

PHARMACOLOGICAL ACTIVITY OF *Selaginella doederleinii* Hieron: AN UPDATED  
REVIEW

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**ABSTRACT**

*Selaginella doederleinii*, a medicinal herb of general recognition that is a member of *Selaginellaceae* family, is prevalent in Guangxi province, China. It is alternatively referred to as immortality grass. Presently, an abundance of research established that *S. doederleinii* possesses medicinal properties and is capable of a wide range of pharmacological actions. Parts of this plant are documented to possess diverse pharmacological activities in traditional medicine, with particular emphasis on the leaves, roots, and twigs. These components are utilized for their antiviral, anti-inflammatory, anticancer, antioxidant, antihyperuricemia, antibacterial, antihypertensive, and potential therapeutic properties in the treatment of alzheimer's disease. The primary constituents of this botanical specimen comprise phytone, cedrol, 2-pentylfuran, caryophyllene, and n-hexadecane. Anthraquinone, chamomile, adenosine, biapigenin, adenosine, benzoate ester,  $\beta$ -caryophyllene, and zingerone are additional constituents.

**KEYWORDS:** *Selaginella doederleinii*, Medicinal plants, Antiviral, Anti-inflammatory, Anticancer, Antioxidant, Antihyperuricemia, Antibacterial, Antihypertensive, Alzheimer's disease.

**INTRODUCTION**

Medicinal plants are defined as plants that are utilized in diverse ways across allopathic and traditional medical systems around the world to maintain health or treat specific diseases. Even individuals with a lifetime of exclusively utilizing allopathic medicines often resort to herbal remedies due to the fact that 20-25% of prescribed medications originate from plants.<sup>[1]</sup> Research to obtain new alternative medicines derived from natural ingredients continues to be carried out, one of which is through exploring active compounds from natural ingredients, especially medicinal plants which have traditionally been used by people to treat various diseases in various countries.<sup>[2,3]</sup> *Selaginella doederleinii*, also known as "da ye cai" and "shi shang bai," is utilized medicinally for an extended period of time. *S. doederleinii*, a member of the *Selaginellaceae* family, is commonly known as immortality grass. In addition to its antioxidant, anticancer, antiviral, anti-inflammatory, anti-hyperuricemic, and antihypertensive properties, this plant has the potential to be utilized as an Alzheimer's disease treatment.<sup>[4]</sup> Currently there are no detailed evaluation reports regarding the potential to show the effectiveness of *S. doederleinii*, therefore this review

article will discuss the potential pharmacological activity of *S. doederleinii*.

**Phytochemical studies**

There are 58 volatile compounds in *S. doederleinii*, which are said to include 20 terpenes, 11 alkanes, 3 alcohols, 6 ketones, 3 esters, 11 aldehydes, 1 ether, 1 aromatic, 1 phenol, and 1 furan. Meanwhile, the main components in *S. doederleinii* are phytone (5.44%), cedrol (6.97%), caryophyllene (4.80%), n-hexadecane (3.61%), and 2-pentylfuran (7.50%). Other components include anthraquinone, chamomile, adenosine, biapigenin, adenosine, benzoate ester,  $\beta$ -caryophyllene, and zingerone.<sup>[5]</sup>

**Table 1: Chemical compounds contained in *S. doederleinii*.**

No	Chemical Compound	Chemical Formulation
1	Benzodioxole	C <sub>7</sub> H <sub>6</sub> O <sub>2</sub>
2	Dimethyloctate	C <sub>10</sub> H <sub>20</sub> O
3	Hexadecanoic acid	C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>
4	Octadecanoic acid	C <sub>18</sub> H <sub>36</sub> O <sub>2</sub>
5	Phytosterols	C <sub>29</sub> H <sub>50</sub> O
6	Dihydroxyanthraquinone	C <sub>16</sub> H <sub>12</sub> O <sub>5</sub>
7	Anthraquinone	C <sub>14</sub> H <sub>8</sub> O <sub>2</sub>
8	Chrysazin	C <sub>14</sub> H <sub>8</sub> O <sub>4</sub>
9	Chamomile	C <sub>15</sub> H <sub>10</sub> O <sub>5</sub>
10	Biapigenin	C <sub>30</sub> H <sub>18</sub> O <sub>10</sub>
11	Podocarpusflavone A	C <sub>15</sub> H <sub>10</sub> O <sub>2</sub>
12	Adenosine	C <sub>10</sub> H <sub>13</sub> N <sub>5</sub> O <sub>4</sub>
13	Hydroxycinnamic acid	C <sub>10</sub> H <sub>10</sub> O <sub>4</sub>
14	Benzoate Ester	C <sub>6</sub> H <sub>5</sub> CO <sub>2</sub> CH <sub>3</sub>
15	Protocatehuic acid	C <sub>7</sub> H <sub>6</sub> O <sub>4</sub>

## PHARMACOLOGICAL STUDIES

### Antiviral

Antiviral represents a class of pharmaceuticals that have been developed with the explicit purpose of managing ailments stemming from viral infections being the principal causative agents of numerous severe diseases affecting plants, animals, and humans.<sup>[6]</sup> Studies in living things showed that *S. doederleinii* can kill viruses when given at doses of 100, 300, and 900 mg/kg/day for 15 days in a mouse model of CVB3 infection.<sup>[7]</sup> Even though it is preliminary research, the results of this research can provide information for further research regarding *S. doederleinii* as a compound as an antiviral drug.

### Anti-inflammatory

Particularly in chronic inflammatory conditions, the overproduction of free radicals by activated inflammatory leukocytes may play a significant role in a variety of pathologies.<sup>[8,9]</sup> Anti-inflammatory is a type of drug that can reduce inflammation caused by non-microorganisms.<sup>[10,11]</sup> However, currently available drugs have some undesirable side effects, such as gastrointestinal toxicity, kidney toxicity, or gastrointestinal bleeding.<sup>[12]</sup> When given to mice in vivo at a dose of 64 g/kg/day, *S. doederleinii* significantly reduced the inflammation caused by monosodium urate (MSU) crystals by suppressing the production of pro-inflammatory cytokines.<sup>[13]</sup>

### Anticancer

Throat cancer (TC) is a prevalent, refractory, and palindromic head and neck squamous cell cancer (HNSCC) with a relatively high mortality ratio. Throat carcinoma is the second most refractory and plondromic head and neck squamous cell carcinoma (HNSC).<sup>[14]</sup> Giving *S. doederleinii* extract to mice with Hep-2 by mouth for 28 days at doses of 0.45 and 90 mg/kg can stop the growth of throat cancer. Additionally, *S. doederleinii* is shown to be able to turn on the mitochondrial pathway in throat cancer cell lines at

concentrations of 14.29 µg/mL and 16.94 µg/mL, which led to apoptosis.<sup>[15]</sup>

### Antioxidant

The shift toward more practical and quick lifestyles has a negative impact on health, particularly when it comes to providing for necessities like food. The combustion or high-temperature processing of fast food or instant foods can induce the generation of free radical compounds.<sup>[16,17]</sup> Free radicals are characterized as molecular entities that experience electron loss, leading to instability and an endeavor to recoup electrons from neighboring molecules or cells.<sup>[18,19]</sup> The capacity of antioxidants to either directly scavenge free electrons or enhance the expression and activity of free scavenging enzymes within the body is widely recognized. Antioxidant compounds, such as flavonoids, phenolic acids, and polyphenols, can stop the oxidative processes that lead to degenerative diseases. They do this by protecting against free radicals like hydroperoxides, peroxides, and lipid peroxyl.<sup>[20-23]</sup> In vitro testing studies, administration of *S. doederleinii* at a concentration of 150 µg/mL is reported to have potential antioxidant activity.<sup>[24]</sup> The results of this study can provide information for further research regarding *S. doederleinii* as a compound that has potential as an antioxidant.

### Antihyperuricemia

Elevated levels of uric acid (UA) in the bloodstream are what distinguish hyperuricemia as a pathological condition. Its etiology involves either an overabundance of uric acid production, particularly in the liver, or a decrease in renal excretion. Nevertheless, existing pharmaceuticals exhibit certain adverse effects, including toxicity to the gastrointestinal tract, liver, and kidneys.<sup>[25]</sup> Giving 102 g/kg/day of *S. doederleinii* to a mouse model with hyperuricemia caused by potassium oxonate and adenine had a big impact on lowering the acid levels in the mice and reducing the inflammation caused by MSU crystals.<sup>[26]</sup>

### Antibacterial

As an antibacterial medication eliminates and inhibits the metabolic activity of pathogenic bacteria, it reduces the pathogenic impact of the drug on the biological environment.<sup>[27,28]</sup> However, currently available drugs have side effects such as disturbances in energy metabolism, nucleic acid synthesis, coenzyme metabolism, and cell leakage.<sup>[29]</sup> In vitro research, administering *S. doederleinii* at a concentration of 1.6 µg/mL to *Staphylococcus aureus* bacteria shows antibacterial properties.<sup>[30]</sup>

### Antihypertensive

When systolic blood pressure surpasses 140 mmHg and diastolic blood pressure surpasses 90 mmHg in two separate measurements separated by 5 minutes, both taken while at rest or in a calm state, hypertension or high blood pressure is present. However, the adverse effects of currently available hypertension medications include edema, headaches, hypotension, and liver and kidney dysfunction.<sup>[31]</sup> In vivo research, administration of *S. doederleinii* at a dose of 0.5 mg/kg for 30 minutes had an antihypertensive effect where there is a significant reduction in blood pressure in experimental animals.<sup>[32]</sup>

### Alzheimer's disease

Alzheimer's disease, a neurodegenerative disorder characterized by progressive cognitive decline, is responsible for more than 50% of dementia cases.<sup>[33]</sup> Nevertheless, existing pharmaceutical interventions are accompanied by nausea, diarrhea, stomach aches, and vomiting, in addition to urinary incontinence, insomnia, and nightmares.<sup>[34]</sup> Administration of *S. doederleinii* at a dose of 5-50 g/kg/day in vivo in mouse models shows cognitive function and memory in mice, which can be used to treat Alzheimer's disease.<sup>[35]</sup>

### CONCLUSION

Antiviral, anti-inflammatory, anticancer, antioxidant, antihyperuricemia, antibacterial, antihypertensive, and treatment activity against Alzheimer's disease have all been scientifically demonstrated for *S. doederleinii*; the specific mechanism of action for each disease tested is distinct. However, additional research is required to determine whether *S. doederleinii* is effective in the treatment of various diseases so that it may be developed as a substitute for synthetic drugs that have demonstrated harmful side effects.

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