



RESEARCH ARTICLE
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Medicinal plants as food for animals and humans in Cao Bang province, Vietnam: Establishing a list and proposing some solutions to contribute to the development of such medicinal plant species

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ABSTRACT

The topic of choosing a research site in Cao Bang province of Vietnam, the purpose is to build a data of medicinal plants that are eaten by animals and humans (vegetable plants, edible plants (seeds/fruits), plants for food animals). Data is built based on references, fieldworks, information of specimens located at herbaria (HN, VNM). Identification of plant specimens based on morphological comparison method. Collection of use value information of plant species based on references related to medicinal plants and useful plants. Application of Microsoft Access to analyze data. A list of 216 medicinal plant species that are eaten by animals and humans in Cao Bang province has been compiled. A model built for research and development of those species based on comprehensive cooperations and supports from agencies of agriculture, construction, essential oil, fashion, forestry, medicinal plants, ornamental plants. The agencies can support the research and development of 216 species. Each species can be supported by several agencies: 2 species can be supported by 5 agencies. 9 species can be supported by 4 agencies. 14 species can be supported by 3 agencies. 191 remain species can be supported by 2 agencies.

Keywords: *Plants, medicine, edible, Cao Bang, Viet Nam.*

INTRODUCTION

Medicinal plants and edible plants are very important and indispensable plants for human life. The development of each of these plants, although there have been many results and contributions to mankind, of each country and each region of each country, but have not yet brought about maximum efficiency in many aspects because there has not been an effective combination of the two fields of medicine and edible plants. Having a data link between medicinal plants and edible plants will help the development of functional food and medicine products to be effective.

The topic of choosing a research site in Cao Bang province of Vietnam, the purpose is to build a common data of medicinal plants and useful plants related to vegetable plants, edible plants (seeds/fruits) and plants for food animals and propose some solutions to contribute to the development of those plant species.

MATERIALS AND METHODS

Data is built based on references [1-11], fieldwork in Cao Bang province for many years, with a focus on research in the years 2017 to 2022, information of specimens located at herbaria (HN: herbarium of Institute of Ecology and Biological Resources (IEBR), Vietnam Academy of Science and Technology (VAST); VNM: herbarium of Institute of Tropical Biology (ITB), VAST). Identification of plant specimens based on morphological comparison method. Collection of use value information of plant species based on references related to medicinal plants and useful plants. Application of Microsoft Access to analyze data.

Analyze data and propose some scientific solutions to contribute to the development of those plant species.

RESULTS

Establishing a list of medicinal plant species that are eaten by animals and humans in Cao Bang province, Vietnam (Table 1).

TABLE 1. A list of medicinal plant species that are eaten by animals and humans in Cao Bang province, Vietnam

	Scientific Name	Use	Agency
1	<i>Achyranthes aspera</i>	Me Ve	Agr Med
2	<i>Adenostemma lavenia</i>	Me Ve	Agr Med
3	<i>Aerva sanguinolenta</i>	Me Ve	Agr Med
4	<i>Agastache rugosa</i>	Me Ve	Agr Med
5	<i>Ageratum conyzoides</i>	Me Fo	Agr Med
6	<i>Alangium barbatum</i>	Me Ve	Agr Med
7	<i>Allospondias lakonensis</i>	Me Ed	Agr Med
8	<i>Alpinia malaccensis</i>	Me Ed Or	Agr Med, Orn
9	<i>Alternanthera sessilis</i>	Me Ve	Agr Med
10	<i>Alysicarpus vaginalis</i>	Me Fo	Agr Med
11	<i>Amaranthus caudatus</i>	Me Fo	Agr Med
12	<i>Amaranthus lividus</i>	Me Ve	Agr Med
13	<i>Amaranthus spinosus</i>	Me Ve Fo	Agr Med
14	<i>Amomum aromaticum</i>	Me Ed	Agr Med
15	<i>Amomum longiligulare</i>	Me Ed	Agr Med
16	<i>Amomum villosum</i>	Me Ed	Agr Med
17	<i>Anaphalis margaritacea</i>	Me Ve	Agr Med
18	<i>Angiopteris confertinervia</i>	Me Ed	Agr Med

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19	<i>Antiaris toxicaria</i>	Me Ed	Agr Med
20	<i>Antidesma bunius</i>	Me Ed	Agr Med
21	<i>Apluda mutica</i>	Me Fo	Agr Med
22	<i>Aporosa dioica</i>	Me Ed Ti	Agr Med, For, Con
23	<i>Aralia armata</i>	Me Ve	Agr Med
24	<i>Artemisia annua</i>	Me Ve	Agr Med
25	<i>Artemisia japonica</i>	Me Ve	Agr Med
26	<i>Artemisia lactiflora</i>	Me Ve	Agr Med
27	<i>Artemisia vulgaris</i>	Me Ve Es	Agr Med, Ess
28	<i>Artocarpus heterophyllus</i>	Me Ed Ve Ti	Agr Med, For, Con
29	<i>Artocarpus lakoocha</i>	Me Ed	Agr Med
30	<i>Astragalus sinicus</i>	Me Ve	Agr Med
31	<i>Baccaurea ramiflora</i>	Me Ed Ve Ti	Agr Med, For, Con
32	<i>Bambusa vulgaris</i>	Me Fo Or	Agr Med, Orn
33	<i>Barringtonia acutangula</i>	Me Ve	Agr Med
34	<i>Begonia aptera</i>	Me Ve	Agr Med
35	<i>Bidens pilosa</i>	Me Ve	Agr Med
36	<i>Bischofia javanica</i>	Me Ed Ve Ti	Agr Med, For, Con
37	<i>Blainvillea acmella</i>	Me Ve	Agr Med
38	<i>Blumea lacera</i>	Me Ve	Agr Med
39	<i>Blumea lanceolaria</i>	Me Ve	Agr Med
40	<i>Boehmeria nivea</i>	Me Ve Fo Fi	Agr Med, Fas
41	<i>Boehmeria tonkinensis</i>	Me Ve	Agr Med
42	<i>Broussonetia papyrifera</i>	Me Ve Fo	Agr Med
43	<i>Callicarpa rubella</i>	Me Ed	Agr Med
44	<i>Canarium bengalense</i>	Me Ed Ti	Agr Med, For, Con
45	<i>Canarium parvum</i>	Me Ed	Agr Med
46	<i>Canavalia ensiformis</i>	Me Ve Fo	Agr Med
47	<i>Capsella bursa-pastoris</i>	Me Ve	Agr Med
48	<i>Cardamine hirsuta</i>	Me Ve	Agr Med
49	<i>Centella asiatica</i>	Me Ve	Agr Med
50	<i>Chamaecrista mimosoides</i>	Me Fo	Agr Med
51	<i>Chenopodium ambrosioides</i>	Me Ve Es	Agr Med, Ess
52	<i>Choerospondias axillaris</i>	Me Ed	Agr Med
53	<i>Cissus repens</i>	Me Ed	Agr Med
54	<i>Cissus triloba</i>	Me Ve	Agr Med
55	<i>Citrus limonia</i>	Me Ed	Agr Med
56	<i>Citrus reticulata</i>	Me Ed	Agr Med
57	<i>Claoxylon indicum</i>	Me Ve	Agr Med
58	<i>Claoxylon longifolium</i>	Me Ve	Agr Med
59	<i>Clausena indica</i>	Me Ed	Agr Med
60	<i>Clausena lansium</i>	Me Ed	Agr Med
61	<i>Cleistocalyx operculatus</i>	Me Ed Ti Dy	Agr Med, For, Con, Fas
62	<i>Clerodendrum cyrtophyllum</i>	Me Ve	Agr Med
63	<i>Clerodendrum serratum</i>	Me Ve	Agr Med
64	<i>Clinopodium chinense</i>	Me Ve	Agr Med
65	<i>Clinopodium gracile</i>	Me Ve	Agr Med
66	<i>Coccinia grandis</i>	Me Ve	Agr Med
67	<i>Codariocalyx gyroides</i>	Me Fo	Agr Med
68	<i>Codonopsis javanica</i>	Me Ed	Agr Med
69	<i>Coix lacryma-jobi</i>	Me Fo	Agr Med
70	<i>Colocasia esculenta</i>	Me Ve Fo	Agr Med
71	<i>Commelina communis</i>	Me Ve	Agr Med

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72	<i>Crateva magna</i>	Me Ve	Agr Med
73	<i>Crescentia cujete</i>	Me Ed Or	Agr Med, Orn
74	<i>Crotalaria incana</i>	Me Fo	Agr Med
75	<i>Cryptotaenia japonica</i>	Me Ve	Agr Med
76	<i>Cynodon dactylon</i>	Me Fo	Agr Med
77	<i>Cyperus compressus</i>	Me Fo	Agr Med
78	<i>Cyperus difformis</i>	Me Fo	Agr Med
79	<i>Cyperus diffusus</i>	Me Fo	Agr Med
80	<i>Cyperus rotundus</i>	Me Fo Es	Agr Med, Ess
81	<i>Deeringia amaranthoides</i>	Me Ve	Agr Med
82	<i>Desmodium gangeticum</i>	Me Fo	Agr Med
83	<i>Desmodium heterocarpon</i>	Me Fo	Agr Med
84	<i>Desmodium podocarpum</i>	Me Fo	Agr Med
85	<i>Dichroa febrifuga</i>	Me Fo	Agr Med
86	<i>Dichrocephala benthamii</i>	Me Ve	Agr Med
87	<i>Dichrocephala integrifolia</i>	Me Ve	Agr Med
88	<i>Diospyros kaki</i>	Me Ed Ti Dy	Agr Med, For, Con, Fas
89	<i>Diospyros malabarica</i>	Me Ed Ti	Agr Med, For, Con
90	<i>Dracontomelon duperreanum</i>	Me Ed Ve	Agr Med
91	<i>Echinochloa crus-galli</i>	Me Fo	Agr Med
92	<i>Echinochloa frumentacea</i>	Me Fo	Agr Med
93	<i>Eichhornia crassipes</i>	Me Ve Fo	Agr Med
94	<i>Elaeagnus conferta</i>	Me Ed	Agr Med
95	<i>Elatostema balansae</i>	Me Ve	Agr Med
96	<i>Eleocharis dulcis</i>	Me Fo	Agr Med
97	<i>Elsholtzia blanda</i>	Me Ed	Agr Med
98	<i>Emilia sonchifolia</i>	Me Ve	Agr Med
99	<i>Erythralium scandens</i>	Me Ve	Agr Med
100	<i>Eupatorium fortunei</i>	Me Ve	Agr Med
101	<i>Fibraurea recisa</i>	Me Ve	Agr Med
102	<i>Fibraurea tinctoria</i>	Me Ve	Agr Med
103	<i>Ficus auriculata</i>	Me Ed Ve	Agr Med
104	<i>Ficus fulva</i>	Me Ed Fo	Agr Med
105	<i>Ficus racemosa</i>	Me Ve	Agr Med
106	<i>Fimbristylis dichotoma</i>	Me Fo	Agr Med
107	<i>Fimbristylis miliacea</i>	Me Fo	Agr Med
108	<i>Flacourtia jangomas</i>	Me Ed	Agr Med
109	<i>Flueggea virosa</i>	Me Ed	Agr Med
110	<i>Galinsoga parviflora</i>	Me Ve	Agr Med
111	<i>Garcinia multiflora</i>	Me Ed	Agr Med
112	<i>Garcinia oblongifolia</i>	Me Ed Ti	Agr Med, For, Con
113	<i>Garuga pinnata</i>	Me Ed	Agr Med
114	<i>Glycine max</i>	Me Ed Ve Fo	Agr Med
115	<i>Glycine soja</i>	Me Fo	Agr Med
116	<i>Glycosmis parviflora</i>	Me Ed	Agr Med
117	<i>Gnaphalium hypoleucum</i>	Me Ve	Agr Med
118	<i>Gnaphalium luteo-album</i>	Me Ve	Agr Med
119	<i>Grangea maderaspatana</i>	Me Ve	Agr Med
120	<i>Gymnopetalum cochinchinense</i>	Me Ve	Agr Med
121	<i>Gymnopetalum integrifolium</i>	Me Ve	Agr Med
122	<i>Helicia nilagirica</i>	Me Fo	Agr Med
123	<i>Heliciopsis lobata</i>	Me Ed	Agr Med

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124	<i>Houttuynia cordata</i>	Me Ve	Agr Med
125	<i>Hydrocotyle nepalensis</i>	Me Ve	Agr Med
126	<i>Illicium difengpii</i>	Me Ed	Agr Med
127	<i>Illicium majus</i>	Me Ed Ti	Agr Med, For, Con
128	<i>Jasminum coarctatum</i>	Me Ve	Agr Med
129	<i>Kalimeris indica</i>	Me Ve Or	Agr Med, Orn
130	<i>Kummerowia stipulacea</i>	Me Fo	Agr Med
131	<i>Lactuca indica</i>	Me Ve	Agr Med
132	<i>Lespedeza juncea</i>	Me Fo	Agr Med
133	<i>Leucaena leucocephala</i>	Me Fo	Agr Med
134	<i>Limnophila chinensis</i>	Me Ve	Agr Med
135	<i>Liquidambar formosana</i>	Me Ve	Agr Med
136	<i>Litsea glutinosa</i>	Me Ed	Agr Med
137	<i>Ludwigia adscendens</i>	Me Ve	Agr Med
138	<i>Ludwigia octovalvis</i>	Me Ve	Agr Med
139	<i>Lysimachia fortunei</i>	Me Ve	Agr Med
140	<i>Maclura cochinchinensis</i>	Me Ed	Agr Med
141	<i>Maesa indica</i>	Me Ed Ve	Agr Med
142	<i>Maesa japonica</i>	Me Ed	Agr Med
143	<i>Mappianthus iodoides</i>	Me Ed	Agr Med
144	<i>Markhamia stipulata</i>	Me Ve	Agr Med
145	<i>Mazus pumilus</i>	Me Ve	Agr Med
146	<i>Merremia hederacea</i>	Me Ve	Agr Med
147	<i>Morus alba</i>	Me Ed	Agr Med
148	<i>Mosla dianthera</i>	Me Ve	Agr Med
149	<i>Mucuna pruriens</i>	Me Fo	Agr Med
150	<i>Mukia maderaspatana</i>	Me Ed	Agr Med
151	<i>Mussaenda cambodiana</i>	Me Ve	Agr Med
152	<i>Myosoton aquaticum</i>	Me Ve	Agr Med
153	<i>Nephelium lappaceum</i>	Me Ed	Agr Med
154	<i>Nymphaea pubescens</i>	Me Ve	Agr Med
155	<i>Nymphaea rubra</i>	Me Ve	Agr Med
156	<i>Oroxylum indicum</i>	Me Ed Dy	Agr Med, Fas
157	<i>Oxalis corniculata</i>	Me Ve	Agr Med
158	<i>Oxalis corymbosa</i>	Me Ve	Agr Med
159	<i>Paederia foetida</i>	Me Ve	Agr Med
160	<i>Paederia scandens</i>	Me Ve	Agr Med
161	<i>Panicum sarmentosum</i>	Me Fo	Agr Med
162	<i>Paspalum scrobiculatum</i>	Me Fo	Agr Med
163	<i>Passiflora foetida</i>	Me Ed Ve	Agr Med
164	<i>Pegia sarmentosa</i>	Me Ed	Agr Med
165	<i>Peripterygium quinquelobum</i>	Me Ve	Agr Med
166	<i>Phyllanthus emblica</i>	Me Ed Ve	Agr Med
167	<i>Picris hieracioides</i>	Me Ve	Agr Med
168	<i>Piper lolot</i>	Me Ve	Agr Med
169	<i>Plantago asiatica</i>	Me Ed	Agr Med
170	<i>Polyalthia cerasoides</i>	Me Ed	Agr Med
171	<i>Portulaca oleracea</i>	Me Ve	Agr Med
172	<i>Pothos repens</i>	Me Fo	Agr Med
173	<i>Pouzolzia sanguinea</i>	Me Ve Fi	Agr Med, Fas
174	<i>Prunus cerasoides</i>	Me Ed Ti	Agr Med, For, Con
175	<i>Prunus salicina</i>	Me Ed	Agr Med

176	<i>Pseuderanthemum palatiferum</i>	Me Ve	Agr Med
177	<i>Psidium guajava</i>	Me Ed	Agr Med
178	<i>Pueraria montana</i>	Me Fo	Agr Med
179	<i>Rauvolfia verticillata</i>	Me Ve	Agr Med
180	<i>Rhodomyrtus tomentosa</i>	Me Ed	Agr Med
181	<i>Rhynchosia volubilis</i>	Me Fo	Agr Med
182	<i>Rorippa nasturtium-aquaticum</i>	Me Ve	Agr Med
183	<i>Rotala rotundifolia</i>	Me Ve	Agr Med
184	<i>Rubus cochinchinensis</i>	Me Ed	Agr Med
185	<i>Rubus leucanthus</i>	Me Ed	Agr Med
186	<i>Rubus multibracteatus</i>	Me Ed	Agr Med
187	<i>Rubus obcordatus</i>	Me Ed	Agr Med
188	<i>Rubus parvifolius</i>	Me Ed	Agr Med
189	<i>Saraca dives</i>	Me Ve Or	Agr Med, Orn
190	<i>Saurauia tristyla</i>	Me Ed Ve	Agr Med
191	<i>Schefflera heptaphylla</i>	Me Ve	Agr Med
192	<i>Scirpus juncooides</i>	Me Fo	Agr Med
193	<i>Setaria viridis</i>	Me Fo	Agr Med
194	<i>Sida rhombifolia</i>	Me Ve Fi	Agr Med, Fas
195	<i>Solanum nigrum</i>	Me Ed	Agr Med
196	<i>Solanum spirale</i>	Me Ed	Agr Med
197	<i>Sonchus asper</i>	Me Ve	Agr Med
198	<i>Sonchus oleraceus</i>	Me Ve	Agr Med
199	<i>Spilanthes oleracea</i>	Me Ve	Agr Med
200	<i>Sterculia nobilis</i>	Me Fo	Agr Med
201	<i>Streblus ilicifolius</i>	Me Ed	Agr Med
202	<i>Synedrella nodiflora</i>	Me Ve	Agr Med
203	<i>Talinum paniculatum</i>	Me Ve	Agr Med
204	<i>Terminalia catappa</i>	Me Ed Dy	Agr Med, Fas
205	<i>Toddalia asiatica</i>	Me Ed	Agr Med
206	<i>Toona sinensis</i>	Me Ve	Agr Med
207	<i>Trema orientalis</i>	Me Ve Fo Fi	Agr Med, Fas
208	<i>Trichosanthes tricuspidata</i>	Me Ve	Agr Med
209	<i>Vigna mungo</i>	Me Fo	Agr Med
210	<i>Vigna umbellata</i>	Me Ve Fo	Agr Med
211	<i>Vigna unguiculata</i>	Me Ed Ve Fo	Agr Med
212	<i>Wedelia biflora</i>	Me Ve	Agr Med
213	<i>Xerospermum noronhianum</i>	Me Ed	Agr Med
214	<i>Youngia japonica</i>	Me Ve	Agr Med
215	<i>Zehneria indica</i>	Me Ve	Agr Med
216	<i>Ziziphus oenoplia</i>	Me Fo	Agr Med

Abbreviation for use value. Me: Medicinal plant; Ed: Edible plant; Ve: Vegetable plant; Fo: Food for animal; Fi: Fibre plant; Or: Ornamental plant; Ti: Timber; Es: Plant with essential oil product.

Abbreviation for agencies. Agr: agriculture agencies; Con: construction agencies; Ess: essential

oil companies; Fas: fashion companies; For: forestry agencies; Med: medicinal plant agencies; Orn: ornamental companies.

Proposing Some Solutions to Contribute to the Development of Such Medicinal Plant Species:

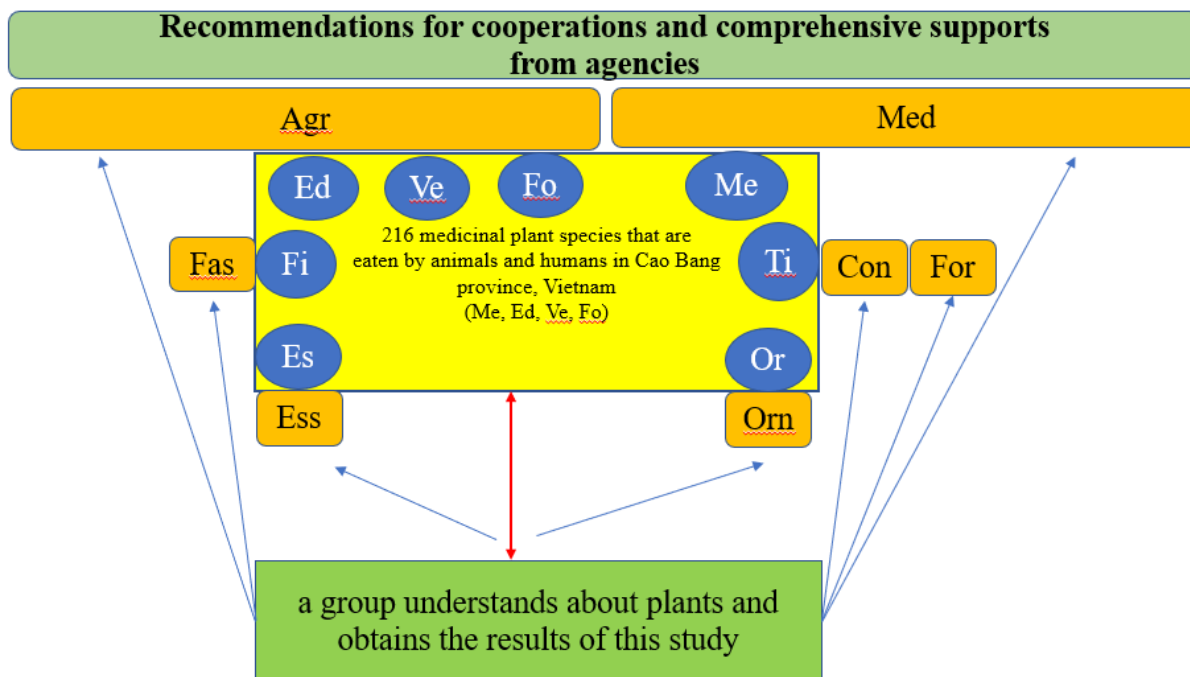


FIGURE 1. Cooperation and comprehensive support from many agencies for research and development of medicinal plants that are eaten by animals and humans in Cao Bang province, Vietnam

DISCUSSION

Specific data on will provide a clear direction for research and development of medicinal plants in Cao Bang province. If the proposal for cooperation is successful:

The agriculture agencies can support the research and development of 216 species. The medicinal plant agencies can support the research and development of 216 species. The construction agencies can support the research and development of 11 species. The essential oil agencies can support the research and development of 3 species. The fashion agencies can support the research and development of 8 species. The forestry agencies can support the research and development of 11 species.

The ornamental agencies can support the research and development of 5 species.

Each species can be supported by several agencies: 2 species (*Cleistocalyx operculatus*, *Diospyros kaki*) can be supported by 5 agencies (Agr, Med, For, Con, Fas). 9 species (*Aporosa dioica*, *Artocarpus heterophyllus*, *Baccaurea ramiflora*, *Bischofia javanica*, *Canarium bengalense*, *Diospyros malabarica*, *Garcinia oblongifolia*, *Illicium majus* and *Prunus cerasoides*) can be supported by 4 agencies (Agr, Med, For, Con). 7 species (*Boehmeria nivea*, *Oroxylum indicum*, *Pouzolzia sanguinea*, *Sida rhombifolia*, *Terminalia catappa*, *Trema orientalis* and *Artemisia vulgaris*) can be supported by 3 agencies (Agr, Med, Fas); 5 species (*Alpinia malaccensis*,

Bambusa vulgaris, *Crescentia cujete*, *Kalimeris indica* and *Saraca dives*) can be supported by 3 agencies (Agr Med, Orn). 2 species (*Chenopodium ambrosioides* and *Cyperus rotundus*) can be supported by 3 agencies (Agr, Med, Ess). 191 remain species can be supported by 2 agencies (Agr, Med).

Although the proposals are theoretical, but if the cooperation and comprehensive support from many agencies are achieved, the development of medicinal and edible plants will bring positive results. However, in our opinion, it is necessary to have a group that understands about plants, obtains the results of this study and connects cooperations, supports of agencies to uses of plants (Figure 1).

CONCLUSION

A list of 216 medicinal plant species that are eaten by animals and humans in Cao Bang province has been compiled. A model built for research and development of those species based on comprehensive cooperations and supports from agriculture, construction, essential oil, fashion, forestry, medicinal plant and ornamental agencies.

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