

Ethnobotany of Colorant Plants in Ethnic Communities in Northern Vietnam

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Abstract

Vietnam is the tropical country, which includes 12,000 flowering plant species in its flora. And Vietnam is a homeland of 54 ethnic minorities with a broad range of experience in using plants for dyeing, especially for food. As a result 43 species belonging to 24 families giving a dye for food were identified. Ethnic people have abundant knowledge in using plants for dyeing food such as processing, preparation, mixing plants to require colors. In the framework of this study, we report on the traditional colorant species in Northern Vietnam and the value of indigenous knowledge in processing and blending plants to achieve required colors.

Keywords: Colorant plants, Coloring food, Northern Vietnam, Indigenous knowledge

Introduction

For a long time, Vietnamese people have used colorant plants and, even now, they remain a part of daily life. However, at this time, there is no document or evidence precisely recording and describing the appearance of these plants. Via modern evidence, in the two wars in Vietnam (the resistance against French Colonist and the war against America), the symbol of this period was the farmers in brown or black clothes and the soldiers in green uniform. These colors helped them to disguise and hide from their enemies. Everyone wore dark-colored clothes to avoid enemy planes and for easy hiding [1]. If a shirt was white, it was dyed moss green or a waning-grass brown called “màu phòng không” (literally, air-defense color) (Tinh 2010) using Trau leaf (*Piper betel*) or Bang leaf (*Terminalia catappa*). Traditional clothes and colors have been part of festivals and worshipping ceremonies for ages. The King Hung legend mentions Chung cake wrapped in La dongleaves (*Phrynium* spp.) as green represents earth and Day cake made of sticky rice as white represents heaven. Prince Lang Lieu created these two types of cake, which he submitted for the contest to determine the heir to the throne. Thanks to his unique idea, Lang Lieu became the next Viet King. Colorant plants have always travelled along side the history and development of every ethnic group in Vietnam (Pháp 1968, Schultz 1965). However, the persistence of plant-derived dyes and associated cultural practices and traditional knowledge is threatened with rapid socio-economic change in Vietnam. Research is needed to document the ethnobotany of dye plants in indigenous communities and associated traditional knowledge towards cultural conservation.

Materials and Methodology

The study in this paper is based on real-life interviews and field investigations completed in the communities of ethnic minorities in some provinces in Northern Vietnam. Field investigations and sample collecting were undertaken in chosen areas from 2009 to 2011.

Study site: We focus on high-density ethnic minorities areas such as, black Tai people in the Son La Province and Dien Bien Province; H'Mong people, Dao people, Tay-Nung people and Giay people in the Lao Cai Province and the Cao Bang Province [2]. Undertaken at twelve mountainous hamlets and villages of ethnic minorities as listed below: Tay-Nung people: Den hamlet (Sapa commune, Lao Cai Province);

Lung Quang hamlet (Thong Nong commune, Cao Bang Province).

Giay people: Lau hamlet (Sapa commune, Lao Cai Province) as shown in Figures 1 and 2.

Thai people: black Thai in Bo, Nhop, Bia and Bang hamlets (Thuan Chau commune, Son La Province); Phang-3 hamlets (Muong Phang commune, Dien Bien Province); white Thai in the Na Muoi hamlet (Moc Chau commune, Son La Province). H'Mong, Dao people: Khoang hamlet (Muong Khuong commune, Lao Cai Province); Ranh and Du hamlets (Da Bac commune, Hoa Binh Province) as shown in Figures 3 and 4.

Field research: A Data-base was collected through participant observation and semi-structured interviews (Gary Martin, 2002) with open questions regarding the local knowledge on using



Figure 1: Khâu út cake (steamed rice cake), the traditional cake of Giay people in Muong Khuong Commune, Sapa, Lao Cai.

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Figure 2: Traditional dishes of Giáy people in Tet holiday, in Lầu village.



Figure 3: Seven-colored steamed sticky rice, made by Nung people at Muong Khuong, Sapa, Lao Cai.



Figure 4: Colorful steamed sticky rice of Dao people in Lao Cai.

colorant plants. The questions are related to dye plants and dye technique [3]. Key informants were identified on the basis of semi-structure interviews for transect walks through the surrounding mountains and fields to collect documented dye plants for samples and voucher specimens. Picture cards with dye plants were shown to informants to document local knowledge of dye plants. Research samples: Scientific names have been identified according to the Flora of Vietnam (FV). The samples are being preserved in the Hanoi Herbarium of the Institute of Ecology and Biological Resources and Vietnam National Museum of Nature.

Results

Checklist of colorant plants

Following survey results, we recorded forty three colorant plant species for coloring food and beverages. Ethnic people use plants for dyeing and mordanting. A total of ten species are used for red color, seventeen species for yellow, ten species for green, eight for black and four species for purple, one species for blue and one species for orange [4]. Among dye plants that are well known, *Peristrophe bivalvis* has got several varieties for different colors. Almost research areas, we have

recorded purple and pink races, particularly we have met red varieties of *P. bivalvis* in a few places (Hoa Binh, Son La, Lao Cai provinces); yellow varieties is unique found in communities of Dao (Sapa) and Tay (Muong Khuong) at Laocai province. Checklist is detailed in Table 1 belowing here.

Food coloring

Processing experience depending on available materials, the people there have particular methods of collecting and processing pigments [5]. The major methods are hot extracting (boiling ingredients in water to extract colors), cold extracting, solvent extracting, and mixing colored ingredients directly into food.

Hot water extracting method: With this method, the material is boiled in water for 15-20 minutes. Meanwhile pigments in the material dissolve [6]. The extract is used to dye materials before processing food (rice is soaked before making steamed sticky rice, flour is dyed before baking) (Figure 5).

Cold water extracting method: Fresh raw materials are pounded, strained, and soaked with rice in order to create color; then this rice will be used to make steamed sticky rice or pie with the extracted colors. Cold extraction is applied to the materials collected from such species as pine-apple, *Rhodomyrtus tomentosa*, *Basella rubra* (Mùng tơi), *Reynoutria japonica* (Cốt khí củ) etc [7].

Solvent extracting method: Since it is used for dyeing food, the solvent to extract color from plants is alcohol. This material is non-toxic, inexpensive and easy to find. The materials containing pigments are cut into pieces or ground, then soaked in alcohol (in the ethnic minority areas the concentration of alcohol is often 35-40%). After a certain time raw pigments dissolve in alcohol and produce a colored solution to dye food [8]. This method is often used to extract color from *Morus alba*, *Eleutherine bulbosa*, etc. Pigments extracted by solvents are commonly used in processed beverages (soft drinks, colored wine, etc.)

Use of raw materials directly: Raw materials used for this method are usually leaves of some species (*Artemisia* spp, *Paederia scandens*) to create the color of green or ash of some species (*Oryza sativa*, *Rhus chinensis*, etc.) to require black color. Figure 6 The Tay and Nung groups in Trang Dinh district (Lang Son) create the color of green by boiling the leaves of *Artemisia* spp, removing fibers (veins) and crushing into powder, then grinding with sticky rice to make green rice cake. Similarly, the Tay and Nung in Van Quan (Lang Son province) use leaves of *Paederia scandens* instead of *Artemisia* spp. (Figure 7). To dye rice cake in black, the Giay and Yao get sticky straw (only straw portion of panicle) burned to ash, then the ash is sifted smooth and mixed with glutinous rice which was soaked overnight, stirred so that the ash stick



Figure 5: Rice is soaked in Mat Mong extraction for making yellow.

	Family name	Latin name	Vietnames-e name*	Tribal name	English name	Part containing	Colors	Food	Other	Methods and use
1	Acanthaceae	<i>Dicliptera chinensis</i> (L.) Juss.	Diễn	-	Chinese foldingwing	Leaves	Red	Rice		Boiling for extraction, food
2	Acanthaceae	<i>Peristrophe bivalvis</i> (L.) Merr. (several cultivars)	Cắm	Cọ khấu cắm/ Do khô là/ Chăm thú	Pepper leaf herb	Leaves	Red, purple, yellow	Rice	Chopstick	Boiling. For coloring food, tool.
3	Altingiaceae	<i>Liquidambar formosana</i> Hance	Sau sau	Sâu sâu	Sweet gum	Leaves	Black	Rice		Boiling for extraction, food
4	Amaranthaceae	<i>Amaranthus caudatus</i> L.	Dền tía	-	Tassel flower	Leaves	Red	Drink		Boiling, food Root is used for dyeing eggs in festivals
5	Anacardiaceae	<i>Rhus chinensis</i> Mill.	Muối (ashes)	Khoai sớ/ Mây pắt	Nutgall tree	Stem (bark)	Black	Rice		Ash, food
6	Asteraceae	<i>Artemisia indica</i> Willd.	Ngải cứu	Nhà ngải	Japanese	Leaves	Green	Cake		Mixing with material, steaming
7	Asteraceae	<i>Artemisia vulgaris</i> L.	Ngải cứu	Nhà ngải	Mugwort	Leaves	Green	Cake		Mixing with material, steaming
8	Asteraceae	<i>Gnaphalium affine</i> D. Don	Rau khúc	Mền hão/ Đọc nhà mẩn	Jersey cudweed	Whole plant	Green	Cake		Steaming and grinding
9	Basellaceae	<i>Basella rubra</i> L.	Mồng tơi	-	Malabar spinach	Fruit	Purple	Rice		Use fresh extraction
10	Bignoniaceae	<i>Oroxylum indicum</i> (L.) Kurz	Núc nác	Cò ứng ca/ Cò lín vải	India trump tree	Stem-ash Bark	Black Yellow	Cake	Cloth	Additive material for dyeing indigo (Textile)
11	Bixaceae	<i>Bixa orellana</i> L.	Điều nhuộm	Cọ xôm pu/ Mắc sết	Annatto	Coat-seed	Orang, dark-yellow	Rice	Fibre	Boiling Food, Textile (thread)
12	Buddlejaceae	<i>Buddleja macrostachya</i> Wall. ex Benth.	Búp lẹ chùm to	-	Butter fly bushes	Flower	Yellow	Rice		Boiling Food
13	Buddlejaceae	<i>Buddleja officinalis</i> Maxim.	Mật mông hoa	Bóc phón/ Đọc pa lín	Butter fly bushes	Flower	Yellow	Rice		Boiling Food
14	Buddlejaceae	<i>Buddleja paniculata</i> Wall.	Búp lẹ chùm tụ tán	-	Butter fly bushes	Flower	Yellow	Rice		Boiling Food
15	Caesalpiniaceae	<i>Caesalpinia sappan</i> L.	Vang	Cò vang	Sapan wood	Wood	Red	Rice	Fibre	Boiling Food, textile (chi)
16	Curcubitaceae	<i>Momordica cochinchinensis</i> (Lour.) Spreng.	Gấc	Cọ gấc	Giant spine gourd	Coat seed	Red	Rice		Mixing with material, steaming or boiling
17	Dracaenaceae	<i>Dracaena cochinchinensis</i> (Lour.) S.C. Chen	Bồng bồng	-	Cambodia dragon tree	Stem	Red	Drink		Soaking in alcohol or boiling
18	Fabaceae	<i>Clitoria ternatea</i> L.	Đậu biếc	-	Butterfly pea	Flower	Blue	Rice		Coloring sticky rice
19	Fabaceae	<i>Dalbergia volubilis</i> Roxb.	Trắc leo	-	-	Ash	Black	Rice, Cake		Wooden ash, food,
20	Fabaceae	<i>Milletia</i> sp.	Cát sâm	-	India beech tree	Stem	Red	Drink		Soaking in alcohol, food
21	Fabaceae	<i>Vigna cylindrical</i> (L.) Skeels	Đậu đen	-	-	Seed	Black	Rice		Mixing with material, after that boiling, food
22	Iridaceae	<i>Eleutherin bulbosa</i> (Mill.) Urban	Sâm đại hành	Hom bố lượ	-	Corn	Red	Drink		Boiling or Soaking in alcohol, food
23	Malvaceae	<i>Hibiscus sabdariffa</i> L.	Bụp giấm	Bó xọn	Roselle	Fruit	Red	Drink		Boiling, food
24	Marantaceae	<i>Phrynium imbricatum</i> Gagnep.	Lá dong	-	-	Leaves	Green	Rice cake		Cover rice cake, steaming
25	Menispermaceae	<i>Fibraurea tinctoria</i> Lour.	Hoàng đằng	Cò hem	-	Stem	Yellow	Wine	Fibre	Boiling, textile
26	Moraceae	<i>Morus alba</i> L.	Dâu tằm	-	Mulberry	Fruit	Purple	Drink		Extraction by sugar
27	Myrsinaceae	<i>Embelia parviflora</i> Wall. Ex A. DC	Chua ngút	Xà là pẹt	-	Stem	Red	Drink		Soaking in alcohol
28	Myrtaceae	<i>Rhodomyrtus tomentosa</i> (Ait.) Hassk.	Sim	-	Rose myrtle	Fruit	Purple	Drink		Mixing fresh fruit with material and steaming or

29	Pandanaceae	<i>Pandanus amaryllifolius</i> Roxb.	Dứa thom	-	Panda leaves	Leaf	Green	Rice, Cake		Grinding fresh leaves, filtering and mix material to fresh leaves liquid, steaming or boiling for make cake, jelly (food)
30	Poaceae	<i>Oryza sativa</i> L. var. <i>glutinosa</i> Blanco	Lúa nếp	Phượng hầu nữ	Asian rice (sticky rice)	Wooden ash Seed	Black, Mordant	Rice, Cake	Cloth	Making black Chung cake; Boiling seed with fabric for mordants
31	Poaceae	<i>Thysanolaena maxima</i> (Roxb.) Kuntze	Chít	Khâu út	Tiger grass	Leaf	Yellow	Rice cake	Fibre	Cover rice cake, Giay traditional cake (food) Boiling fresh leaves to dye thread (Dao)
32	Polygonaceae	<i>Reynoutria japonica</i> Houtt.	Cốt khí củ	Nhà mềng lai/ Cầu trâu	Japanese knot weed	Tuber	Yellow	Sticky rice	Fibre	Grinding or boiling to dye thread.
33	Verbenaceae	<i>Gmelina arborea</i> Roxb. Ex Sm.	Lối thọ	Cọ phặng	White teak	Flower	Yellow	Rice		Boiling, soaking rice in this extraction (food)
34	Rubiaceae	<i>Luculia gratissima</i> (Wall.) Sweet	Gạc nai	-	-	Wood	Yellow	Drink		Boiling, Soaking in alcohol Food
35	Rubiaceae	<i>Morinda citrifolia</i> L.	Nhàu	-	Noni	Root, Bark	Yellow		Fibre	Boiling
36	Rubiaceae	<i>Paederia foetida</i> (Lour.) Merr.	Mơ dây	-	Skunk	Leaf	Green			Grinding, mixing with rice to make rice cake
37	Smilacaceae	<i>Smilax glabra</i>	Khúc khắc	Cọ khúc khắc	-	Stem	Red	Drink	Fibre	Boiling, Textile
38	Urticaceae	<i>Boehmeria nivea</i> (L.) Gaudich.	Lá gai	-	Ramie	Leaf	Black	Cake		Boiling with lime water, grinding with rice and steaming to make gai cake (tay and nung traditional cake)
39	Zingiberaceae	<i>Alpinia gagnepainii</i> (Gagnep.) K. Schum	Riềng	-	-	Leaf	Green	Rice		Grinding fresh leaves, mix with glutinous rice for make chung cake to require green color
40	Zingiberaceae	<i>Alpinia officinarum</i> Hance	Riềng	-	-	Leaf	Green	Rice		Grinding fresh leaves, mix with glutinous rice for make chung cake to require green color
41	Zingiberaceae	<i>Curcuma longa</i> L.	Nghệ vàng	Mịn đăm	Curcuma	Rhizomes	Yellow	Rice	Fibre	Steamed sticky rice, dyeing thread
42	Zingiberaceae	<i>Curcuma zedoaria</i> (Christm) Rosc.	Nghệ đen	-	-	Rhizomes	Yellow	Rice	Fibre	Grinding and mixing with material
43	Zingiberaceae	<i>Zingiber officinale</i> Roscoe	Gừng	Khinh	Ginger	Leaves	Green	Rice		Grinding fresh leaves, mix with glutinous rice for make chung cake to require green color

*Plant name can be found in Vietnam checklist of plants (Bản 2003, 2005)

Table 1: Checklist of natural colorant plants for food that used by ethnic people in Northern Vietnam.

evenly in rice, then used the mixture to make black glutinous rice cakes [9]. Meanwhile, the Tay and Nung groups (Muong Khuong district, Lao Cai province) use ash of Muối tree (*R. chinensis*) to dye cake black.

Unique techniques of creating colors: Ethnic minorities have unique experience of creating different colors in food processing. Here are some experiences in common use,

Changing pH: Taking advantage of a modified color pigments in the material according to pH of the extract, the ethnic minorities have used pickles water (low acidic, pH) and lime water (high alkaline, pH)

to correct the colors of extracts [10]. Extracts from fresh turmeric (*C. longa*) if used to dye immediately would create yellow, if added pickles water (low pH) the extract environment would switch to acid and make orange, if added lime water (high pH) the extract would turn yellow-green to dye food. This experience is used commonly among the Tay, Nung, Giay, etc.

Creating different colors from one species: With their unique experience, from the same material with different processing methods, the ethnic minorities can create different colors to dye food. This is



Figure 6: Black Chung cake is made by Tay group in Cao Bang Province, Chirita speciosa.



Figure 7: Nhà ngài cake, colored using *Artemisia vulgaris*. Tay traditional cake used during the 3 March festival (slan ma or the grave visit festival) in the province of Cao Bang.



Figure 8: The blooming season of Mat Mong (*Buddleja officinalis*) is in March.

the experience we noted when investigating at Nung ethnic groups in Muong Khuong district, Lao Cai province [11]. From the leaves of *P. bivalvis* (Cắm, Chằm lai) which varieties often make purple, if fresh leaves are pounded with cold water and filtered out of residue a black solution will be gained, if fresh leaves are boiled in hot water a lighter purple solution will be collected.

Coordinate the materials: During the coloring process, the Nung (Muong Khuong, Lang Son province) may create unavailable colors by combining these trees to dye during processing. When leaves of *Peristrophe bivalvis* are boiled in hot water a purple solution will be collected. Besides, extract from fresh leaves of this plant combined with ash from *Dalbergia volubilis* would create blue [12]. If the combination of three species (*P. bivalvis*, *D. volubilis* and *B. officinalis*) is used, a dyeing solution of teal will come out by the following steps: soak rice in the extract from flower of *B. officinalis* to make it yellow, Figure 8 then soak yellow rice in the solution obtained from fresh leaf extract of *P. bivalvis* added with ash from *D. volubilis*. Depending on the amount of ash in the extract, we shall get the color with various shades of green.

No.	Name of extraction	Color shapes	Processing	pH
1	Cắm (red)	Red	Boiling leaves in water	6
2	Cắm (purple)	Dark purple	Boiling leaves in water	6,5
3	Cắm (purple)	Violet	Grinding fresh leaves	8
4	Cắm (purple)	Blue	Grinding fresh leaves + ash of Trắc wooden (<i>Dalbergia</i>)	9
5	Cắm (purple)	Duck neck blue (sapphire)	Grinding fresh leaves + ash of Trắc wooden (<i>Dalbergia</i>), extraction of <i>Buddleja</i> flowers	9
6	Mặt mông hoa	Yellow	Boiling flowers	6

Table 2: pH of extractions of colorant plants.

From our point of view, at a certain angle, pH decides colors of the extracts. Here are pH values of some key extracts (Table 2). However, from experience of the people, when the ash is added into Cam leaves extraction, they have to put inch by inch and always try color. On the other hand, the quality of glutinous rice decides partly the showy beauty.

Conclusion

Plant-derived dyes persist at the study sites for their important role in dyeing food and traditional costumes. The most prevalent use of documented dye plants is to color food, specifically glutinous rice [13]. The pigments derived from dye plants at the study site including red, blue, black, purple, yellow and brownish red. These dyes are derived from various plant parts including roots, leaves, flower, stems, bark, tuber, and seed-coat. We recorded forty three plant species that using as traditional colorant plants by ethnic people. Especially, in festivities and weddings, it is essential for ethnic people to have foods and steamed glutinous rice dyed with natural colorants from plants. These foods have special symbolic meanings to each ethnic minority. Colors and dyeing plants once played important roles in the culture of ethnic minority groups. Traditionally, knowledge of dye plants and their processing was transferred from mother to daughters. The elderly in communities have kept this knowledge. The indigenous knowledge in the utilization of colorant plants in ethnic communities is unique and valuable. However, the transmission of knowledge from the old to the young has decreased and impeded by the deaths of the elders, many young people look for jobs outside of their communities [14]. Therefore, it is urgent to collect and systematize this knowledge. In this study, we do not mention that modernization impacts knowledge of the colorants. This issue will be reported in another publication.

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