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Article

Taxonomic characteristics of the *Melastoma* L. species in ngoc thanh commune, vinh phuc province

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Abstract

Melastoma L. (Melastomataceae Juss.) is an important component in the secondary forests ecosystem in Ngoc Thanh commune, Phuc Yen city, Vinh Phuc province. Four species and one subspecies of this genus have been recorded in the Ngoc Thanh commune. A detailed description along with their distribution, habitat, ecology, and photo has been provided to aid species identification. The key to identify all taxa of this genus in Ngoc Thanh commune has been constructed.
Keywords: Taxonomic, identification, Melastoma, Melastomataceae, Ngoc Thanh commune

1. Introduction

Ngoc Thanh commune is located in the north of Phuc Yen city, Vinh Phuc province, with an area of 7732.68 ha, accounting for 64.3% of the natural area of Phuc Yen city. Thanks to the hinge position between the delta and mountainous regions, Ngoc Thanh commune possesses an extremely rich flora, especially vascular plants. Shrub and medium-sized tree species dominate the forest ecosystems in this area. Among the shrub species, it is easy to find the *Melastoma* species along the trails, along streams or in the wilds, etc.

Melastoma L. genus is one of 27 genera belonging to the family Melastomataceae Juss. recorded in Vietnam [3, 4, 6, 8-10]. Species of this genus are present in many places and play an important role in the ecosystems of secondary forests and scrublands in Vietnam, including in Ngoc Thanh commune. Currently, approximately 142 organic compounds have been isolated by scientists from *Melastoma* spp., mainly flavonoids, tannins, and many organic acids with high medicinal properties [7]. Pharmacological activities of *Melastoma* spp. have also been reported, including anticancer, anti-inflammatory, antioxidant, antibacterial, antidiarrheal, and wound healing [7]. In Vietnam, people in many localities have been using parts of *Melastoma* spp. in the traditional herbal remedies to treat diarrhea, hemorrhoids, toothache, stomachache, and wound healing. Factly, the vernacular name

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"Mua" is used as a common name for many species in this genus by the local people in Ngoc Thanh commune, leading to confusion among the species during the process of collecting medicinal plants. Therefore, taxonomic studies on the genus *Melastoma* in Ngoc Thanh commune are necessary to contribute to improving the identification and use of *Melastoma* species in this place.

The attempt of this study was to describe the morphological characteristic, specimen, habitat, ecology, distribution, and use value (if any) of *Melastoma* species collected in Ngoc Thanh commune, Phuc Yen city, Vinh Phuc province.

2. Materials and Methods

The study area covers Ngoc Thanh commune, Vinh Phuc province, Vietnam. The collected specimens were processed and preserved in the herbarium of the Botany laboratory, Hanoi Pedagogical University 2 (HPU2). In addition, we also researched dry specimens that were kept in the herbarium of Hanoi National University (HNU) and the herbarium of Institute of Ecology and Biological Resources, Hanoi (HN). On the other hand, photographs of herbarium sheets were obtained (or downloaded) from K, L, and P. The identification of species belonging to this genus was confirmed in consultation with standard literature [3-6, 8-10]. Updated nomenclature is determined by consulting The Plant List (2022), a working list of all plant species.

3. Taxonomic treatment

3.1. Taxonomic characteristics of the genus Melastoma L. in Ngoc Thanh commune

Melastoma L. 1753. Sp. Pl. 1: 389; Lour. 1790. Fl. Cochinch. 1: 173; Guill. 1921. Fl. Gén. Indo-Chine 2(7): 879; Phamh. 2000. Illustr. Fl. Vietn. 2: 72; Renner, 2001. Fl. Thailand, 7(3): 438; Meyer, 2001. Blumea, 46: 351; Nguyen K.D., 2003. Check. Pl. Sp. Vietn. 2: 915; Chen J. & Renner, 2007. Fl. China, 13: 363. – Type: *Melastoma malabathricum* L.

– *Otanthera* Blume, 1831. Flora 14: 488. – Type: *Otanthera moluccana* Blume.

– Vernacular name: Mua, muôi

Erect or procumbent shrubs; young stems 4-sided or nearly terete, with bristles or scales. Leaves opposite, petiolate; leaf blade lanceolate, ovate or elliptic, usually strigose or subvillous on both surfaces, sometime almost glabrous; lateral veins 1-3 paired, tertiary veins numerous and parallel. Inflorescences terminal or in distal leaf axils, cymose, rarely flowers solitary. Flowers normally 5-merous (rarely 4-, 6- or 7-merous); bracts ovate to elliptic or lanceolate, abaxially strigose or almost glabrous, margin ciliate. Hypanthium campanulate, scatteredly to densely covered with bristles or scales, rarely glabrous; calyx lobes triangular to lanceolate, margin bristly ciliate. Petals lavender to purple, ovate to obovate, apical oblique. Stamens dimorphic, the episepalous stamens are longer than the epipetalous ones. Longer stamens with lavender to purple anthers; connective long extended at base, curved, apex 2-tuberculate. Shorter stamens with yellow anthers; connective not extended but with 2-tuberculate. Ovary half inferior, normally 5-celled (rarely 4-, 6- or 7-celled), placenta axile, and apically bristly. Style filiform, as long as petals. Fruit a freshy capsule or sometimes berry-like, strigose or scales (rarely glabrous). Seeds numerous, small, cochleate and embedded in pulp.

In Southeast Asia, India, South China, Japan, Northern Australia and Oceania, about 50 species have been described [6]. In Ngoc Thanh commune, on the basis of analysis and examination of collected specimens, we have identified four species and one subspecies belonging to the genus *Melastoma*.

3.2. Taxonomic key to species of genus Melastoma L. in Ngoc Thanh commune

1A. Creeping shrub, often rooting at the nodes; indehiscent berry-like, globose .....***M. dodecandrum***
1B. Erect shrub, not rooting at the nodes; dehiscent fleshy capsule, campanulate .....(2)
2A. Young stem nearly terete ..... ***M. malabathricum* ssp. *normale***
2B. Young stem 4-sided.....(3)
3A. Young stem scatteredly covered with scales; hypanthium densely covered with appressed scales ....***M. candidum***
3B. Young stem scatteredly to densely covered with bristles; hypanthium scatteredly to densely covered with spreading bristles.....(4)
4A. Young stem and hypanthium densely covered with reddish bristles, 3-10 mm long .... ***M. sanguineum***
4B. Young stem and hypanthium scatteredly covered with white bristles, 1.5-2 mm long .. .. ***M. bauchei***

3.3. Taxonomic characteristics of the Melastoma species in Ngoc Thanh commune

3.3.1. ***Melastoma dodecandrum*** Lour. 1790. FI. Cochinch. 1: 274; Phamh. 2000. Illustr. Fl. Vietn. 2: 73; Meyer, 2001. Blume, 46: 362; Chen J. & Renner, 2007. Fl. China, 13: 364.

– *Melastoma repens* Desr. 1797. Encycl. 4: 54.

– Vernacular name: mua lùn, mua thấp, mua 12 tiểu nhị.

Creeping shrub, often rooting at the nodes, 25-30 high; young stems 4-sided, scatteredly covered with bristles. Leaf blade ovate to elliptic, 2-4 × 1-1.5 cm, strigose or almost glabrous on both surfaces; lateral veins 1-2 paired; petiole 2-10 mm long. Inflorescences terminal, cymose, (1-)3-flowered; flowers normally 5-merous (rarely 4- merous). Bracts ovate, 2-4 × 1.5-2 mm, abaxially almost glabrous, margin ciliate. Hypanthium campanulate, 4-6.5 × 3-4 mm, scatteredly covered with bristles or almost glabrous; calyx lobes triangular, 2-5 × 1-3 mm, margin ciliate; intersepalar emergences penicillate, c. 1 mm, crowned by 2-3 bristles. Petals lavender to purple, obovate, 1-1.5 × 0.7-0.8 cm. Outer stamens, episepalous: yellow filaments 4-6 mm long; connective long extended at base, 4-6 mm long, curved, apex 2-tuberculate, c. 1-2 mm long; lavender anthers 5-6 mm long. Inner stamens, epipetalous, yellow: filaments 4-6 mm long; connective not extended but with 2-tuberculate; anthers 4-5 mm long. Ovary normally 5-celled (rarely 4- celled), apically bristly. Style filiform, 1-1.5 cm long. Fruit indehiscent berry-like, globose, 7-8 × 6-7 mm; reddish seeds (Fig. 1).

Figure 1. *Melastoma dodecandrum* Lour.: (1) flowering plant; (2) flowering branch; (3) leaf; (4) inflorescence; (5) bracteole; (6) flower lack petals; (7) hypanthium and style; (8) abaxially petal; (9) adaxially petal; (10) stamen; (11) fruit; (12) seed. (photo by V.-Q. Khuat, 2017, Me Linh station for biodiversity, Ngoc Thanh commune)

Loc. class.: Vietnam (Cochinchine); **Type:** Herb. Jussieu s.n. (n.v.)

Habitat and ecology: this species is usually growing on moist soils near forests, at the foot of limestone mountains.

Phenology: flowering April-June, fruit ripening June-October.

Locality: Thanh Loc forest, Me Linh station for biodiversity, Dai Lai lake.

Specimens examined: Vinh Phuc prov. (Ngoc Thanh commune) Khuat V.Q. QH0003, QH0004, QH0005 (HPU2). – Thai Nguyen prov., s.n. (HN); Pételot 1323 (HNU). – Lang Son prov., Bien L.K. 5989 (HN). – Quang Ninh prov., Tuoi P.M. 53 (HN). – Ha Noi city, Pételot 1324 (HNU). – Hoa Binh prov., Khoi N.D. 5656 (HN); s.n. (HNU). – Nghe An prov., Tiep N.A. 801 (HN).

Local uses: Roots are used to treat boils, blood stasis, rheumatism, and edema in women after childbirth. Crushed leaves mixed with urine, grilled to cover pain caused by broken limbs; leaves decoction to treat scabies, itching, foot ulcers and snakebites. The ripe fruit is edible [1, 2].

3.3.2. ***Melastoma malabathricum*** L. ssp. ***normale*** Meyer, 2001. Blume, 46: 364; Renner et al. 2001. Fl. Thailand, 7(3): 443.

– *Melastoma normale* D. Don, 1825. Prodr. Fl. Nep. 220.

– Vernacular name: mua thường, muôi thường, mua an bích, muôi an bích.

Erect shrub, 1.5-4 m high; young stems nearly terete, densely covered with spreading or erect bristles. Leaf blade elliptic to ovate, 6-14 × 3-7 cm, pilose on both surfaces; lateral veins 1-2 paired; petiole 0.7-1.5 cm long. Inflorescences terminal or in distal leaf axils, cymose, 3-10- flowered; flowers 5-merous. Bracts lanceolate, 6-8 × 2-4 mm, outside hairy, inside glabrous. Hypanthium campanulate,

6-10 × 6-8 mm, covered with long appressed golden scales; calyx lobes triangular, 6.5-12 × 3-5 mm, margin ciliate; intersepalar emergences simple. Petals lavender to purple, ovate, 2.2-2.5 × 1.8-2 cm. Outer stamens, episepalous: yellow filaments 8-10 mm long; connective long extended at base, 5.5-7 mm long, curved, apex 2-tuberculate, c. 1.5-2 mm long; lavender anthers 7.5-9 mm long. Inner stamens, epipetalous, yellow: filaments 7.5-8 mm long; connective not extended but with 2-tuberculate; anthers 6.5-7 mm long. Ovary 5-celled, apically bristly. Style filiform, 1.5-2 cm long. Fruit dehiscent fleshy capsule, campanulate, 6-10 × 6-10 mm; yellow seeds (Fig. 2).

Figure 2. *Melastoma malabathricum* L. ssp. *normale* Meyer: (1) flowering plant; (2) flowering branch; (3) leaf; (4) young stem; (5) inflorescence; (6) flower; (7) scale covers outside hypanthium; (8) adaxially petal; (9) abaxially petal; (10) stamen; (11) calyx lobe; (12) ovary and style; (13) fruit; (14) seed. (photo by V.-Q. Khuat, 2017, Thanh Loc forest, Ngoc Thanh commune)

Loc.class.: Nepal; **Type:** Hamilton s.n. (K!) (photo).

Habitat and ecology: grows scattered in open forests or in land hills. Light-loving, good regeneration by seeds.

Phenology: flowering March-May, fruit ripening April-July.

Locality: Thanh Loc forest, Me Linh station for biodiversity, Dai Lai lake, Dong Cau, Dong De, Thanh Cao, and Lap Dinh.

Specimens examined: Vinh Phuc prov. (Ngoc Thanh commune) Khuat V.Q. QH0037, QH0038, QH0039 (HPU2); 4399 (HN); Duc N.M. et al. 03 (HNU). – Tuyen Quang prov., 4017 (HNU). – Thai Nguyen prov., Gramain A. et al. 662 (HN). – Ninh Binh prov., Loc P.K. P7108 (HNU). – Thanh Hoa prov., Quy N.K. 13 (HNU). – Nghe An prov., Chan V.V. VVC262 (HNU). – Quang Binh prov., Tue H.V. 773 (HN). – Kon Tum prov., Averyanov L. et al. VH183 (HN). – Lam Dong prov., Loc P.K. P7722 (HN).

Local uses: whole plant is used to treat dysentery, indigestion, and healing skin wounds [1,2].

3.3.3. ***Melastoma candidum*** D. Don, 1823. Mem. Wern. Nat. Hist. Soc. 4: 288; Guillaumin, 1921. Fl. Gén. Indo-Chine, 2: 880; Huang S.F. & Huang T.C. 1993. Fl. Taiwan, 3: 918.

– *Melastoma septemnervium* Lour. 1790. Fl. Cochinch. 1: 173, non Jacq. (1763.).

– Vernacular name: mua vảy, muôi trắng, muôi bảy gân.

Erect shrub, 1-2.5 m high; young stems 4-sided, scatteredly covered with golden-brown scales. Leaf blade elliptic to ovate, 4.5-12 × 2-6 cm, strigose or subvillous on both surfaces; lateral veins 1-2 paired; petiole 5-18 mm long. Inflorescences terminal or in distal leaf axils, cymose, few-flowered; flowers 5-merous. Bracts ovate, 10-21 × 5-13 mm, covered with appressed hairs on both sides. Hypanthium campanulate, 6-13 × 6-9 mm, densely covered with appressed golden scales; calyx lobes lanceolate, 8-11 × 3-6 mm, hairy on both sides; intersepalar emergences lanceolate, with bristles. Petals lavender to purple, obovate, 27-32 × 19-25 mm. Outer stamens, episepalous: yellow filaments 7-11 mm long; connective long extended at base, 7-9 mm long, curved, apex 2-tuberculate, 1.5-2.5 mm long; lavender anthers 9-12 mm long. Inner stamens, epipetalous, yellow: filaments 7-8 mm long; connective not extended but with 2-tuberculate; anthers 8-9 mm long. Ovary 5-celled, apically bristly. Style filiform, 18-20 mm long. Fruit dehiscent fleshy capsule, campanulate, 8-12 × 7-10 mm; reddish seeds (Fig. 3).

Figure 3. *Melastoma candidum* D. Don: (1) flowering plant; (2) leaf; (3) inflorescence; (4) bract; (5) adaxially petal; (6) stamen; (7) hypanthium, ovary, style, and calyx lobe; (8) calyx lobe; (9) lanceolate intersepalar emergence; (10) scale covers outside hypanthium; (11) fruit; (12) open fruit; (13) seed. (photo by V.-Q. Khuat, 2017, Thanh Loc forest, Ngoc Thanh commune)

Loc.class.: China; **Type:** not designated.

Habitat and ecology: grows scattered or forms dominant population on land hills, grasslands, path at edge of fields in high mountainous areas.

Phenology: flowering March-May, fruit ripening June – August

Locality: Thanh Loc forest, Me Linh station for biodiversity, Dai Lai lake, Dong Cau, Dong De, Thanh Cao, and Lap Dinh.

Specimens examined: Vinh Phuc prov. (Ngoc Thanh commune) Khuat V.Q. QH0026, QH0027, QH0028, QH0029, QH0030 (HPU2); Y60 (HN); Nga V.T.T. 132 (HNU). – Cao Bang prov., Loc P. K. el al. CBL 726 (HN). – Phu Tho prov., Phuong V.X. 6237 (HN). – Ha Tinh prov., Khoi N.D. 946 (HN); Loc P.K. P7136 (HNU). – Thua Thien Hue prov., Thuan L.T. 91 (HN). – Da Nang city, Phuong 8630 (HN). – Kon Tum prov., Bien L.K. 860 (HN).

Local uses: Roots are used to treat indigestion, hepatitis, vomiting blood, and hematoma. Fresh or dried leaves, after crushing or pulverizing, can be applied to burns or wounds to help stop bleeding [1, 2].

3.3.4. ***Melastoma sanguineum*** Sims. 1821. Bot. Mag. 48: 2241; Clarke. 1879. Fl. Brit. India, 2: 524; Phamh. 2000. Illustr. Fl. Vietn. 2: 75; Meyer, 2001. Blume, 46: 379; Renner et al. 2001. Fl. Thailand, 7(3): 447; Chen J. & Renner, 2007. Fl. China, 13: 364.

– *Melastoma chevalieri* Guillaumin, 1921. Bull. Soc. Bot. France 68: 3.

– Vernacular name: mua bà, muôi bà, mua đỏ.

Erect shrub, 1-4 m high; young stems 4-sided, covered with reddish bristles. Leaf blade elliptic to lanceolate, 3-24 × 1-10 cm, glabrous or strigose on both surfaces; lateral veins 2-3 paired; petiole 1-3.5 cm long. Inflorescences terminal or in distal leaf axils, cymose, 2-6-flowered; flowers normally 5-merous (rarely 6- or 7-merous). Bracts ovate, 4-12 × 2-10 mm, the outside covered with bristles, the inside glabrous. Hypanthium campanulate, 0.7-1.6 cm long, densely covered with reddish bristles, 0.3-1 cm long; calyx lobes lanceolate, 0.6-1 × 0.4-0.6 cm, the outside covered with bristles, the inside glabrous; intersepalar emergences 0.4-0.8 cm long, covered with bristles. Petals lavender to purple, obovate, 3.3-4.6 × 2.2-3.2 cm. Outer stamens, episepalous: lavender filaments 1.6-2 cm long; connective long extended at base, 1.7-2.2 cm long, curved, apex 2-tuberculate, 2-2.5 mm long; lavender anthers 1-1.5 cm long. Inner stamens, epipetalous: lavender-yellow filaments 1.2-1.4 cm long; connective not extended but with 2-tuberculate; lavender-yellow anthers 1.1-1.2 cm long. Ovary normally 5-celled (rarely 6- or 7-celled), apically bristly. Style filiform, 2.7-3.2 cm long. Fruit dehiscent fleshy capsule, campanulate, 0.8-2 × 0.7-1.5 cm; orange seeds (Fig. 4).

Figure 4. *Melastoma sanguineum* Sims.: (1) flowering plant; (2) leaf; (3) inflorescence; (4) flower; (5) bract; (6) adaxially petal; (7) flower lack petals; (8) calyx lobe and intersepalar emergence; (9) stamen; (10) hypanthium, ovary, and style; (11) bristle covers outside hypanthium; (12) open fruit; (13) seed. (photo by V.-Q. Khuat, 2017, Me Linh station for biodiversity, Ngoc Thanh commune)

Loc. class.: Indonesia; **Type:** Elbert s.n. (L!) (photo).

Habitat and ecology: commonly grows on land hills, forest edges, scrublands, wet and well-lit places.

Phenology: flowering July-August, fruit ripening September-October.

Locality: Thanh Loc forest, Me Linh station for biodiversity, Dai Lai lake, Thanh Cao, and Lap Dinh.

Specimens examined: Vinh Phuc prov. (Ngoc Thanh commune) Khuat V.Q. QH0013, QH0014, QH0015 (HPU2); Ban N.T. et al. LX-VN151 (HN); Loc P.K. P2416 (HNU). – Lao Cai prov., Harder D.K. et al. DKH 4749 (HN). – Lang Son prov., Loc P.K. P7080 (HNU). – Quang Ninh prov., Vinh L.Q. LN071 (HN); Bich D.H. 881 (HNU). – Hoa Binh prov., Nghia T.D. T1212 (HN). – Thanh Hoa prov., Kham V. DC0005 (HN). – Thua Thien Hue prov., Tue H.V. 579 (HN). – Đa Nang city, Phuong V.X. 4825 (HN). – Kon Tum prov., Averyanov L. VH968 (HN). – Dak lak prov., Bien L.K. 1141 (HN). – Lam Dong prov., Averyanov L. VH2486 (HN).

Local uses: Roots are used to treat liver diseases, jaundice, headache, and toothache. Roots, leaves and fruits treat diarrhea and vaginal diseases [1,2].

3.3.5. ***Melastoma bauchei*** Guillaumin, 1912. Notul. Syst. 2: 303; 1921. Fl. Gén. Indo-Chine 2: 886; Phamh. 2000. Illustr. Fl. Vietn. 2: 72.

– *Melastoma trungii* Pócs & Tiep, 1965. Ann. Hist. Nat. Mus. Natl. Hung. 57: 167.

– Vernacular name: mua bauche, muôi bauche, mua bụi.

Erect shrub, 30-50 cm high; young stems 4-sided, scatteredly covered with bristles. Leaf blade elliptic to ovate, 2-5.5 x 1-3.5 cm, strigose on both surfaces; lateral veins 1-2 paired; petiole 2-5 mm long. Inflorescences terminal, cymose, 3-5-flowered; flowers 5-merous. Bracts elliptic, 5-10 × 3-4 mm, the outside covered with bristles, the inside glabrous. Hypanthium campanulate, 5-10 × 3-5 mm, scatteredly covered with white bristles, c. 1.5-2 mm long; calyx lobes elliptic to spatulate, 5-10 × 2-3.5 mm, the outside covered with bristles, the inside glabrous; intersepalar emergences penicillate, c. 2-2.5 mm, crowned by 2-3 bristles. Petals lavender to purple, obovate, 20-22 × 10-12 mm. Outer stamens, episepalous: yellow filaments 8-9 mm long; connective long extended at base, 7-8 mm long, curved, apex 2-tuberculate, 1-1.4 mm long; lavender anthers 5-5.5 mm long. Inner stamens, epipetalous, yellow: filaments 5-6 mm long; connective not extended but with 2-tuberculate; anthers 4.5-5 mm long. Ovary 5-celled, apically bristly. Style filiform, c. 16 mm long. Fruit dehiscent fleshy capsule, subglobose, 6-9 × 6-8 mm; yellow seeds (Fig. 5).

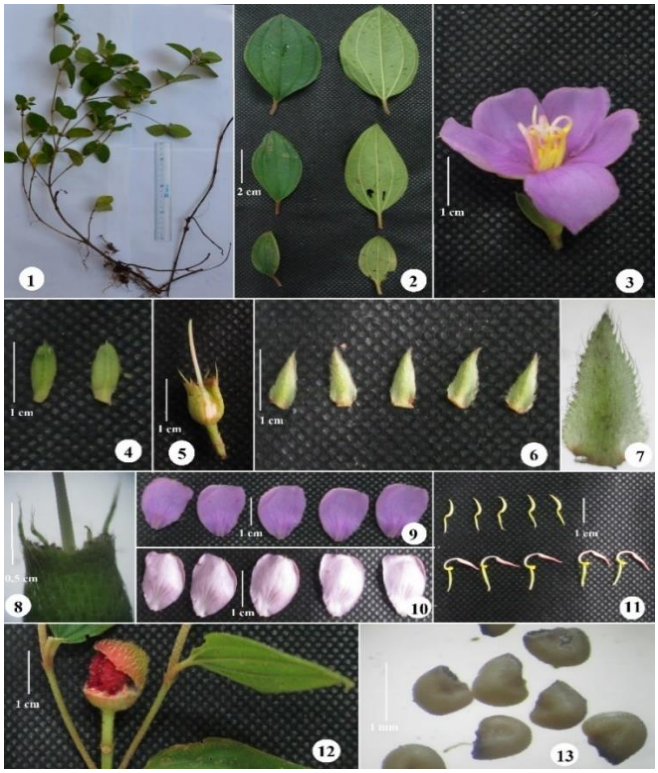

Figure 5. *Melastoma bauchei* Guillaumin: (1) flowering plant; (2) leaf; (3) flower; (5) bract; (6) hypanthium, ovary, and style; (6-7) calyx lobe; (8) intersepalar emergence; (9) adaxially petal; (10) abaxially petal; (11) stamen; (12) open fruit; (13) seed. (photo by V.-Q. Khuat, 2017, Thanh Loc forest, Ngoc Thanh commune)

Loc.class.: Vietnam (Quang Tri); **Type:** Bauche 114 (P!) (photo).

Habitat and ecology: grows scattered in the mountains.

Phenology: flowering July, fruiting August.

Locality: Thanh Loc forest, Dong Cau, and Lap Dinh.

Specimens examined: Vinh Phuc prov. (Ngoc Thanh commune) Khuat V.Q. QH0009, QH0010, QH0011 (HPU2). – Ha Tinh prov., Loc P.K. 7181 (HNU).

Local uses: Whole plant is used as green manure and firewood. The ripe fruit is edible [1,2].

4. Conclusions

Four species and one subspecies of the genus *Melastoma* L. (Family: Melastomataceae Juss.) have been recorded in the Ngoc Thanh commune, Vinh Phuc province. A detailed description along with their distribution, habitat, ecology, and photo has been provided to aid species identification. The results of this study will be a premise for studying the taxonomy of the genus *Melastoma* in particular and the family Melastomataceae in general in Vietnam.

Declaration of Competing Interest

The authors declare no competing interests.

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