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Medicinal flowering plants in Cao Bang province, Vietnam: The diversity and medical uses

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Abstract

There has not been a systematic publication of the list of medicinal plants for the whole Cao Bang province, leading to many difficulties in the use and development of medicinal plants here. The most important goal is to build a list of medicinal flowering plants with information about specific therapeutic uses; The next objective is to evaluate the diversity of taxa for all medicinal plants and their medicinal uses. The method for establishment of the list for medicinal flowering plants in Cao Bang province based on references, field investigations from 2016 to present and study on approximately 2000 specimens at herbaria; Application of Microsoft Access for data storage and analysis. The results recorded 940 medicinal species, 585 genera, 156 families in Cao Bang province. Of these, 577 species are used for 49 medicinal uses (asthma, brain hemorrhage, bronchitis, burned, cancer, cirrhosis, detoxify, diabetes, diuretic, dysentery, encephalitis, eyesore, flu, fracture, galactopoietic, gastritis, gonorrhoea, haemorrhoids, headache, heart and blood pressure diseases, hemostatic, hepatitis, hurt fall, inflammatory bowel, irregular menstruation, keratitis, kidney stone, malaria, measles, mumps, nephritis, obese, oedema, otitis, paralytic, pertussis, pimple, pneumonia, rheumatism, scrofulous, sinusitis, snake bite, sore throat, sterile, syphilis, toothache, tranquillizer, urolithiasis, vaginitis); The assessment of taxonomic ranks of medicinal flowering plants and the number of plant species, genera and families used for each medicinal use.

Keywords: Diversity; Plants; Diseases; Cao Bang; Vietnam

1. Introduction

Cao Bang province is an unique geographical location, special climatic conditions, should there be a very diverse and abundant flora. Due to the high diversity of plants and many ethnic groups living in Cao Bang using medicinal plants, a large number of medicinal plants can be predicted here. There has not been any systematic publication on the diversity of medicinal plants for the whole Cao Bang province, leading to difficulties in the use and development of medicinal plants here. The evaluation of the diversity of medicinal uses will help guide more specific research in medicine. This study will address that problem. To properly use plants, identification is an important first step. Vietnam has many scientists specializing in research on flowering plants, but few scientists research on other groups of plants. Therefore, the topic selects flowering plants for research to ensure the species identification has high accuracy.

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2. Material and methods

Establishment of the list of medicinal flowering plants in Cao Bang province based on references [1-12], field investigations from 2016 to present and study on approximately 2000 specimens at herbaria (HN, the herbarium of Institute of Ecology and Biological Resources, Vietnam; KRIB, the herbarium of Korea Research Institute of Bioscience and Biotechnology, South Korea; and the herbarium of Chung Nam National University, South Korea). The identification of species based on the morphological comparison method. Scientific names of the plants according to the Checklist of plants in Vietnam [8]. Names of 49 medicinal uses according to the National Institute of Medicinal Materials (2006, 2011) [5] and V. C. Vo (2012) [12]. The medicinal uses of plants are referenced from the documents [1-8, 10, 12].

Coding plant families: 1: MAGNOLIACEAE; 2: ANNONACEAE; 3: MYRISTICACEAE; 6: CHLORANTHACEAE; 8: LAURACEAE; 9: SAURURACEAE; 10: PIPERACEAE; 11: ARISTOLOCHIACEAE; 14: NYMPHAEACEAE; 17: ILLICACEAE; 18: SCHISANDRACEAE; 19: NELUMBONACEAE; 22: MENISPERMACEAE; 23: RANUNCULACEAE; 24: BERBERIDACEAE; 26: FUMARIACEAE; 27: HAMAMELIDACEAE; 28: ALTINGIACEAE; 31: ULMACEAE; 32: MORACEAE; 34: URTICACEAE; 36: FAGACEAE; 37: BETULACEAE; 38: MYRICACEAE; 40: JUGLANDACEAE; 41: PHYTOLACCACEAE; 47: PORTULACEAE; 49: CARYOPHYLLACEAE; 50: AMARANTHACEAE; 51: CHENOPODIACEAE; 52: POLYGONACEAE; 53: PLUMBAGINACEAE; 54: DILLENACEAE; 58: ANCISTROCLADACEAE; 59: THEACEAE; 62: CLUSIACEAE; 63: HYPERICACEAE; 64: ELATINACEAE; 65: FLACOURTIACEAE; 67: VIOLACEAE; 70: PASSIFLORACEAE; 73: CUCURBITACEAE; 74: DATISCEAE; 75: BEGONIACEAE; 76: CAPPARACEAE; 78: BRASSICACEAE; 80: SALICACEAE; 81: ACTINIDIACEAE; 83: ERICACEAE; 87: STYRACACEAE; 88: SYMPLOCACEAE; 89: EBENACEAE; 90: SAPOTACEAE; 91: MYRSINACEAE; 92: PRIMULACEAE; 93: ELAEOCARPACEAE; 94: TILIACEAE; 95: STERCULIACEAE; 96: BOMBACACEAE; 97: MALVACEAE; 100: EUPHORBIACEAE; 102: THYMELEACEAE; 105: ITEACEAE; 106: HYDRANGEACEAE; 107: PITTOSPORACEAE; 109: CRASSULACEAE; 111: ROSACEAE; 113: MIMOSACEAE; 114: CAESALPINIACEAE; 115: FABACEAE; 117: DROSERACEAE; 120: LYTHRACEAE; 121: SONNERATIACEAE; 123: RHIZOPHORACEAE; 125: COMBRETACEAE; 126: MYRTACEAE; 127: MELASTOMACEAE; 128: ONAGRACEAE; 130: LECYTHIDACEAE; 132: BURSERACEAE; 132: ANACARDIACEAE; 133: SIMAROUBACEAE; 134: RUTACEAE; 135: MELIACEAE; 138: SAPINDACEAE; 139: HIPPOCASTANACEAE; 141: SABIACEAE; 148: OXALIDACEAE; 149: GERANIACEAE; 151: BALSAMINACEAE; 157: ALANGIACEAE; 158: MASTIXIACEAE; 161: ARALIACEAE; 162: APIACEAE; 163: AQUIFOLIACEAE; 164: ICACINACEAE; 166: CELASTRACEAE; 168: RHAMNACEAE; 169: VITACEAE; 170: LEEACEAE; 171: OLEACEAE; 175: ERYTHROPALACEAE; 176: CARDIOPTERIDACEAE; 179: LORANTHACEAE; 180: VISCACEAE; 181: BALANOPHORACEAE; 182: ELAEAGNACEAE; 183: PROTEACEAE; 184: CAPRIFOLIACEAE; 185: VALERIANACEAE; 186: DIPSACACEAE; 187: LOGANIACEAE; 189: APOCYNACEAE; 190: ASCLEPIADACEAE; 192: MENYANTHACEAE; 193: RUBIACEAE; 195: CONVULVULACEAE; 196: CUSCUTACEAE; 198: BORAGINACEAE; 199: SOLANACEAE; 200: BUDDLEJACEAE; 201: SCROPHULARIACEAE; 202: BIGNONIACEAE; 205: GESNERIACEAE; 206: OROBANCHACEAE; 209: ACANTHACEAE; 210: PLANTAGINACEAE; 211: VERBENACEAE; 212: LAMIACEAE; 214: CAMPANULACEAE; 215: LOBELIACEAE; 219: ASTERACEAE; 221: ALISMACEAE; 229: CONVALLARIACEAE; 229: LILIACEAE; 230: HYPOXIDACEAE; 231: ASPARAGACEAE; 232: SMILACACEAE; 234: DIOSCOREACEAE; 235: TACCACEAE; 236: PONTEDERIACEAE; 238: IRIDACEAE; 239: BURMANIACEAE; 241: MUSACEAE; 244: COSTACEAE; 245: ZINGIBERACEAE; 247: MARANTACEAE; 248: ORCHIDACEAE; 250: CYPERACEAE; 252: ERIOCAULACEAE; 252: COMMELINACEAE; 259: POACEAE; 260: ARECACEAE; 261: ARACEAE; 262: LEMNACEAE; 263: PANDANACEAE;

Coding medicinal uses: 1: Tranquillizer; 2: Vaginitis; 3: Paralytic; 4: Obese; 5: Flu; 6: Eyesore; 7: Toothache; 8: Detoxify; 9: Syphilis; 10: Asthma; 12: Gonorrhoea; 13: Dysentery; 14: Galactopoietic; 15: Diuretic; 16: Mumps; 17: Snake bite; 18: Urolithiasis; 19: Malaria; 20: Rheumatism; 21: Diabetes; 22: Heart and blood pressure diseases; 23: Haemorrhoids; 24: Cancer; 25: Gastritis; 26: Hepatitis; 27: Keratitis; 28: Sore throat; 29: Encephalitis; 30: Nephritis; 31: Sinusitis; 32: Sterile; 33: Cirrhosis; 34: Brain hemorrhage; 35: Pimple; 36: Hemostatic; 37: Fracture; 38: Burned; 39: Pneumonia; 40: Bronchitis; 41: Hurt fall; 42: Irregular menstruation; 43: Kidney stone; 44: Measles; 45: Headache; 46: Inflammatory bowel; 47: Oedema; 48: Otitis; 49: Pertussis; 50: Scrofulous (Note: 11: one disease was not mentioned, so there are 49 medicinal uses).

Use Microsoft Access to manage data, assess plant diversity and medicinal uses.

3. Results

3.1. Medicinal plant data

3.1.1. Data of each species is coded in the following order:

order of species: family code, scientific name, medicinal use code.

3.1.2. Medicinal plant data

1: 184 *Abelia chinensis* 5 / 2: 97 *Abelmoschus moschatus* 13 15 17 18 25 35 38 45 / 3: 95 *Abroma augusta* 3 12 35 41 42 / 4: 97 *Abutilon indicum* 5 15 20 26 39 45 46 / 5: 100 *Acalypha australis* / 6: 248 *Acampe rigida* 17 37 41 / 7: 161 *Acanthopanax lasiogyne* 20 / 8: 161 *Acanthopanax trifoliatum* 2 5 18 20 32 35 41 43 46 / 9: 219 *Achillea millefolium* 10 43 / 10: 50 *Achyranthes aspera* 5 13 16 19 20 29 30 41 42 47 / 11: 134 *Acronychia pedunculata* 13 15 20 35 41 / 12: 81 *Actinidia coriacea* / 13: 81 *Actinidia latifolia* 18 35 / 14: 8 *Actinodaphne obovata* / 15: 8 *Actinodaphne pilosa* / 16: 73 *Actinostemma tenerum* 8 / 17: 201 *Adenosma caeruleum* 3 17 20 26 / 18: 219 *Adenostemma lavenia* 5 13 17 19 26 38 45 / 19: 206 *Aeginetia indica* 17 21 28 / 20: 50 *Aerva sanguinolenta* / 21: 139 *Aesculus assamica* 13 45 / 22: 212 *Agastache rugosa* 5 17 20 35 39 40 / 23: 219 *Ageratum conyzoides* 31 43 / 24: 135 *Aglaia elaeagnoidea* / 25: 261 *Aglaonema siamense* 23 28 35 / 26: 133 *Ailanthus triphysa* 2 13 / 27: 212 *Ajuga macrosperma* 17 22 35 38 39 40 / 28: 157 *Alangium barbatum* 20 / 29: 157 *Alangium chinense* 8 17 20 22 41 45 / 30: 157 *Alangium kurzii* 20 41 / 31: 113 *Albizia chinensis* 17 46 / 32: 100 *Alchornea tiliifolia* / 33: 100 *Aleurites moluccana* 8 13 / 34: 221 *Alisma plantago-aquatica* 30 43 / 35: 138 *Allophylus caudatus* 20 26 30 / 36: 132 *Allospodias lakonensis* / 37: 87 *Alniphyllum fortunei* 20 / 38: 37 *Alnus nepalensis* 13 20 26 39 41 / 39: 261 *Alocasia cucullata* 5 17 38 40 / 40: 245 *Alpinia blepharocalyx* 8 / 41: 245 *Alpinia chinensis* 5 20 42 / 42: 245 *Alpinia globosa* 8 13 / 43: 245 *Alpinia malaccensis* / 44: 245 *Alpinia officinarum* 19 20 25 / 45: 245 *Alpinia pinnanensis* / 46: 189 *Alstonia scholaris* 5 10 13 19 20 40 / 47: 50 *Alternanthera sessilis* 13 17 50 / 48: 28 *Altingia siamensis* / 49: 115 *Alysicarpus vaginalis* 13 / 50: 50 *Amaranthus caudatus* 23 45 50 / 51: 50 *Amaranthus lividus* 13 17 / 52: 50 *Amaranthus spinosus* 13 17 22 35 38 47 / 53: 252 *Amischotolype hispida* / 54: 245 *Amomum aromaticum* 7 8 19 / 55: 245 *Amomum longiligulare* 20 / 56: 245 *Amomum villosum* 13 / 57: 169 *Ampelopsis cantoniensis* 5 20 25 26 28 38 / 58: 169 *Ampelopsis heterophylla* 20 35 / 59: 219 *Anaphalis margaritacea* 7 8 13 50 / 60: 58 *Ancistrocladus tectorius* / 61: 92 *Androsace umbellata* 6 7 28 41 45 49 / 62: 162 *Angelica decursiva* 5 10 20 40 45 / 63: 212 *Anisochilus pallidus* 17 20 43 / 64: 212 *Anisomeles indica* / 65: 248 *Anoectochilus setaceus* 20 25 41 / 66: 125 *Anogeissus acuminata* / 67: 32 *Antiaris toxicaria* 13 / 68: 100 *Antidesma bunius* 20 / 69: 100 *Antidesma microphyllum* 44 / 70: 100 *Antidesma montanum* 19 44 45 / 71: 135 *Aphanamixis grandiflora* 17 20 / 72: 135 *Aphanamixis polystachya* 20 / 73: 259 *Apluda mutica* 17 / 74: 100 *Aporosa dioica* / 75: 161 *Aralia armata* 17 19 20 26 28 30 35 47 / 76: 161 *Aralia chinensis* 2 17 20 21 26 28 30 41 47 / 77: 113 *Archidendron clypearia* 38 / 78: 113 *Archidendron lucidum* 20 38 / 79: 91 *Ardisia caudata* 7 28 / 80: 91 *Ardisia conspersa* 41 / 81: 91 *Ardisia corymbifera* 20 28 41 / 82: 91 *Ardisia gigantifolia* 20 35 41 / 83: 91 *Ardisia mamillata* 13 20 26 / 84: 91 *Ardisia silvestris* 13 28 / 85: 91 *Ardisia villosa* 13 20 41 / 86: 91 *Ardisia virens* 37 41 46 / 87: 260 *Areca laosensis* / 88: 260 *Arenga pinnata* 5 15 40 / 89: 261 *Arisaema balansae* / 90: 11 *Aristolochia indica* 19 28 / 91: 11 *Aristolochia kwangsiensis* 13 25 28 / 92: 2 *Artabotrys hongkongensis* 20 / 93: 219 *Artemisia annua* 5 19 / 94: 219 *Artemisia indica* 20 / 95: 219 *Artemisia japonica* 5 7 17 19 20 38 45 / 96: 219 *Artemisia lactiflora* 17 26 38 / 97: 219 *Artemisia vulgaris* 13 19 20 45 / 98: 32 *Artocarpus heterophyllus* 9 14 17 19 22 35 / 99: 32 *Artocarpus lakoocha* 35 / 100: 248 *Arundina graminifolia* 17 20 26 47 / 101: 11 *Asarum balansae* 20 40 / 102: 11 *Asarum caudigerum* 7 10 40 44 45 / 103: 11 *Asarum glabrum* / 104: 231 *Asparagus cochinchinensis* 15 21 24 28 / 105: 229 *Aspidistra tonkinensis* 36 / 106: 229 *Aspidistra typica* 8 13 19 20 / 107: 219 *Aster ageratoides* 5 17 19 40 49 / 108: 115 *Astragalus sinicus* 6 23 28 / 109: 100 *Baccaurea ramiflora* / 110: 126 *Baeckea frutescens* 5 35 44 / 111: 181 *Balanophora fungosa* / 112: 181 *Balanophora latisepala* / 113: 259 *Bambusa tuldoidea* / 114: 259 *Bambusa vulgaris* 36 / 115: 130 *Barringtonia acutangula* 17 19 36 / 116: 114 *Bauhinia bracteata* / 117: 114 *Bauhinia championii* 20 41 / 118: 114 *Bauhinia pyrrhoclada* / 119: 114 *Bauhinia variegata* 13 17 25 39 46 / 120: 205 *Beccarinda tonkinensis* / 121: 75 *Begonia aptera* 13 35 38 41 49 / 122: 75 *Begonia pedatifida* 17 20 41 / 123: 168 *Berchemia floribunda* 19 20 33 42 / 124: 168 *Berchemia lineata* 17 19 20 26 40 41 / 125: 64 *Bergia ammannioides* 17 / 126: 37 *Betula alnoides* 5 13 17 19 20 / 127: 219 *Bidens biternata* 17 29 46 / 128: 219 *Bidens pilosa* 5 7 13 19 20 23 25 26 28 / 129: 219 *Bidens tripartita* 5 13 17 20 28 / 130: 148 *Biophytum sensitivum* 12 15 21 35 38 43 46 / 131: 100 *Bischofia javanica* 20 24 28 39 / 132: 189 *Blaberopus mairei* / 133: 219 *Blainvillea acmella* 5 / 134: 127 *Blastus cochinchinensis* / 135: 248 *Bletilla striata* 35 36 / 136: 219 *Blumea balsamifera* 5 20 31 45 / 137: 219 *Blumea densiflora* 5 19 46 / 138: 219 *Blumea lacera* 8 35 / 139: 219 *Blumea lanceolaria* 5 15 20 28 40 45 / 140: 219 *Blumea martiniana* 5 45 / 141: 219 *Blumea megacephala* 5 33 / 142: 219 *Blumea mollis* 10 45 / 143: 34 *Boehmeria macrophylla* 20 / 144: 34 *Boehmeria nivea* 5 15 17 23 30 41 44 47 / 145: 34 *Boehmeria tonkinensis* / 146: 96 *Bombax ceiba* 13 15 20 / 147: 161 *Brassaiopsis glomerulata* 20 41 49 / 148: 100 *Breynia fruticosa* 2 18 20 25 / 149: 100 *Breynia vitis-idaea* 7 10 28 / 150: 100 *Bridelia retusa* 20 / 151: 32 *Broussonetia papyrifera* 13 15 45 / 152: 200 *Buddleja asiatica* 6 10 13 20 35 37 44 / 153: 200 *Buddleja officinalis* 6 20 26 / 154: 250 *Bulbostylis densa* 5 / 155: 239 *Burmannia disticha* 40 / 156: 95 *Byttneria pilosa* 20 41 42 / 157: 114 *Caesalpinia bonduc* 13 / 158: 114 *Caesalpinia latisiliqua* / 159: 114 *Caesalpinia minax* 5 7 13 20 / 160: 114 *Caesalpinia sappan* 13 20 22 36 / 161: 115 *Cajanus scarabaeoides* 5 20 / 162: 260 *Calamus tetradactylus* / 163: 248 *Calanthe triplicata* 17 19 36 / 164: 211 *Callicarpa arborea* 20 41 / 165: 211 *Callicarpa candicans* 5 35 49 / 166: 211 *Callicarpa longifolia* 9 / 167: 211 *Callicarpa macrophylla* 20 41 / 168: 211 *Callicarpa rubella* 2 8 20 36 / 169: 219 *Callistephus chinensis* / 170: 59 *Camellia caudata* / 171: 132 *Canarium album* 7 8 13 17 28 / 172: 132 *Canarium bengalense* 20 / 173: 132 *Canarium parvum* 20 38 / 174: 132 *Canarium tramdenum* 8 17 20 38 39 / 175: 115 *Canavalia cathartica* / 176: 115 *Canavalia ensiformis* 17 / 177: 78 *Capsella bursa-pastoris* 18 22 23 35 43 44 46 / 178: 123 *Carallia lanceaefolia* / 179: 78 *Cardamine hirsuta* 8 13 17 / 180: 138 *Cardiospermum halicacabum* 5 20 21 30 41 47 49 / 181: 250 *Carex baccans* / 182: 250 *Carex cruciata* 13 44 / 183: 250 *Carex filicina* / 184: 250 *Carex phacota* 44 / 185: 250 *Carex scaposa* / 186: 219 *Carpesium*

abrotanoides 28 40 / 187: 219 *Carpesium cernuum* / 188: 260 *Caryota mitis* 13 / 189: 260 *Caryota monostachya* / 190: 260 *Caryota urens* 2 13 36 / 191: 36 *Castanea mollissima* 13 50 / 192: 0 *Catunaregam spinosa* 13 20 41 / 193: 169 *Cayratia japonica* 2 8 13 15 17 20 26 28 50 / 194: 169 *Cayratia trifolia* 2 35 / 195: 166 *Celastrus monospermus* / 196: 50 *Celosia argentea* 2 13 17 22 23 27 36 / 197: 162 *Centella asiatica* 2 8 13 14 15 17 28 35 36 38 44 45 / 198: 114 *Chamaecrista mimosoides* 13 17 30 47 / 199: 51 *Chenopodium ambrosioides* 10 / 200: 6 *Chloranthus japonicus* 2 5 35 41 / 201: 6 *Chloranthus spicatus* 5 20 41 45 / 202: 132 *Choerospondias axillaris* 35 38 / 203: 219 *Chrysanthemum indicum* 13 17 22 26 29 35 45 / 204: 219 *Chrysanthemum maximum* 17 / 205: 259 *Chrysopogon aciculatus* / 206: 135 *Chukrasia tabularis* / 207: 8 *Cinnamomum bejolghota* 20 / 208: 8 *Cinnamomum bonii* / 209: 8 *Cinnamomum burmannii* 5 19 20 35 / 210: 8 *Cinnamomum parthenoxylon* 5 13 20 44 49 / 211: 135 *Cipadessa baccifera* 5 13 19 20 / 212: 219 *Cirsium japonicum* 22 26 30 / 213: 219 *Cirsium lineare* 2 17 35 41 42 / 214: 22 *Cissampelos pareira* 13 15 30 41 43 / 215: 169 *Cissus repens* 13 28 30 / 216: 169 *Cissus triloba* 17 35 45 / 217: 134 *Citrus limonia* 10 45 / 218: 134 *Citrus reticulata* 8 15 19 / 219: 100 *Claoxylon indicum* 16 17 20 / 220: 100 *Claoxylon longifolium* / 221: 134 *Clausena excavata* 35 / 222: 134 *Clausena indica* 5 20 37 45 / 223: 134 *Clausena lansium* 5 19 29 / 224: 100 *Cleidion brevipetiolatum* 26 / 225: 248 *Cleisostoma rostratum* / 226: 100 *Cleistanthus tonkinensis* / 227: 126 *Cleistocalyx operculatus* 5 13 20 26 35 45 / 228: 23 *Clematis smilacifolia* 7 47 / 229: 211 *Clerodendrum chinense* 2 17 20 22 35 36 42 / 230: 211 *Clerodendrum colebrookianum* 13 28 44 / 231: 211 *Clerodendrum cyrtophyllum* 3 13 28 29 33 39 44 46 / 232: 211 *Clerodendrum japonicum* 2 13 20 22 23 35 38 42 / 233: 211 *Clerodendrum serratum* 5 6 13 17 19 20 26 28 37 45 / 234: 209 *Clinacanthus nutans* 20 38 / 235: 212 *Clinopodium chinense* 5 12 13 26 / 236: 212 *Clinopodium gracile* 5 13 20 35 41 44 45 46 / 237: 100 *Cnesmosa javanica* / 238: 162 *Cnidium monnieri* 2 32 / 239: 73 *Coccinia grandis* 12 17 20 21 27 / 240: 22 *Cocculus laurifolius* 20 / 241: 115 *Codariocalyx gyroides* / 242: 214 *Codonopsis javanica* 15 / 243: 248 *Coelogyne fimbriata* / 244: 259 *Coix lacryma-jobi* 14 20 43 / 245: 261 *Colocasia esculenta* 13 17 24 35 38 / 246: 252 *Commelina benghalensis* 39 40 / 247: 252 *Commelina communis* 5 8 13 28 / 248: 252 *Commelina diffusa* 8 13 15 38 / 249: 219 *Conyza aegyptiaca* / 250: 219 *Conyza bonariensis* 5 19 20 / 251: 219 *Conyza canadensis* 7 13 15 18 20 26 40 / 252: 219 *Conyza japonica* 28 39 45 / 253: 219 *Conyza leucantha* 5 28 39 45 / 254: 219 *Conyza sumatrensis* 20 / 255: 23 *Coptis teeta* 6 13 / 256: 229 *Cordyline fruticosa* 13 20 36 46 49 / 257: 26 *Corydalis balansae* / 258: 244 *Costus speciosus* 17 30 33 35 48 49 / 259: 76 *Crateva magna* 17 / 260: 63 *Cratoxylum cochinchinense* 12 13 42 46 / 261: 202 *Crescentia cujete* 45 / 262: 229 *Crinum asiaticum* 28 35 / 263: 229 *Crinum latifolium* 20 24 / 264: 219 *Crossostephium artemisioides* 44 / 265: 115 *Crotalaria albida* 10 13 17 19 25 26 35 39 / 266: 115 *Crotalaria annamensis* 22 24 35 / 267: 115 *Crotalaria calycina* 30 / 268: 115 *Crotalaria ferruginea* 5 30 35 / 269: 115 *Crotalaria incana* 13 17 / 270: 115 *Crotalaria montana* 13 26 / 271: 115 *Crotalaria sessilifolia* 24 35 / 272: 100 *Croton kongensis* / 273: 100 *Croton tiglium* 19 20 / 274: 100 *Croton tonkinensis* / 275: 190 *Cryptolepis buchananii* / 276: 162 *Cryptotaenia japonica* 17 / 277: 230 *Curculigo capitulata* 15 20 30 43 / 278: 230 *Curculigo gracilis* / 279: 230 *Curculigo orchioides* 10 20 30 / 280: 245 *Curcuma longa* 17 20 38 46 / 281: 245 *Curcuma zedoaria* 17 24 / 282: 196 *Cuscuta japonica* / 283: 219 *Cyathocline purpurea* 6 15 / 284: 50 *Cyathula prostrata* 13 20 / 285: 248 *Cymbidium aloifolium* / 286: 248 *Cymbidium ensifolium* 15 / 287: 248 *Cymbidium lancifolium* 41 / 288: 248 *Cymbidium sinense* 28 / 289: 259 *Cymbopogon citratus* 5 20 45 48 / 290: 259 *Cynodon dactylon* 13 17 19 20 26 42 43 / 291: 198 *Cynoglossum zeylanicum* 17 26 35 42 / 292: 250 *Cyperus compressus* / 293: 250 *Cyperus cuspidatus* / 294: 250 *Cyperus difformis* / 295: 250 *Cyperus diffusus* / 296: 250 *Cyperus esculentus* / 297: 250 *Cyperus rotundus* 5 13 / 298: 259 *Dactyloctenium aegyptium* / 299: 115 *Dalbergia assamica* 17 20 41 / 300: 115 *Dalbergia rimosa* 45 / 301: 50 *Deeringia amaranthoides* 20 / 302: 138 *Delavaya toxocarpa* / 303: 248 *Dendrobium acinaciforme* 32 / 304: 248 *Dendrobium chrysanthum* / 305: 248 *Dendrobium lindleyi* 17 / 306: 248 *Dendrobium loddigesii* / 307: 248 *Dendrobium longicornu* 17 / 308: 248 *Dendrobium nobile* 17 38 / 309: 115 *Dendrobium triangulare* 13 17 20 / 310: 161 *Dendropanax chevalieri* 20 42 / 311: 115 *Derris 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3.2. Diversity of medicinal flowering plants

940 species, 585 genera, 156 families are recorded in Cao Bang province. 10 families with rich number of species: ASTERACEAE (82 species), FABACEAE (54 species), EUPHORBIACEAE (43 species), ORCHIDACEAE (38 species), LAMIACEAE (31 species), POACEAE (26 species), Cyperaceae (23 species), MORACEAE (21 species), RUBIACEAE (20 species), VERBENACEAE (20 species). Genera with rich number of species: *Ficus* (14 species), *Desmodium* (9 species), *Ardisia* (8 species), *Blumea* (7 species), *Crotalaria* (7 species), *Litsea* (7 species), *Smilax* (7 species), *Alpinia* (6 species), *Conyza* (6 species), *Cyperus* (6 species), *Dendrobium* (6 species), *Hedyotis* (6 species), *Liparis* (6 species), *Rubus* (6 species), *Schefflera* (6 species).

3.3. Diversity of medical uses of medicinal flowering plants in Cao Bang province

577 species are used for 49 medicinal uses; 363 remain medicinal plant species are used for other medicinal uses.

Treatment of asthma: 63 species, 18 genera, 17 families. Treatment of brain hemorrhage: 2 species, 2 genera, 2 families. Treatment of bronchitis: 34 species, 33 genera, 26 families. Treatment of burned: 74 species, 67 genera, 45 families. Treatment of cancer: 19 species, 18 genus, 15 family. Treatment of cirrhosis: 18 species, 17 genera, 12 families. Detoxify: 49 species, 40 genera, 26 families. Treatment of diabetes: 28 species, 14 genera, 13 families. Diuretic: 58 species, 47 genera, 34 families. Treatment of dysentery: 237 species, 187 genera, 91 families. Treatment of encephalitis: 8 species, 8 genera, 7 families. Treatment of eyesore: 16 species, 15 genera, 13 families. Treatment of flu: 152 species, 123 genera, 57 families. Treatment of fracture: 13 species, 13 genera, 9 families. Galactopoietic: 10 species, 10 genera, 8 families. Treatment of gastritis: 32 species, 31 genera, 22 families. Treatment of gonorrhoea: 16 species, 16 genera, 15 families. Treatment of haemorrhoids: 28 species, 22 genera, 18 families. Treatment of headache: 84 species, 75 genera, 46 families. Treatment of heart and blood pressure diseases: 34 species, 28 genera, 20 families. Treatment of hemostatic: 30 species, 30 genera, 23 families. Treatment of hepatitis: 103 species, 90 genera, 48 families. Treatment of hurt fall: 115 species, 96 genera, 50 families. Treatment of inflammatory bowel: 62 species, 57 genera, 38 families. Treatment of irregular menstruation: 32 species, 31 genera, 22 families. Treatment of keratitis: 4 species, 4 genera, 4 families. Treatment of kidney stone: 24 species, 24 genera, 17 families. Treatment of malaria: 92 species, 78 genera, 40 families. Treatment of measles: 42 species, 36 genera, 26 families. Treatment of mumps: 5 species, 5 genera, 5 families. Treatment of nephritis: 54 species, 49 genera, 30 families. Treatment of obese: 2 species, 2 genera, 2 families. Treatment of oedema: 37 species, 36 genera, 26 families. Treatment of otitis: 12 species, 12 genera, 9 families. Treatment of paralytic: 9 species, 9 genera, 8 families. Treatment of pertussis: 19 species, 19 genera, 16 families. Treatment of pimple: 136 species, 125 genera, 57 families. Treatment of pneumonia: 23 species, 22 genera, 17 families. Treatment of rheumatism: 318 species, 244 genera, 96 families. Treatment of scrofulous: 14 species, 14 genera, 11 families. Treatment of sinusitis: 7 species, 7 genera, 5 families. Treatment of snake bite: 183 species, 155 genera, 71 families. Treatment of sore throat: 95 species, 82 genera, 44 families. Treatment of sterile: 7 species, 7 genera, 5 families. Treatment of syphilis: 11 species, 10 genus, 9 family. Treatment of toothache: 58 species, 36 genera, 35 families. Tranquillizer: 4 species, 4 genera, 4 families. Treatment of urolithiasis: 13 species, 13 genera, 11 families. Treatment of vaginitis: 43 species, 40 genera, 28 families. 363 remain medicinal plant species are used for other medicinal uses.

4. Discussion

Specific data on diseases treated with medicinal plants will help to clearly guide the research of medicinal plants.

5. Conclusion

940 species belonging to 585 genera, 156 families were recorded in Cao Bang province. Of these, 577 species are used for 49 medicinal uses.

Compliance with ethical standards

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Disclosure of conflict of interest

All the authors declare no conflict of interest.

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