 | 0.0425 | 0.056 | 2.55 | 3.07 | 16.7 |

TNF-alpha-inhibitor, HIF-alpha inhibitor, detoxicant (alcohol) antidote(aluminum); 1.70% peak area was .gamma.-Sitosterol, it is PPAR- Gamma- Antagonist* protection against obesity and related diseases such as type 2 diabetes; 1.44% peak area was 2,4,8,8- TETRAMETHYL-DECAHYDR CYCLOPROPADI[N]PHTHALENE, it is Antimicrobial 22; 2.37% peak area was Phytol, acetate, it is a Fragrance22; 1.43% peak area was Oxirane, hexadecyl, whih is an Antimicrobial 22.

The proximate composition of Clerodendrum colebrookianum is recorded moisture as 77.90%, 4.28% carbohydrate, 2.36% crude protein, 4.21% crude fibre and 0.35% crude fat. The minerals concentrations are 0.215mg of Fe/g, 0.105mg/g of Mn, 0.0425mg of Cu/g, 0.056mg Zn/g, 2.55mg of Magnesium/g, 4.3mg of Na/g and 24.5mg of K per gram of sample.

DISCUSSION

Minerals and Proximate compositions in a food is vital for the proper growth and development of a healthy body and secondary metabolites included in diet act as a nutraceuticals thus help in fighting various health problems. Minerals contents and Proximate composition of Clerodendrum colebrookianum was recorded to be adequate for a healthy growth and development of a body and the secondary metabolite constituents was recorded to contain at least eleven compounds that are reported to be useful for high blood pressure problem. In addition, as many as twenty useful phytoconstituents were recorded from the sample including antioxidant, anti uric acid formation, anti-tumour, help in zinc bioavailability and aromatic. The present study advocates the traditional knowledge on the use of Clerodendrum colebrookianum as a remedy for high blood pressure problem.

ACKNOWLEDGEMENT

The author highly grateful to the scientist in-charge CSIR-North East Institute of Science and Technology Branch, Itanagar, Naharlagun, Arunachal Pradesh, India and Principal, Jawaharlal Nehru College, Pasighat for providing laboratory facilities and Prof A.K.Das and Dr. R.Shankar for research guidance.
SUMMARY

- *Clerodendrum colebrookianum* Walp. is a medicinal food plant widely used for high blood pressure.
- Phytoconstituents and proximate were discussed in the present study.
- Moisture content was recorded as 77.90%, carbohydrate as 4.28%, crude protein as 2.36%, crude fibre as 4.21% and crude fat as 0.35% respectively. The minerals concentrations as 0.215mg of Fe/g, 0.105mg/g of Mn, 0.0425mg of Cu/g, 0.056mg Zn/g, 2.55mg of Magnesium/g, 4.3mg of Na/g and 24.5mg of K per gram of sample.
- A total of eleven compounds are recorded to be useful for high blood pressure problem and as many as other twenty useful phytoconstituents were recorded from the sample including antioxidant, anti-uric acid formation, anti-tumour, bioavailability of zinc etc.
- The present study advocates the traditional knowledge on the use of *Clerodendrum colebrookianum* as a remedy for high blood pressure problem.

ABOUT AUTHORS

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Cite this article: Payum T. Phytoconstituents and Proximate Composition of Clerodendrum Colebrookianum Walp.: A Widely Used Anti High Blood Pressure Medicinal Food Plant in Eastern Himalayas. Pharmacogn J. 2020;12(6)Suppl:1534-40.