

## Anti-halitosis effects of *Aegopodium podagraria*

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### Abstract

Among various natural substances, *Aegopodium podagraria* seed contains oil and various minerals, and because of its unique fragrance, it has been widely used since ancient times as medicine and spice. It has been reported that *A. podagraria* seed oil has anti-bacterial effects on *Streptococcus mutans* and that hot water extracts from *Foeniculum vulgare* extract are effective in preventing cavities. Accordingly, the present study investigated whether *A. podagraria* seed extracts can effectively eliminate halitosis in the oral cavity and improve the oral health of patients suffering from halitosis. In this study, the dried sample was powdered by a pin crusher and the powders were extracted 3 times with ethanol. The extract was filtered through filter paper and evaporated using a vacuum rotary evaporator. As a result of test using BB checker, the anti-halitosis effects of *A. podagraria* seed extract were shown to be statistically significant. According to the results of the present study, *A. podagraria* seed extracts, an herbal medicine, showed noticeable reducing effects in suppressing halitosis.

**Keywords-** Halitosis, *Aegopodium podagraria*, Herbal medicine

### Introduction

Halitosis can be defined as odor emitted from oral or nasal cavity that can be unpleasant to others [1], which has been recognized as a problem that can have an important impact on one's mental health and social life. People in today's society have shown greater interests in oral health than in the past for enhancing their quality of life, and interest in oral health has been reported to be an important factor in managing one's mental health and social life, as well as serving as an indicator of mental health [2].

The causes of such halitosis can be divided largely into intraoral and extraoral problems, as well as oral psychological issues, with intraoral problems being the most dominant cause of halitosis [3].

It has been reported that halitosis from intraoral causes is mostly due to volatile sulfur compounds (VSCs) generated from bacterial decay associated with poor oral hygiene and xerostomia, and VSCs, which accounts for 90% of all volatile compounds, are major components of halitosis. VSCs are closely associated with proteolytic anaerobic bacteria, and these bacteria are responsible for producing VSCs that cause halitosis [4].

As aging of our society continues, there is an increasing trend in halitosis caused by degenerative drying of the salivary

glands from aging [5]. As methods for reducing halitosis, tooth brushing, tongue brushing [6], and gum chewing have been used. In addition, use of aromatic oral rinses, which offers convenience, have also been on the rise, but since these rinses are synthetic chemicals, efficacy and side effects associated with their long-term use are gradually becoming issues of concern [7]. As such, there are much recent activities in development of oral rinses using natural substances that do not cause adverse effects inside the body even after long term usage [8-9].

Among various natural substances, *Aegopodium podagraria* seed contains oil and various minerals, and because of its unique fragrance, it has been widely used since ancient times as medicine and spice. It has been reported that *A. podagraria* seed oil has anti-bacterial effects on *Streptococcus mutans* and that hot water extracts from *Foeniculum vulgare* extract are effective in preventing cavities [10-11].

Accordingly, the present study investigated whether *A. podagraria* seed extracts can effectively eliminate halitosis in the oral cavity and improve the oral health of patients suffering from halitosis.

### Materials and methods

#### Materials and extraction procedure

The *A. podagraria* seeds used in the study were harvested from Yeongcheon in North Gyeongsang Province of South Korea, and dried seeds were used. The dried sample was powdered by a pin crusher (Myungsung Machine, Seoul, Korea) and the powders were extracted 3 times with ethanol. The extract was filtered through filter paper (100 mm; Whatman, Maidstone, UK) and evaporated using a vacuum rotary evaporator (CCA-1110; Eyela, Tokyo, Japan).

#### Testing of anti-halitosis effects using BB checker

Anti-halitosis effects were measured using BB checker (mBA-21), according to the cysteine challenge test method [12]. Each group contained eight healthy participants who did not take any particular medications within recent 6 months. For three hours prior to testing, oral hygiene care, such as tooth brushing, as well as food intake, were limited. The baseline halitosis levels were measured, twice with five minute interval, from all participants; after which, the participants washed their mouths for 30 s with 10ml of 3 mM cysteine solution to induce halitosis. After collecting the gas inside the oral cavity, oral gas (OG) and exhaled gas (EG) were measured. Each experimental group was given an additional treatment of 2% *A. podagraria* seed extract, whereas the control group received

no treatments. All tests were measured twice, and anti-halitoses effects were calculated as VSCs relative ratio.

### Statistics

Collected data were analyzed using SPSS 18.0 for Windows (SPSS INC. USA). *P* value of <0.05 was considered statistically significant.

### Results

As a result of test using BB checker, the anti-halitoses effects of *A. podagraria* seed extract were shown to be statistically significant. EG was decreased by 55.5% ( $z=-2.207, p=.027$ ), while OG was decreased by 73.5% ( $z=-2.100, p=.036$ ).

**Table 1.** Anti-halitoses effects using BB checker.

	Experimental group	Control group	Z	p
	M±SD	M±SD		
EG	1.19±0.81	2.56±2.00	-2.207	.027
OG	3.45±6.34	11.14±13.98	-2.100	.036

VSC relative ratio=VSC concentration/baseline

Z=Mann-Whitney U test

Statistically significant by Mann-Whitney U test ( $p<.05$ )

### Comparison and Discussion

As intraoral cause, anaerobic bacteria initially decomposes food debris, along with desquamated oral mucosal epithelial cells and saliva, which further breaks down bacterial proteins and amino acids, byproducts of protein degradation, to produce VSCs; which then causes halitosis from complex interactions with ammonia and alcohol [12-13]. Countless number of people have suffer from this problem and there are still some people who do not even recognize this problem.

Halitosis-related studies, based on scientific systems, had only begun after the 1930's, and as incidents of halitosis have increased, use of oral hygiene products, sprays, and oral rinses for eliminating halitosis has also increased. However, because oral rinses are made of synthetic chemicals, adverse effects are expected with long term use [14]. Therefore, development and studies are needed on natural plants that contain currently known halitosis-inhibiting substances, while showing no adverse effects. Moreover, the number of case studies that have used medicinal herbs to cure diseases in the oral region is increasing today. It is believed that producing anti-halitoses agent that is made of medicinal herbs and is easy to use in the oral region represents an opportunity to expand the scope of dental prevention and treatment [15-16].

Accordingly, the present study examined anti-halitoses effects of *A. podagraria* seed extract, which is known to show efficacies for the chills, dysmenorrhea, vomiting, and vitamin b deficiency, as well as being used clinically for pain relief and anthelmintic purposes [11]. In previous studies related to herbal extracts for inhibiting halitosis, *Pinus densiflora* [8] and *Alnus firma* [9] extracts have been studied. In addition to these, there was a study that examined the effects of VCSs from *Schisandra chinensis* in the oral cavity [17], and in the study that analyzed the anti-halitoses effect of Fructus Mume, Folium Eriobotriae, Cortex Acanthopanicis, and Radix

Angelicae Dahuricae, their anti-halitoses effects were reported to be 91.54%, 87.97%, 100%, and 72.36%, respectively [18]. In the study that examined the efficacies of herbal medicines, Radix Scutellariae, Cortex Phellodendri Chinensis, Cortex Moutan, and Cortex Magnoliae Officinalis, as oral care agents, Cortex Moutan and Cortex Magnoliae Officinalis showed 100% odor eliminating capability, while Radix Scutellariae and Cortex Phellodendri Chinensis showed anti-halitoses capabilities of 82.22% and 66.6% [14].

According to the results of the present study, *A. podagraria* seed extracts, an herbal medicine, showed noticeable reducing effects in suppressing halitosis. In looking at the resulting values, it was confirmed that oral treatment with *A. podagraria* seed extract reduced the malodor-producing gas content. As such, it was confirmed that *A. podagraria* seed extract has malodor suppressing effects, and tooth brushing with *A. podagraria* seed extract can help reduce halitosis.

Because the bb checker used in the present study quantifies oral gas and does provide information on its cause, it is not clear whether the outcome is due to reduction in bacteria or other factors. Moreover, since there have been no published report to date on malodor suppressing effects of *A. podagraria* seed extracts, there is the need for continued follow up studies that analyze more effective single ingredient for malodor suppression.

In summarizing the results stated above, *A. podagraria* seed extracts can be an excellent malodor suppressing material, and developing it into products that can be kept in the mouth, sprayed, or swallowed can not only help prevent halitosis, but cure it as well. Therefore, development of oral spray or rinse can be utilized for their economic value, as well as their academic significance.

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