The diversity of dicotyledonous edible plants in Nam Dong Conservation Area, Thanh Hoa Province, northern Vietnam

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Abstract. The survey was completed in assistance with ethnic groups living in Nam Dong Conservation Area in June–August 2019. The study was focused on the dicotyledonous plants used in Nam Dong Conservation Area as a food plants. Observed and documented plants belong to 49 species and 33 families; among them 21 trees, 10 shrubs, 12 herbs, and 6 lianas. These species are used commonly as fresh or cooked vegetables. The investigation underlines the significance of available ethnobotanical knowledge pertaining to the use of the dicotyledonous wild edible plants for the human benefit.

1. Introduction
Nam Dong Conservation Area lies between 20°18'07"–20°19'38"N and 104°52'08"–104°53'26"E, and includes territory over 646 ha. It is located in the southwestern part of Quan Hoa District of Thanh Hoa Province in northern Vietnam. The territory of Nam Dong District is a hilly area with dominating elevations 600–900 m a.s.l. with a tropical climate, annual precipitation 1600–1700 mm, high humidity (86%), cool winter (15–20°C) and warm summer (27–34°C). Diverse natural conditions lead to the formation of various forest types with very rich species composition. The forest covers about 86% of the area and harbours 673 documented flowering plant species [1]. Five ethnic groups: Thai (66,49%), Muong (24,11%), Kinh (7,48%), Mong (1,58%) and Hoa (0,34%) inhabit Nam Dong Conservation Area. Since ancient ages, they have been dependent on forest for their livelihood. For a long time they accumulated huge traditional knowledge, which they passed on from generation to generation [1–5]. This knowledge is based on their needs, instincts, observation, trial and error and long experiences [4–6]. Traditional knowledge is providing them with food security and materials for shelter, ritual, and healthcare system [3–14]. Traditional wild edible plant products are used mostly as a soup, boiled, spice, jelly or eaten as a fresh vegetable [3–14].

2. Methods and Materials
Fieldwork was carried out in June–August 2019 by the visiting the different places of Nam Dong Conservation Area to record the edible plants used by local people for different forms of their
traditional livelihoods. The data were collected through personal conversations and questionnaires with 40 informants between the ages of 25–65 years. Plants (or their parts) were used for the preparation of the voucher herbarium specimens following standard herbarium technique. Plant species identification was based on the available relevant literature reported by Averyanov [2, 3], Nguyen [15-17], Pham [18], Phung [19], Soejarto [20], Suk [21], and Tran [22]. These specimens were deposited in the herbarium of Vietnam National University of Forestry (VNF) and in the Herbarium of Komarov Botanical Institute of the Russian Academy of Sciences (LE).

3. Results and Discussion
The families (and their species) of dicotyledonous edible plants reported during the study of Nam Dong Conservation Area arranged alphabetically are listed in table 1. This list beside accepted names includes data on the life form, plant parts and method of use. The present investigation includes 49 plant species belonging to 33 families enumerated in table 1.

| Family, species | Life form | Part utilized | Mode of use |
|-----------------|-----------|---------------|-------------|
| Actinidiaceae,  |           |               |             |
| Saurauja roxburghii Wall. | small tree | fruits | ripe fruits are edible |
| Amaranthaceae,  |           |               |             |
| Amaranthus viridis L. | herb     | leaves, shoots | young leaves and shoots are eaten boiled |
| Anacardiaceae,  |           |               |             |
| Choerospondias axillaris (Roxb.) Burtt et Hill, | tree | fruits | ripe fruits are edible |
| Mangifera longipes Griff., | tree | fruits | ripe fruits are edible |
| Rhus chinensis Mill., | tree | fruits | ripe fruits are edible |
| Spondias lakonensis Pierre | tree | fruits | ripe fruits are edible |
| Apioaceae,      |           |               |             |
| Centella asiatica (L.) Urb., | herb | leaves, stems | leaves and stems are eaten raw |
| Eryngium foetidum L. | herb | leaves | leaves are eaten raw |
| Areliaceae,     |           |               |             |
| Aralia armata (Wall. ex G. Don) Seem., | shrub | leaves, shoots | young leaves and shoots are eaten boiled |
| Schefflera heptaphylla (L.) Frodin | tree | leaves | young leaves are eaten boiled |
| Asteraceae,     |           |               |             |
| Artemisia vulgaris L., | herb | leaves | young leaves are eaten boiled |
| Blumea lanceolata Warb. | herb | leaves | young leaves are eaten raw |
| Begoniaceae,    |           |               |             |
| Begonia aptera Blume | herb | leaves, shoots | leaves and shoots are used as a spice (sour taste) |
| Bignoniaceae,   |           |               |             |
| Oroxyxylum indicum (L.) Kurz | tree | fruits | mature fruits are edible (it are grilled in hot coal then eat with boiled pork) |
| Burseraceae,    |           |               |             |
| Canarium bengalense Roxb. | tree | fruits | ripe fruits are edible (mature fruits are used in cooking fish as a spice) |
| Caesalpiniaeae, |           |               |             |
| Saraca dives Pierre | tree | leaves, seeds | young leaves are eaten raw. seeds are eaten boiled |
| Clusiaceae,     |           |               |             |
| Garcinia oblongifolia Champ.ex Benth. | shrub | fruits | ripe fruits are edible |
| Cucurbitaceae,  |           |               |             |
| Gynostemma pentaphyllum (Thunb.) Makino | climber | leaves, shoots | young leaves and shoots are used to make soup |
| Hodgsonia macrocarpa (Blume) Cogn. | climber | seeds | oil from seeds are edible |
| Dilleniaceae,   |           |               |             |
| Dillenia ovata Wall. ex Hook. f. & Thomson | tree | fruits | ripe fruits are edible |
| Elaeocarpaceae, |           |               |             |
| Elaeocarpus griffithii (Wight) A. Gray | tree | fruits | ripe fruits are edible |

Table 1. Dicotyledonous edible plants used in Nam Dong Conservation Area.
| Family, species | Life form | Part utilized | Mode of use |
|----------------|-----------|---------------|-------------|
| Euphorbiaceae, | tree      | fruits        | ripe fruits are edible (sweet-sour tasting, cooling) |
| Antidesma montanum Blume, | | | |
| Baccaurea cauliflora Lour., | tree | fruits | ripe fruits are edible |
| Bischofia javanica Blume, | tree | leaves | young leaves are eaten raw |
| Phyllanthus emblica L., | tree | fruits | ripe fruits are edible |
| Sauropus racemosus Beille | shrub | leaves | young leaves are used to make soup |
| Hypericaceae, | tree | leaves | young leaves are eaten raw |
| Cratoxylum formosum (Jacq.) Benth. & Hook. f. ex Dyer | shrub | fruits | ripe fruits are edible |
| Melastomataceae, | climber | leaves | leaves are used to make jelly |
| Melastoma candidum D. Don | | | |
| Menispermaceae, | shrub | fruits | ripe fruits are edible |
| Cissampelos andromorpha DC. | | | |
| Moraceae, | tree | leaves, fruits | young leaves are eaten raw. ripe fruits are edible (sweet taste and good flavour) |
| Ficus auriculata Lour., | | | |
| Ficus racemosa L. | tree | leaves, fruits | young leaves and fruits are eaten raw |
| Morus alba L., | shrub | fruits | ripe fruits are edible |
| Streblus asper Lour., | shrub | fruits | ripe fruits are edible |
| Myrsinaceae, | shrub | leaves | young leaves are eaten raw |
| Maesa perlaria (Lour.) Merr. | | | |
| Olacaceae, | climber | leaves, shoots | leaves and shoots are eaten boiled |
| Erythrophalum scandens Blume | | | |
| Opiliaceae, | tree | leaves, fruits | leaves and fruits are used to make soup |
| Melientha suavis Pierre | | | |
| Oxalidaceae, | herb | leaves, flowers | leaves and flowers are used as a spice (sour taste) |
| Oxalis corymbosa DC. | | | |
| Passifloraceae, | climber | leaves, fruits | ripe fruits are edible |
| Passiflora foetida L. | | | |
| Piperaceae, | herb | leaves, shoots | leaves and shoots are eaten raw |
| Peperomia pellucida (L.) Kunth | | | |
| Plantaginaceae, | herb | leaves | young leaves are eaten boiled |
| Plantago asiatica L. | | | |
| Polygonaceae, | herb | leaves | leaves are used as a spice (sour taste) |
| Polygonum chinensis L. | | | |
| Rosaceae, | climber | fruits | ripe fruits are edible |
| Rubus alceaeolus Poiret | | | |
| Rutaceae, | shrub | leaves | leaves are used as a spice (for roasting pork) |
| Clausena excavata Burm. f. | | | |
| Solanaceae, | herb | leaves, shoots | young leaves and shoots are eaten boiled |
| Physalis angulata L., | | | |
| Solanum nigrum L., | herb | leaves, shoots | young leaves and shoots are eaten boiled |
| Solanum torvum Sw. | shrub | fruits | mature fruits are eaten boiled |
| Sterculiaceae, | tree | seeds | seeds are eaten boiled |
| Sterculia lanceolata Cav. | | | |
| Tiliaceae, | tree | fruits | ripe fruits are edible |
| Microcos tomentosa Sm. | | | |
| Verbenaceae, | shrub | leaves | young leaves are used to make soup |
| Clerodendrum cyrtophyllum Turcz. | | | |

Data analysis (table 1) showed that 49 species of dicotyledonous wild edible plants of Nam Dong belong to 33 families. The largest families are: Euphorbiaceae (5 species – 10.2%), Moraceae and Anacardiaceae (by 4 species – by 8.2%), Solanaceae (3 species – 6.1%), which together represent
32.7%. Comparing these data with the 9 largest families of wild edible plants of Meghalaya of Northeast India [11], only 2 same families were found – Euphorbiaceae and Moraceae.

A comparison of the diversity of dicotyledonous wild edible plants used by ethnic minorities of Meghalaya of northeast India (94 species) [11] and Nam Dong Area of northern Vietnam (49 species) shows that there are only five common Dicotyledonous species for these territories (*Centella asiatica*, *Eryngium foetidum*, *Peperomia pellucida*, *Polygonum chinensis*, *Solanum nigrum*).

The dicotyledonous wild edible plants of Nam Dong Area belong to the following life forms: trees – 21 species (42.9%), shrubs – 10 (20.4%), herbs – 12 (24.5%), and climbers – 6 (12.2%).

The 49 dicotyledonous wild edible plants have been categorized into 9 groups on the base of their use: edible fruit (19 species – 38.8%), edible leaves (12 – 24.5%), edible leaves and shoot (8 – 16.4%), edible leaves and fruit (4 – 8.2%), seed (2 – 4.1%), and by one species (by 2.0%) belong to the following groups: edible leaves and flower, leaves and stem, leaves and seeds, stem and flower. Out of total wild plants, five species are used to make soup, 11 species are eaten boiled, 10 species are edible as fresh vegetables, ripe fruit (20 species), four species are used as a spice, one species in jelly, and one species can be used to produce of edible oil.

Nowadays, as pollution occurs in many places, and as many farmers apply large volumes of pesticides to cultivated vegetables, many wild vegetables are considered as safer for humans. This result revealed that dicotyledonous wild edible plant species hold an significant role in food security in rural mountainous areas, particularly in developing countries.

4. Conclusion

In total, 49 species of dicotyledonous wild edible plants from 33 families used by ethnic groups live in Nam Dong are recorded. A comparative analysis of the diversity of edible plants of Nam Dong Area showed that their traditional food customs are unique. Most of the food plants are trees (42.9%), shrubs, and herbs are represented approximately equally, a small part are lianas. Leaves and fruits are mainly used for food by the local ethnic minorities of Nam Dong Area; few species provide edible stems, seeds, and flowers. Edible plant parts are used by local people in the form of soups, boiled or fresh vegetables, ripe fruit, spice, jelly, and oil.

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