

# 東北医科薬科大学

## 審査学位論文（博士）要旨

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学位論文題名	Deciphering the Chemical Structures with Anti-Trypanocidal Properties and Identifying Distinctive Compounds in Scutellaria and Artemisia Plants Native to Mongolia (モンゴル国産 <i>Scutellaria</i> 属及び <i>Artemisia</i> 属植物に含まれる抗トリパノソーマ活性成分の化学構造解析)
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# Deciphering the Chemical Structures with Anti-Trypanocidal Properties and Identifying Distinctive Compounds in *Scutellaria* and *Artemisia* Plants Native to Mongolia

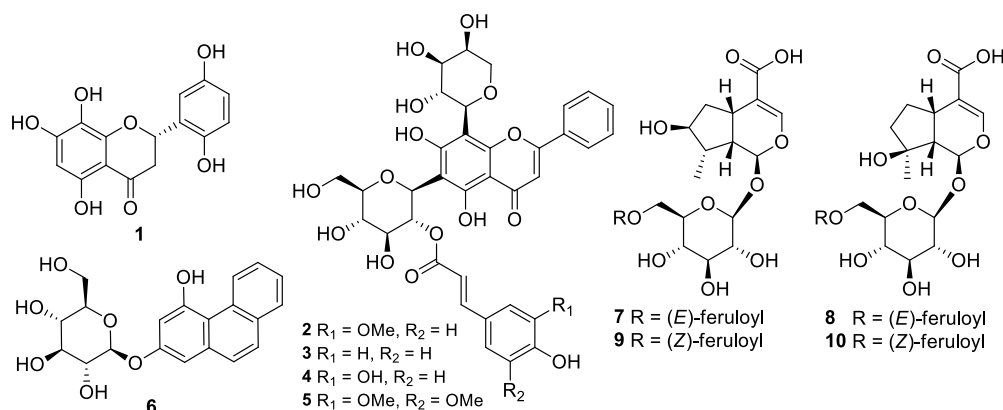
東北医科薬科大学大学院薬学研究科

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In this investigation, we have undertaken a comprehensive analysis of three distinct plant species: *Scutellaria scordiifolia*, *Artemisia siversiana*, and *Artemisia adamsii*, with the aim of elucidating their phytochemical potentials and therapeutic attributes in combating infectious diseases caused by *Trypanosoma* in livestock animals.

## Phytochemical investigation of *Scutellaria scordiifolia* and its trypanical activity<sup>1</sup>

This investigation unveiled 10 previously uncharacterized compounds, encompassing a flavanone (compound **1**), four chrysin derivatives with C-glycoside structures (compounds **2** – **5**), a phenanthrene glucoside (compound **6**), 4 iridoid glucosides (compounds **7** – **10**), in addition to 31 previously documented substances. The sugar configurations in the C-glycosides were determined by comparing their electric circular dichroism spectra with calculated data.

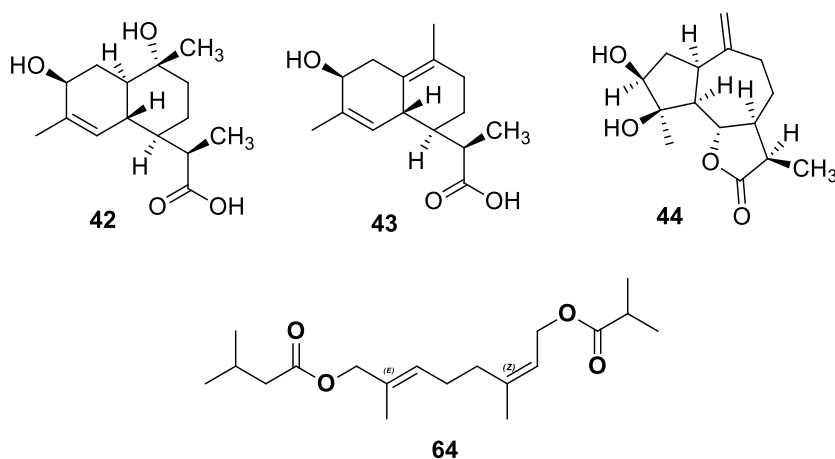


The new compounds purified from *Scutellaria scordiifolia*

Certain compounds within the categories of flavanones (compounds **1** and **17**), flavonols (compounds **11** – **13**), flavone (compound **14**), and specific flavone glucuronides (compounds **15** and **16**) exhibited significant trypanocidal effects against *Trypanosoma congolense*. The activity data and quantitative analysis of flavonoids using high-performance liquid chromatography (HPLC) from the aerial parts of *S. scordiifolia* indicate their potential effectiveness in treating diseases caused by the aforementioned trypanosomes.

## Isolation and evaluation of trypanocidal activity of sesquiterpenoids, flavonoids, and lignans in *Artemisia sieversiana* collected in Mongolia<sup>2</sup>

In this investigation, we isolated three new sesquiterpenoids (labeled as **42** – **44**) and one monoterpene (**64**) along with known substances from *A. sieversiana*, examining their characteristics. The complete structure of compound **42** was determined using single-crystal X-ray diffraction crystallography, revealing a configuration distinct from previously reported compounds with similar structures. Additionally, two other novel sesquiterpenoids (**43** and **44**) with analogous structures and determined their configurations. Furthermore, we evaluated the anti-trypanosomal effects of the isolated compounds (**42** – **59**) against *Trypanosoma congolense*, the pathogen responsible for fatal trypanosomiasis in animals. Flavonoids and lignans were identified as the active components, displaying IC<sub>50</sub> values ranging from 2.9 to 90.2 μM.

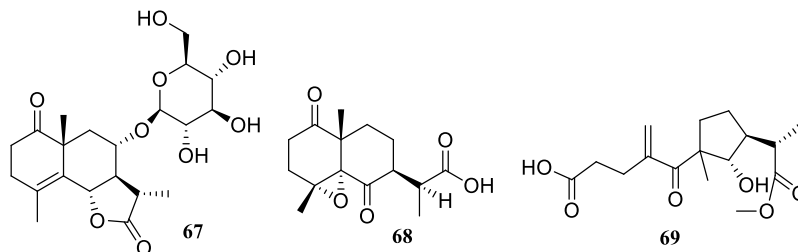


Isolated new compounds from *A. sieversiana*

## Phytochemical constituents of *Artemisia adamsii*

Within this study, three new sesquiterpenoids were isolated together with 23 known compounds which are flavonoids, coumarins and quinic acid derivatives. Additionally, all the isolated compounds were mentioned for the first time from *A. adamsii*. Until recently, comprehensive scientific information about the phytochemicals in this plant has been lacking. As a result, the reputed traditional uses of the plant have not been adequately supported by scientific evidence. Our findings, which reveal the phytochemicals of *A. adamsii*, may contribute to further research aimed at understanding

ecological interactions with animals and other plant species, as well as exploring the therapeutic applications of this plant.



Molecular structure of new sesquiterpenoids from *Artemisia adamsii*

1. **Nurbyek Stipan**, Buyanmandakh Buyankhishig, Keisuke Suganuma, Yoshinobu Ishikawa, Mika Kutsuma, Marie Abe, Kenroh Sasaki, Bekh-Ochir Davaapurev, Javzan Batkhoo, Toshihiro Murata (2023). Phytochemical investigation of *Scutellaria scordiifolia* and its trypanocidal activity. *Phytochemistry* 209, 113615.
2. **Stipan Nurbyek**, Toshihiro Murata, Keisuke Suganuma, Yoshinobu Ishikawa, Buyanmandakh Buyankhishig, Takashi Kikuchi, Tsesuren Byambajav, Bekh-Ochir Davaapurev, Kenroh Sasaki, Javzan Batkhoo (2020). Isolation and evaluation of trypanocidal activity of sesquiterpenoids, flavonoids, and lignans in *Artemisia sieversiana* collected in Mongolia. *J Nat Med* 74, 750–757.