

A SURVEY OF VASCULAR PLANT SPECIES IN THE DRY SEASON, CAM MOUNTAIN, AN GIANG PROVINCE

Nguyen Thi Hai Ly^{1,*}, Lu Ngoc Tram Anh¹, Nguyen Huu Chiem²

¹*Resources and Environment Faculty, Dong Thap University, 783, Pham Huu Lau street, Ward 6, Cao Lanh city, Dong Thap, Vietnam*

²*Environment and Natural Resources Management Faculty – Can Tho University, 3/2 Street, Ninh Kieu District, Can Tho city, Viet Nam*

*Email: nguyenhaily2009@gmail.com

Received: 1 April 2016; Accepted for publication: 15 June 2016

ABSTRACT

The survey which was conducted in the dry season (from February to April) in Cam Mountain, reported 49 plant species belonged to 45 genera and 29 families. These species include 10 big wood species (G) (20.4 %), 14 small wood species (g) (28.6 %), 7 bush species (17.2 %), 9 creeper species (18.4 %) and 9 herbaceous species (18.4 %). There are 33 species used for herbal medicines, 12 species for wood fire, 11 species for fruit, 10 species for household tools and 9 species for food. *Pterocarpus macrocapus* Kurz is the species that listed in Viet Nam Red Data Book (2007). The average value of Margalef (d) and Pielou (J') indexes are 2.45 ± 0.37 and 0.94 ± 0.02 , respectively. There are 54.5 % quadrates which (d) and (J') indexes are higher than Margalef (d) and Pielou (J') indexes. The Shannon – Weiner (H') index of 63.6 % quadrats is higher than the average value of Shannon - Weiner index (1.94 ± 0.19). The number of species at quadrats O1T1, O3T1 and O1T2 are more diverse than other quadrats. The transect 1 (T1) to the east is more diverse than the transect 2 to the west of Cam forest.

Key words: Plant diversity, vascular plant, Cam Mountain.

1. INTRODUCTION

Biodiversity has been addressed by the scientists for more than a century. Interest in the subject increased in the early 1980s, when accelerated habitat destruction and species loss raised international concern and resulted in 1992 in the adoption of the Convention on Biodiversity [1]. Besides human activities and soil characteristics, seasonality also affects plant diversity. Therefore, identifying of natural factors that affect biodiversity and forest vegetation structure is necessary, because it can help to figure out forest management practices in ways that protect biodiversity and ecosystem [2]. An Giang province is located in the upstream of the Mekong Delta River in Viet Nam and lies between Tien and Hau River. This region has a high level of biodiversity thanks to its geography diversity such as hills, mountains and floodplains. With 710

meters above sea level, Cam mountain in An Giang province is one of the areas which is home of various vascular plants that provide foods, herbs, woods and so on for local people in Mekong Delta [3]. Especially, in the dry season, water resource decreases significantly leads to loss of plant diversity. This study aims to investigate the current status of vascular plant distributions in Cam Mountain in the dry season. In addition, the study also provides the fundamental research data for future conservation and utilization of natural resources in this area.

2. MATERIALS AND METHODS

2.1. Research area

Cam mountain is located in An Hao Commune, Tinh Bien district, An Giang province and is far away Long Xuyen city about 90km. This is the highest mountain in the Mekong Delta which is about 710 m above sea level and its perimeter is 28,600 m.

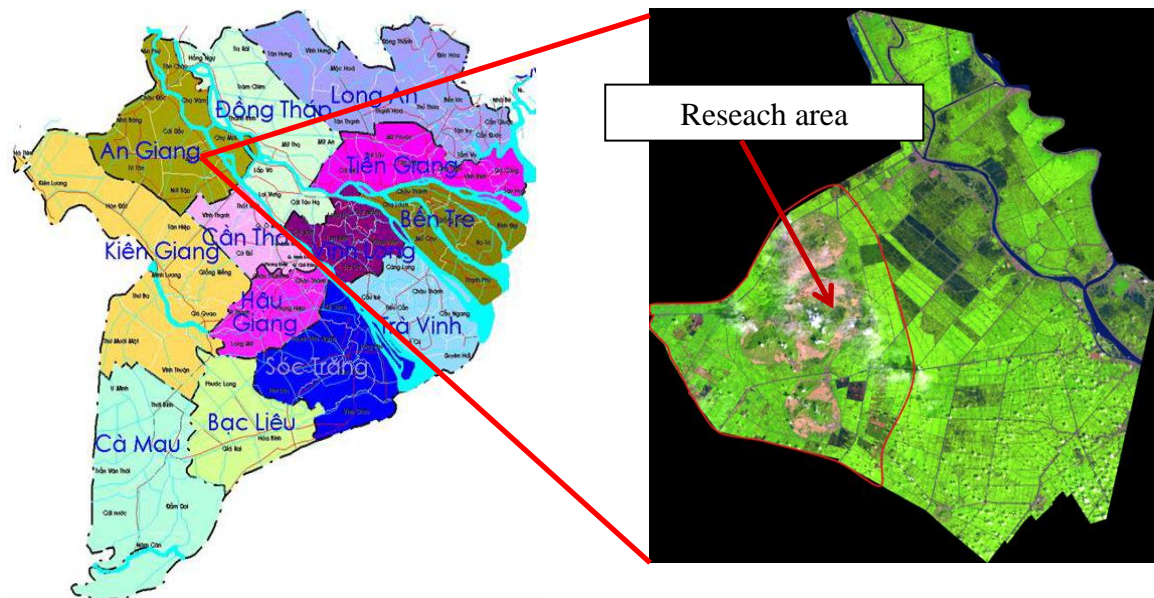


Figure 1. Research area in Cam mountain, An Giang province.

2.2. Methods

The study was carried out from February to April in 2015. Two transects were established on the slopes of the East and West in Cam mountain. There were five to six sample quadrats

Along the altitudinal gradient, 5 - 6 quadrats separated by 100 meters in elevation were established randomly. Species data were recorded in each quadrat. The quadrat size was 10 m × 10 m, in which one 1 m × 1 m small quadrat was used to record wood plants, shrubs and herbs [4]. The abundance of trees, shrubs and herbs was estimated in each quadrat. The sample quadrats were located by using GPS (Table 1).

Table 1. Location of sample quadrats (WGS 84 system).

Quadrats	Easting	Northing	Elevation (m)
O1T1	00497955	01160653	677
O2T1	00498714	01161302	543
O3T1	00500115	01161073	385
O4T1	00500576	01160851	290
O5T1	00500867	01160650	208
O6T1	00501213	01160503	88
O1T2	00497497	01160555	534
O2T2	00497547	01160364	414
O3T2	00497714	01160090	341
O4T2	00498166	01159728	212
O5T2	00498197	01159437	106

The names of species were identified by using the comparative morphology method combined with scanning on reference books including “Dictionary of common plants”, Volume 1, 2 [5] and “An Illustrated Flora of Vietnam 1,2,3” [6]. The use of the plant was garnered by interviewing local people and based on documents such as Vietnam’s Herbal Plants and Remedies [7] and Vietnam’s Red Book (2007) [8].

The diversity index (β) is used to compare diversity of transects: $\beta = S/n$ [9].

S: Total of species in research area

n: The average number of species at quadrats in each area

Using the Primer Version 6 to calculate the diversity indexes.

3. RESULTS AND DISCUSSION

3.1. Vegetable composition

There were 49 vascular plant species of forest plants which belongs to 45 genera and 29 families were recorded. There are seven families, which each have more than 2 species, are accounted for 24.1 % the number of total families. In contrast, family with has only one species is constituted at 75.9 % (22 families). Of the families, the most diversity family is Fabaceae (10 species), followed by Moraceae and Poaceae (4 species) (Table 2).

Fabaceae and Poaceae families are the two largest families which have 108 individuals and 103 individuals respectively, whereas the smallest family is Araliaaceae with only one individual.

Table 2. Families having more than one species

Scientific name	Species	% of total species
Fabaceae	10	20.4
Moraceae	4	8.2
Dipterocarpaceae	2	4.1
Arecaceae	3	6.1
Anacardiaceae	2	4.1
Poaceae	4	8.2
Malvaceae	2	4.1
Total	49	100

The stems characteristic of vascular plants can probably reflect the diversity of flora in Cam Mountain, in the dry season. The diversity of this flora is represented by the number of vascular plants such as 10 large wood species (G), 14 small wood species (g), 7 shrubs (T) species, 9 creeper species (D), 9 herbaceous species (C) (Figure 2). The pie chart shows that wood species occupy the highest percentage of vascular plants, referring to this species can adapt to dry condition. Besides, ecosystem in Cam Mountain also faces with fire in this season because of remaining dry materials (Figure 3).

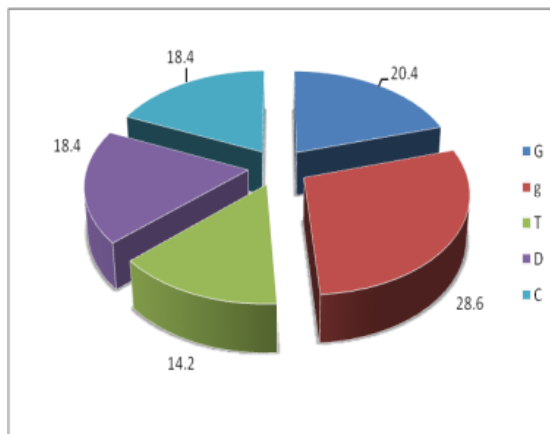


Figure 2. Diversity of life forms in Cam mountain



Figure 3. The vegetable in dry season, Cam mountain

A total of 47 plant species are used by local people in Bay Nui - An Giang, of which 21 species are often used more than one purposes. The table 3 shows that medicine herbs are constituted the largest percentage of group of application at 67.3 %, followed by wood fire at 24.5 %. The percentage of vascular plant used for fruit was 22.4 % and the figure of construction and household tools was 20.4 %. Plant used for ornament was the smallest group of applications, namely 6.1 %. Especially, *Bambusa variabilis* Munro (Tam vong) in Poaceae family is widely used for building material, furniture, and handicraft in life in Mekong Delta and is the income for Bay Nui residence.

Table 3. The groups of useful plant in Cam mountain, An Giang.

Groups of application	Species	% of total species
Medicine	33	67.3
Wood fire	12	24.5
Fruit	11	22.4
Construction and household tools	10	20.4
Food	9	18.4
Ornament	3	6.1
Total	49	100

Especially, *Pterocarpus macrocapus* Kurz (Giang hương) is a rare plant species in Cam Mountain that is listed within Vietnam Red Book (2007) at endangered levels (EN).

Most of forest areas in Cam Mountain are planted forest which combine fast growing trees (*Acacia auriculaeformis* and *Acacia magnum* Willd.) and the other valuable trees such as *Hopea odorata* Roxb., *Dipterocarpus alatus* Roxb.. Although the natural forest area is not as large as planted forest, it still has several precious trees such as *Pterocarpus macrocapus* Kurz. and *Cassia siamea*. In addition, vegetable at transect (T2) was also alternated with some agricultural crops such as *Baccaurea ramiflora* Lour. *Mangifera indica* L., *Anacardium occidentale* L., *Persea Americana* Mill.. However, because local people want to increase income, they grow fruit trees into planted forest, leading to affect the vegetable diversity. Therefore, if the local people are not aware of the negative effects of intercropping, the flora at Cam Mountain will continue to be changed.

3.2 Diversity assessment through diversity index

Table 4. The diversity indexes of the research quadrats in Cam Mountain, An Giang.

Quadrats	Elevation (m)	S	N	d	J'	H'
O1T1	677	9	20	2.69	0.94	2.07
O2T1	543	7	17	2.14	0.91	1.77
O3T1	385	13	31	3.48	0.95	2.43
O4T1	290	9	20	2.69	0.95	2.09
O5T1	208	6	12	2.04	0.98	1.75
O6T1	88	7	22	1.94	0.92	1.79
O1T2	534	9	14	2.99	0.98	2.16
O2T2	414	9	18	2.75	0.92	2.03
O3T2	341	8	17	2.49	0.98	2.04
O4T2	212	4	8	1.46	0.95	1.32
O5T2	106	8	23	2.23	0.89	1.85
Max		13	31	3.48	0.98	2.43
Min		4	8	1.46	0.89	1.32
Mean		8.09± 0.52	18.36 ± 4.09	2.45 ± 0.37	0.94 ± 0.02	1.94 ± 0.19

Table 4 shows that the most diversity quadrat is O3T1 possessed 13 species while the least diversity quadrat is O4T2 with 4 species. Of 11 quadrats, six quadrats have the numbers of species higher than the mean numbers of species. The transect 1 (T1) in east location is more

diverse than the transect 2 (T2) in west location. The value of β diversity index in T1 and T2 transect is 3.95 and 2.72, respectively.

The Margalef species richness index (d) is 2.45 ± 0.37 , in which the lowest value of this index is 1.46 of O4T2 quadrat and the highest value is 3.48 of O3T1 quadrat. Among 11 quadrats, there are six quadrats that their (d) indexes are higher than average index.

The Shannon - Weiner species diversity index (H') is 1.94 ± 0.19 , in which the lowest value of this index is 1.32 of O4T2 and the highest value of this index is 2.43 of O3T1. There are seven quadrats that Shannon - Weiner diversity index are higher than average value and the rest of quadrats that this diversity index is lower than the average index.

The Pielou uniform index (J') is 0.94 ± 0.02 , in which the lowest value is 0.89 of O5T2 quadrat and the highest value is 0.98 of O1T2 quadrat. There are 6 quadrats which their indexes are higher than average index.

4. CONCLUSIONS

The study reported that there are 49 vascular plant species belonged to 45 genera and 29 families. The most diversity family is Fabaceae, followed by Moraceae and Poaceae. Fabaceae and Poaceae are the two largest families; whereas the smallest family is Araliaceae. The wood species exist mainly in this season while the creeper and herbaceous species almost disappear.

Among founding species, there are 47 useful plant species, in which 21 species have more than one using purposes. The largest group is medicinal plant species, followed by wood fire. Three species are listed within Vietnam's Red Book (2007). The transect 1 (T1) in east location is more diverse than the transect 2 (T2) in west location. There have 54.5 % quadrates that their (d) and (J') indexes are higher than average index. There are 63.6 % quadrats that Shannon - Weiner diversity index higher than average index.

Although the Cam Mountain forest is a secondary forest which has its own great values for science and environment. Improper exploitation of natural resources and intercropping activities in Cam Mountain can continually cause loss of biodiversity in the near future.

Acknowledgment. The authors acknowledge financial support from Dong Thap University (project code CS2015.01.23).

REFERENCES

1. Wolfgang J., Ian C., Max F., Brij G., Lars R. and Barry G. - The comparative biodiversity of seven globally important wetlands: a synthesis, *Aquat. Sci.* **68** (2006) pp.400–414.
2. Pickett S. - Drivers and dynamics of change in biodiversity. *Global Biodiversity Assessment, United Nations Environment Programme, Cambridge, 1995, pp. 311–318.*
3. Thang N. D. – Potential of medicinal plant development originated from An Giang forest., 2003. <http://sokhcn.angiang.gov.vn/wps/wcm/connect>, accessed 15/03/2015.
4. Huy L. Q. - Methods of quantitative analysis of plant diversity indices. *Science and technology of agriculture and rural development in 20 years of renovation (forestry)* **5** (2005) 3-12.
5. Chi V.V. - Dictionary of common plant, Volume 1 & 2, Science and Technology Publishing House, Ha Noi, 2002, p.1250 & p.1447.

6. Ho P. H. - An Illustrated Flora of Viet Nam Volume 1& 2 & 3, Youth Publishing House, Ho Chi Minh City, 1999, p.991; p.951 & p.1020.
7. Loi D. T. - Vietnam's Herbal Plants and Remedies, Medical Publish House, Ha Noi, 2004, p.1274.
8. Vietnam's Red Book, Plant-Part 2. - Natural Science and Technology Publishing House, Ha Noi, 2007, pp.11 - 32.
9. Nam V. N. - Research On Mangrove Forest Structure And Plant Diversity In the Dong Tranh Estuaries Of Can Gio Biosphere Reserve, Ho Chi Minh City. Science and Technology Journal of Agriculture and Rural Development, **3** (2012) 102 – 108.