SUMMARY OF DISSERTATION

Name of Doctoral candidate: Doan Thai Hung

Dissertation title: Study on chemical constituents and biological activities of the medicinal plant *Polygala arillata* Buch.-Ham. ex D. Don, (Polygalaceae).

Speciality: Traditional Pharmacy **Code of speciality**: 972.02.06

Name of academic advisors:

1. Assoc. Prof. Dr. Phuong Thien Thuong
2. Assoc. Prof. Dr.Sc. Nguyen Minh Khoi

Name of academic institute: Vietnam National Institute of Medicinal Materials

Summary of the dissertation:

1. Objectives

- *Botanical properties*: Identification of the scientific name of the research sample.
- *Chemical constituents*: Isolation and structural elucidation of constituents from roots of *P. arillata*.
- *Biological activities*: Evaluation of some biological activities (Anti-inflammatory and analgesic activities) of extracts and isolated compounds from the roots of *P. arillata*.

2. Methods

2.1. Botanical study

- Identification of the scientific name of the plant samples on the basis of the morphological characteristics comparison with key taxonomy of species, varieties of the genus *Polygala* (family Polygalaceae) in taxonomic reference books and the standard specimens. Scientific name of the plant samples was expertised by Vietnamese taxonomic botanists.
- Investigation of microscopic characteristics including leaves, stems, and roots. Preparations of specimens by using the double-dyed method. Photographic documentation of the microscopic characteristics was observed under stereomicroscope.

2.2. Phytochemical study

- *Qualitative analysis*: Determination of major chemical groups in the roots of *Polygala arillata* by using specific chemical reactions.
- *Extraction and isolation of chemical constituents*:

+ Extraction of plant materials using ethanol, and subsequently successive partitioning of the extract using increasing polarization solvents (*n*-hexan, ethyl acetate, *n*-butanol).

+ Isolation and purification of compounds by column chromatographic method using silica gel, reverse-phase RP-C_{18} as adsorbents and Sephadex LH-20.

- *Structural elucidation of isolated compounds*: On the basis of the analyses of physical properties (morphology, melting point), spectroscopic data (UV, IR, MS, NMR), and comparison with the literature data.

2.3. Biological study

- Research samples: ethanol extract (VCE) and *n*-butanol fraction (VCB) of roots of *Polygala arillata*.

- Evaluation of peripheral analgesic effect in acetic acid-induced writhing assay.

- Evaluation of inhibitory activity on production of LPS-stimulated NO in RAW 264.7 macrophages by Griess reagent assay.

- Evaluation of acute anti-inflammatory activity in carrageenan-induced paw edema on rats according to Winter method.

- Evaluation of chronic anti-inflammatory activity in the cotton pellet-induced granuloma model.

3. Results and Conclusion

3.1. Botanical properties

- The plant samples were identified as *Polygala arillata* Buch.- Ham.ex D. Don, (Polygalaceae).

- Morphological characteristics including leaves, stems, roots, flowers, fruits, seeds of *Polygala arillata* were documented. The microscopic characteristics of leaves, stems, roots were also described.

3.2. Chemical constituents

- The major chemical groups contained in roots of *Polygala arillata* were identified as amino acids, polysaccharides, organic acids, phenolic compounds.

- Sixteen compounds were isolated from roots of *Polygala arillata* and identified as 1,7-dihydroxy-4-methoxyxanthone (**VC1**), 1,3-dihydroxyxanthone (**VC2**), 1,7-dihydroxyxanthone (**VC3**), 1-methoxy-2,3-methylendioxyxanthone (**VC4**), 1,7-dimethoxyxanthone (**VC5**), 4-hydroxy-2-methylenbutanoic acid (**VC6**), syringic acid (**VC7**), ferulic acid (**VC8**), 1-*O*-(*n*-butyl-4-hydroxy-2-methylenbutanoat)-*β*-D-glucopyranose (**VC9**), tricornose B (**VC10**), 3-*O*-(*E*)-3,4,5-trimethoxycinnamoyl-6′-*O*-benzoylsucrose (**VC11**), tenuifoliside C (**VC12**), 3,6′-di-*O*-sinapoylsucrose (**VC13**), 3-*O*-(*E*)-feruloyl-6′-*O*-(*E*)-sinapoylsucrose (**VC14**), 1,4′-di-*O*-(*E*)-coumaroyl-3-*O*-benzoyl-2′,3′-di-*O*-*β*-D-glucopyranosyl-6′-*O*-acetylsucrose (**VC15**), arilloside A

(**VC16**). Among the isolates, **VC9** and **VC15** are new compounds. Compound **VC6** has been found in *Polygala* genus for the first time. Eight compounds (**VC1**-**3**, **VC5**, **VC7**, **VC8**, **VC10**, **VC11**) have been firstly isolated from species *Polygala arillata*.

3.3. Biological activities

- VCE showed peripheral analgesic effect at three doses of 700; 1400 and 2800 mg/kg body weight. Meanwhile, VCB reduced the writhing at the dose of 320 mg/kg.
- VCE and VCB significantly reduced the production of NO in the LPS-stimulated RAW 264.7 macrophage cells with the IC_{50} values of 2.51 and 4.57 µg/mL, respectively. Three isolated compounds **VC11-13** inhibited the production of NO with the IC_{50} values of 18.20; 10.47 and 20.42 µM, respectively.
- VCE and VCB displayed acute anti-inflammatory activities in carrageenan-induced rat paw edema assay at the doses of 700; 1400 mg/kg body weight (VCE) and 80; 160 mg/kg body weight (VCB).
- VCE and VCB showed chronic anti-inflammatory activities in the cotton pellet-induced granuloma model at the doses of 700 mg/kg and 160 mg/kg body weight, respectively.

Hanoi, May 10th, 2019

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