



**ĐÁNH GIÁ SINH TRƯỞNG VÀ NĂNG SUẤT  
CỦA CÂY ĐƯƠNG QUY NHẬT BẢN (*ANGELICA ACUTILOBA* KIT.)  
VÀ CÂY ĐAN SÂM (*AALVIA MILTIORRHIZA BUNGE*) TRỒNG  
TẠI XÃ HỒNG THÁI, HUYỆN NA HANG, TỈNH TUYÊN QUANG**

Đào Thị Thu Hà<sup>1</sup>, Nguyễn Văn Giáp<sup>1</sup>, Trần Thị Nhung<sup>1</sup>, Đào Thu Huệ<sup>2</sup>, Chu Thị Thuý Nga<sup>2</sup>

<sup>1</sup>Trường Đại học Tân Trào, Việt Nam

<sup>2</sup>Trung tâm nghiên cứu cây thuốc Sapa, Viện Dược Liệu, Việt Nam

Địa chỉ email: [daothuhavfu@gmail.com](mailto:daothuhavfu@gmail.com)

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*Đương quy Nhật Bản,  
Đan sâm, Di thực, Tuyên  
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#### Tóm tắt

*Đương quy Nhật Bản (*Angelica acutiloba* Kit.) được di thực vào Việt Nam từ năm 1990 và Đan sâm (*Salvia miltiorrhiza* Bunge) được di thực vào Việt Nam từ những năm 1960 từ Trung Quốc. Hiện nay, cả 2 loại dược liệu được trồng và phát triển ở nhiều nơi, đây là 2 cây dược liệu quý, là cây thuốc quan trọng trong nhiều bài thuốc đông y, là những vị thuốc có thể thay thế để chữa các bệnh về thiếu máu, đau đầu, suy nhược cơ thể, viêm khớp, hạn chế ung thư và các bệnh về tim mạch, ... Là cây yêu cầu sinh thái ưa khí hậu mát mẻ, khi trồng ở độ cao trên 800 m sẽ cho các hoạt chất dược liệu cao. Kết quả nghiên cứu cho thấy: Khi trồng 2 loại dược liệu này ở xã Hồng Thái, huyện Na Hang, tỉnh Tuyên Quang đường kính củ đạt 0,79 cm, chiều dài củ 27,8 cm, năng suất đạt 68,8 g/cây đối với cây Đan sâm; đạt 1,80 cm về đường kính củ, 19,0 cm về chiều dài củ và năng suất đạt 116,0 g/cây đối với cây Đương quy. Bệnh hại chính trên cây Đan sâm là thối rễ, thối gốc với mức độ rất phổ biến; đối với cây Đương quy bệnh thối rễ, thối gốc không xuất hiện nhưng xuất hiện sâu hại chủ yếu gồm ốc sên nhỏ và sâu cuốn lá, với mức độ ít phổ biến. Nhìn chung, khả năng sinh trưởng và phát triển của 2 loài cây này phù hợp với điều kiện thổ nhưỡng, khí hậu tại huyện Na Hang cũng như các địa phương có điều kiện tương đồng.*

## 1. INTRODUCTION

Hong Thai is a highland commune, located in the east of Na Hang district, this place is likened to Sa Pa of Lao Cai or Da Lat of Lam Dong. Located at an altitude of over 900m, with a cool climate all year round, the average temperature is about 18°C the humidity of the air is 80-86%,o Hong Thai commune is one of the communes that is evaluated as a potential land to develop medicinal plants in Tuyen Quang province. According to the preliminary

report of the Provincial Statistics Office in 2019, the whole province currently has nearly 130 hectares of medicinal plants with 14 species, *Citrus medica* var. *sarcodactylis*, *Polyscias fruticosa* L., *Celastrus hindsii*, *Fallopia multiflora*, *Solanum procumbens*,... Especially, at present, the development of medicinal herbs is still difficult because there is no stable market, while this particular plant also has strict requirements on cultivation techniques. From the selection of seed sources to planting, tending, and harvesting, households in the province are still mainly relying

on experience and lack of technical guidance, so the quality of medicinal herbs is not really high.

*Angelica acutiloba* Kitagawa grown in production today were imported from Japan to Vietnam in 1990, and planted by the National Institute of Medicinal Materials at Sa Pa Medicinal Plant Station (Lao Cai) from 1991 to 1993 (Nguyen Van Dan et al., 1990). So far, *Angelica acutiloba* Kitagawa has not been found growing naturally in the flora of Vietnam. It is grown a lot in the North of Vietnam where there is a subtropical climate (Sa Pa, Bac Ha, Tam Dao, Moc Chau) and the highlands of the Central Highlands (Lam Dong, Dak Lak, Kon Tum.) but the material is not evenly across regions (Nguyen Ba Hoat et al., 2001; Nguyen Van Dan et al., 1990). *Angelica acutiloba* Kitagawa adapts to a cool and humid climate, temperature range 15-25°C, rainfall 1600-2000 mm/year, soil rich in humus. *Salvia miltiorrhiza* Bunge is suitable for cool and humid climate, the weather and soil conditions are too dry for the growth of *Salvia miltiorrhiza* Bunge. The plant grows well at a temperature of 15-25°C. *Salvia miltiorrhiza* Bunge likes the environment with moderate moisture, but has poor tolerance to floods and inundation, maximum soil moisture about 70% at all growth stages. *Salvia miltiorrhiza* Bunge can be grown in many different types of soil, but it grows best in sandy and clay loam soils, with a pH in the range of 6.0 - 8.7.

Towards the goal of building areas specializing in the production of medicinal herbs to supply the market in order to increase people's income, the research and trial planting of medicinal plants of economic value, meeting the demand of the market and suitable to the natural conditions of each region is essential. Within the scope of the research, the paper presents the results of the growth criteria, yield components and yield from planting to harvesting in the migration model of *Angelica acutiloba* Kitagawa and *Salvia miltiorrhiza* Bunge in the commune Hong Thai Na Hang district, Tuyen Quang province.

## 2. RESEARCH METHODS

### 2.1. Research subject and scope

- Subjects: *Angelica acutiloba* Kitagawa seeds and *Salvia miltiorrhiza* Bunge seedlings that have met the standards for planted.

- Location: Hong Thai commune, Na Hang district, Tuyen Quang province.

### 2.2. Research methods and techniques used

#### a) Experimental arrangement

The experiment was arranged in a completely randomized block design, with 3 replicates, the area

of one replicate is 120m<sup>2</sup>. In the experimental plot, the varieties of *Angelica acutiloba* Kitagawa and *Salvia miltiorrhiza* Bunge were planted in two separate plots (each plot has an area of 360m<sup>2</sup>), arranged adjacent to each other, and the beds were 70-80 m wide, the length of the beds was according to the length of the experimental plots. experience.

Setting monitoring plants: In the experimental plot, 10 beds were selected, (representing the spatial locations of the experimental plots), each row selected 20 continuous plants (plants at least 2m from the shoreline) for planting monitoring stakes, collect tracking data.

Experimental conditions: The experiment was arranged on a high ground with convenient drainage for irrigation.

The technical process of planting and tending follows the technical process of the National Institute of Medicinal Materials - Ministry of Health.

#### b) Monitoring indicators

- Monitoring growth time, planting time until flowering and fruiting;

- Growth and development: plant height, number of new leaves, number of branches, canopy diameter, tuber length, tuber diameter at 60 and 150 days for growth parameters and constituent factors yield, yield at 250 days.

- Monitoring pests and diseases:

- : Not sick : Unseen

+ : <10% diseased plants : Uncommon

++ : 11 - 25% diseased plants : Less common

+++ : 26 - 50% diseased plants : Common

++++ : >50% diseased plants : Very common

## 3. RESULTS AND DISCUSSION

### 3.1. Growth and yield components of *Salvia miltiorrhiza* Bunge

*Salvia miltiorrhiza* Bunge is grown by seedlings. After 60 days of planting, the growth indicators tended to increase remarkably between the monitoring times. The average plant height was 28,4cm, ranged from 28,2 to 28,7cm; canopy diameter reaches 26,4cm, ranges from 26,2 – 26,6cm; and had 1,7 – 1,8 leaves/plant at 60 days of surveying. Growth parameters increased to 35,4cm in height, to 35,1cm in canopy diameter and had 3,0 leaves/pant in at 150 days of surveying and increased by 49,1cm in height, 42,2cm in canopy diameter and 5,6 leaves/plant at 250 days of surveying, respectively (Table 3.1).

**Table 3.1. Some growth indicators of *Salvia mitorrhiza* Bunge at 60, 150 and 250 days of surveying**

Surveying time	Height (cm) (average±sd)	Canopy diameter (cm) (average±sd)	Leaf/plant (leaf) (average±sd)
60 days	28,4±2,46	26,4±2,44	1,7±0,25
CV (%)	8,7	9,3	14,0
150 days	35,4±3,56	35,1±3,87	3,0±0,34
CV (%)	9,8	11,2	11,0
250 days	49,1±3,90	42,2±5,14	5,6±0,68
CV (%)	8,0	10,9	12,2

**Table 3.2. Factors constituting yield and yield of *Salvia mitorrhiza* Bunge at 250 days of surveying**

Repetitions	Branch/Clump	Blossom/Plant	Flower/Blossom	Length (cm)	Diameter (cm)	Individual productivity
Repetitions 1	4,4±1,14	5,2±0,84	97,6±7,23	29,6±4,61	0,78±0,11	68,0±17,2
Repetitions 2	5,2±1,47	5,0±1,41	106,0±20,1	26,7±4,08	0,62±0,15	69,8±9,1
Repetitions 3	4,5±1,05	5,7±1,03	103,3±3,38	27,3±2,50	0,98±0,12	68,5±10,7
<b>Average</b>	<b>4,71</b>	<b>5,29</b>	<b>102,6</b>	<b>27,8</b>	<b>0,79</b>	<b>68,8</b>
CV (%)	26,4	21,5	12,9	13,6	16,0	18,1

At the time of 250 days of surveying, the yield components and individual yield of *Salvia mitorrhiza* Bunge did not have a clear difference between the survey sites in the whole model. On average, there are 4,71 branches/clump, ranging from 4,4 – 5,2 branches/clump. The average length of tubers is 27,8cm, ranging from 26,7 to 29,6cm; average tuber diameter was 0,79cm, ranging from 0,62 to 0,98cm. The average yield of individual plants was 68,8g/tub ranging from 68,0 – 69,8g/tub.

Thus, the average growth time of *Salvia mitorrhiza* Bunge plants planted in the model in Hong Thai commune, Na Hang district, Tuyen Quang province is on average 250 days, 10 days higher than those in Hanoi, Phu Tho and Thanh Hoa., but 80 days earlier on average than the sites in Sa Pa and Tam Dao (Ngo Quoc Luat et al., 2014). The average diameter of tubers (main roots) in this study was 2.8cm, which was similar to other studies in other planting sites, such as Ha Noi (average 2,21cm), Phu Tho (average 2,21cm), 2,91cm), Thanh Hoa (2,54cm), Sa Pa (1,92cm), Tam Dao (1,84cm) (Ngo Quoc Luat et al., 2014).

**Table 3.3. Pest composition and prevalence on *Salvia mitorrhiza* Bunge**

Serial	Pestiferous subject		Prevalence	Months
	Name	Scientific name		
1	Borer	<i>Spodoptera litura</i> Fabr	+	3, 9
2	Leaf folder	<i>Homona coffearia</i>	++	3, 9
3	Small snail	<i>Bradybaena similaris</i>	+	3, 4

In general, the growth indicators (height, diameter and number of leaves/plant) of *Salvia mitorrhiza* Bunge in the model tended to increase strongly at the time of monitoring, on average increased from 7,0 to 13,7cm respectively 24,6 – 8,7%) in plant height, from 7,1 – 8,7cm (20,2 – 33,0%) in diameter and increased by 1,2 – 2,6 leaves/plant (equivalent to 70,5 – 86,0%) in terms of number of leaves/plant compared to previous times.

The main pests on *Salvia mitorrhiza* Bunge such as borer, brown-headed leaf folder, small snail,... with uncommon and less common frequency, accounted for less than 25% of the investigated individuals. The time they appear is in March, May and September of the year.

**Table 3.4. Disease composition and prevalence on *Salvia mitorrhiza* Bunge**

Serial	Pestiferous subject		Prevalence	Months
	Name	Scientific name		
1	<b>Tuber rot</b>	<i>Fusarium sp</i>	+++	<b>8, 9</b>
2	<b>Root rot</b>	<i>Rhizoctonia solani</i>	++++	<b>5, 6, 7</b>
3	<b>Leaf rot</b>	<i>Pestaloria sp.</i>	++	<b>6, 7</b>

The disease mainly causes tuber rot, root rot, and leaf rot from common to very common, with the disease rate of over 50% of the investigated plants. The diseases appear more in the months of heavy rain and high humidity (such as June, July and August).

Root rot disease often appears on mature *Salvia mitorrhiza* Bunge plants, which begin to grow strongly on leaves. The initial disease is brown spots appearing at the base of the stem adjacent to the ground, then gradually spreading around the base of the plant. The plant is wilted and withered, when uprooted it is often broken at the base of the stem. Severe disease, the entire stem is rotten and dark brown, flattened fungal nodes appear. In some recent studies, it was also recorded that the root rot caused by *Rhizoctonia solani* caused significant damage to the yield of *Salvia mitorrhiza* Bunge, the disease

thrived and peaked in early April with the disease rate over 35%. The disease develops well in the conditions

of 20 - 25°C and pH 5-6 (Dang Thi Ha & Phan Thuy Hien, 2015).



Figure 1. Dan ginseng grown in Hong Thai commune, Na Hang district, Tuyen Quang province

3.2. Growth and yield components of *Angelica acutiloba Kitagawa*

The indicators of growth, height, canopy diameter and number of leaves/female ginseng planted in the model did not have a clear difference between the repetitions at different monitoring times. That shows, the growth and development of female ginseng on the whole model is relatively uniform.

The average plant height is 9,7cm, canopy diameter is 9,2cm, and an average of 4,2 leaves/plant at the time of 60 days of follow-up, increased to 16,0cm in height, reaching 16,9cm in canopy diameter and increased to 6,3 leaves/plant at 150 days of surveying. The average plant height is 29,7cm, canopy diameter is 26,8cm, and an average of 10,7 leaves/plant at the time of 250 days of follow-up

Table 3.5. Some growth indicators of female ginseng at 60 and 150 days of surveying

Surveying time	Height (cm) (average±sd)	Canopy diameter (cm) (average±sd)	Leaf /plant (leaf) (average±sd)
60 days	9,7 ±1,57	9,2±1,15	4,2±0,67
CV (%)	16,3	12,5	15,8
150 days	16,0±1,59	16,9±1,51	6,3±0,86
CV (%)	10,0	9,0	13,6
250 days	29,7±2,36	26,8±2,15	10,7±1,67
CV (%)	8,0	8,0	15,7

Table 3.6. Factors constituting yield and yield of Female ginseng plant time of 250 days of tracking

Repetitions	Diameter (cm)	Length (cm)	Individual productivity
Repetitions 1	1,8±0,29	19,2±1,94	113,5±19,1
Repetitions 2	1,8±0,26	18,8±2,40	117,5±17,6
Repetitions 3	1,7±0,28	19,1±1,96	117,0±17,0
<b>Average</b>	<b>1,8</b>	<b>19,0</b>	<b>116,0</b>
CV (%)	15,4	11,1	15,4

The average tuber diameter in this study (average 1,8cm) was lower than that obtained when being grown in Don Duong (Lam Dong), from 4,31 to 5,40cm (Pham Anh Cuong & Huynh Thanh) Hung, 2021), is also lower than the results obtained in An Lao (Binh Dinh), an average of 3,01 - 4,08cm (Bui Hong Hai et al., 2019).

lower than the results obtained in Ha Giang province (270g/plant in Quan Ba district and 250g/plant in Dong Van district) (Nguyen Ba Hoat et al., 2001).

The average individual plant yield was 116.0g/plant, ranging from 113,5 to 117,5g/tube (CV%: 15,4%), also relatively similar to the study in Binh Dinh, yield on average from 67,4 – 123,6g/plant (Nguyen Thi Y Thanh & Bui Hong Hai, 2021), but

Table 3.7. Pest composition and prevalence on female ginseng

Serial	Pestiferous subject		Prevalence	Months
	Name	Scientific name		
1	Leaf folder	<i>Unknown</i>	++	7, 8
2	Small snail	<i>Bradybaena similaris</i>	+	2, 3

At the time of the study, two species of small snails and leaf rollers appeared on Female ginseng plant. Snails mainly appear at the stage of new seed germination, new leaves got damaged by snails. In the stage of plants entering the rapid growth stage, leaf folders appeared, but the level was less common, accounting for 11% - 25% of the surveyed plants.



**Figure 3. *Angelica acutiloba* Kitagawa planted in Hong Thai commune, Na Hang district, Tuyen Quang province**

## CONCLUSION AND RECOMMENDATION

### 1. Conclusion

*Salvia miltiorrhiza* Bunge average length is 49,1cm; average 0,8cm in tuber diameter. The average yield of individual plants was 68,8g/tub. The disease mainly causes tuber rot, root rot, and leaf rot from common to very common, with the disease rate of over 50% of the investigated plants. Diseases and diseases appear more in the months of heavy rain and high humidity (such as June, July and August) for *Salvia miltiorrhiza* Bunge.

*Angelica acutiloba* Kitagawa average length is 29,7cm, average 1,8cm in tuber diameter. The average individual yield was 116,0g/plant. Pests

mainly include small snails and leaf rollers, with low prevalence (accounting for 11% - 25%) on *Angelica acutiloba* Kitagawa.

In terms of the growth ability of these two species, we find that they are completely suitable for the climatic conditions of Na Hang district, or other districts with similar climate and soil. However, for *Salvia miltiorrhiza* Bunge, additional research is needed to solve the problem of diseases in order to bring the highest efficiency when cultivating this plant.

### 2. Recommendations

Additional studies are needed to address the disease problem of *Salvia miltiorrhiza* Bunge for maximum effectiveness.

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