

The Ethnobotanical and Botanical Study on *Pseuderanthemum palatiferum* as a New Medicinal Plant in the Mekong Delta of Vietnam

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Abstract

The cultivation and application of *Pseuderanthemum palatiferum*, a plant found in the latter half of the 1990's in northern Vietnam, was studied at a total of 12,829 households located in the city center and suburb of Cantho city. The frequency of the households cultivating the plant, the plant's population and age, recipients, purposes and amount of the dosages were surveyed in interviews with households. Second, growth of the plant at an experimental farm of Cantho University was observed. Only 1.1% of the total households cultivated the plant. However, more ($p < 0.01$) households in the city center cultivated the plant than those in the suburb. More households in the city center cultivated greater populations of the plant. The city center households dosed the plant not only for treatment of human diseases, but also for the prevention and treatment of animal diseases. The frequencies of the dosage and the amount of each dose were more for treatment than for prevention, and more for human diseases than animal diseases. The dosages were more in the city center households. The results of the field study would suggest that cultivation of the plant had been spread from the city center to the suburb, and its dosage had widened from the purpose of treatment to prevention of diseases, and the recipients from human to animal diseases. The plant observed could grow very fast and bloom, in the same way as the growth in northern Vietnam. The easiness of its planting and the earliness of growth would have helped the spread of its cultivation and application in the Mekong Delta region.

Discipline: Animal health

Additional key words: *Acanthaceae*, epidemiology, epizootiology, vegetable functions

Introduction

Pseuderanthemum palatiferum (Nees Radlk, *P. palatiferum* for short) is a new medicinal plant belonging to the *Acanthaceae* family⁴. It was found in the latter half of the 1990's in Cuc Phuong forest in northern Vietnam, as NAPRALERT (1995), medicinal plants' worldwide database of Illinois University in USA, had not reported this plant^{6,11}. After the discovery, the plant has expanded in area of cultivation throughout the country as both a medicinal and ornamental plant³. This plant can allegedly cure many types of human diseases, e.g., wound, trauma, stomachache, colitis, blood pressure,

nephritis and diarrhea. It is therefore called a miraculous medicinal plant⁵. The plant has been botanically, chemically and biologically studied mostly in the northern region of the country¹¹. Through a sequence of studies: its scientific name was given; the chemical composition was analyzed (Table 1); the compounds such as β -sitosterol have been isolated and purified from the leaves; and the extracts from the leaves planted showed antibacterial and antifungal activities⁵.

The ethnobotanical and botanical information of this plant especially in the southern region was, however, not enough because of the short terms of the cultivation and studies. In this study, therefore, information on the actual situation of its cultivation and application in households

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Table 1. Chemical composition of *Pseuderanthemum palatiferum*^{1,8}

Dry matter (%)	13.4
Crude protein (% dry matter)	30.8
Mineral (mg/100 g fresh leaves)	
Ca	875.5
Mg	837.6
Fe	38.8
Cu	0.43
Amino acid (mg/100 g fresh leaves)	
Lysine	30.6
Methionine	29.7
Threonine	61.0

was collected and the botanical features were observed in conditions of the Mekong Delta (39,653 km²), the most southern region of Vietnam. Then, the process of spread of usage as a medical plant and the botanical factors of the spread were discussed.

Materials and methods

1. Ethnobotanical study

Cantho city (141 km²) is a geographical and a socio-economical center of the Mekong Delta. The city consists of a total of 15 wards and villages¹⁰. The study was conducted in 2001 at three wards and one village. Xuan Khanh (2.1 km²) and Hung Loi wards (3.4 km²) are located at the most central part and nearby the central part of the city, respectively. Hung Phu ward (7.5 km²) and An Binh village (11.9 km²) are located in the suburb area. All of the households in the studied areas, a total of 12,829, were visited and asked whether the plant was cultivated or not. Matters concerning cultivation and application of *P. palatiferum*, i.e., the plant population and the age, the recipients and the purposes of its application, the dosage for treatment or prevention of both human and animal diseases, were studied via oral interviews with a questionnaire.

2. Botanical study

Young branches of *P. palatiferum* with lengths of 8–12 cm and pairs of opposite leaves (0 day old) were collected at one of the households interviewed. The branches were put in wet soil in pots and shaded. The plants had two to three gemmae and reached the height of 15–20 cm at day 15. Next, 400 plants of the same growing stage were transplanted to the experimental farm of Cantho University and the growth was observed for 134 days during October 2001 and March 2002. The growth parameters were the number of leaves, cauline

height, number of axillary buds, diameter of canopy and green yield. The test for blooming was continued until April 2004.

3. Statistical analysis

Minitab Statistical Software version 13 was used for the analysis⁹. The chi-square test was done to test hypotheses concerning the frequency distribution of one or more populations. The data of the means was analyzed by ANOVA using General Linear Model. Sources of variation were treatments in factors. The Tukey's test for paired comparisons was used to separate means when the differences were significant at the 1% level.

Results

1. Ethnobotanical study

The frequency for plant cultivation in all the studied households was very low at 1.1% (Table 2). However, differences were found in the frequencies by the location: the highest was in Xuan Khanh (2.7% of the households studied in the area), next highest in Hung Loi (1.1%), and lowest in An Binh (0.1%) and Hung Phu (0.1%) ($p < 0.01$). The population of plants per household was usually only 1 to 2 plants (67.4% of the households cultivated 1 to 2 plants). The plant population was also different between households located in the city center and the suburb. More plants were cultivated in the city center: 6 to 10 plants were cultivated in 8.8% of Xuan Khanh and 5.3% of Hung Loi households, 11 to 30 plants were cultivated in 1.1% and 5.3% of Xuan Khanh and Hung Loi households, respectively; only 1 to 5 plants were cultivated in An Binh and Hung Phu households. All the plants cultivated were less than 36 months old. All of the suburb households and 80.8% of the entire population of households cultivated plants of less than 11 months old. Plants of 12–23 months old were cultivated in 15.4% of Xuan Khanh and 21.1% of Hung Loi households, plants over 23 months old were cultivated in 3.3% and 2.6% of households, respectively.

The raw leaves of the plant were dosed orally in most cases. The other plant parts were rarely used. In all areas, the leaves were dosed more frequently ($p < 0.01$) for treatment (65.9% of the households cultivating the plant in all areas) than for prevention (21.5%) (Table 3). For prevention, the percentage of the households that dosed 3 to 6 leaves per day in all households cultivating the plant (51.7% of the households that dosed the leaves for prevention) tended to be more than those dosed 7 to 9 leaves (38.0%) and over 9 leaves (10.3%). On the other hand, for treatment, the percentage of the households that dosed 7 to 9 leaves (80.9% of the household that dosed

Table 2. The frequencies of *Pseuderanthemum palatiferum* cultivation, the plant population and plant age at the studied households of Cantho city in 2001

Wards/village	Area ¹⁾ (km ²)	n ²⁾	Frequency ³⁾	Plant population ⁴⁾				Plant age (months) ⁴⁾				
				1–2	3–5	6–10	11–30	<6	3–5	6–10	11< ⁵⁾	
City center												
Xuan Khanh	2.1	3,382	91 (2.7)*	73.6 ^a	16.5 ^b	8.8 ^{bc}	1.1 ^c	40.7 ^a	40.7 ^a	15.4 ^b	3.3 ^c	
Hung Loi	3.4	3,466	38 (1.1)**	50 ^a	34.2 ^a	5.3 ^b	5.3 ^b	31.6 ^a	44.7 ^a	21.1 ^{ab}	2.6 ^b	
Suburb:												
An Binh	11.9	3,054	4 (0.1)***	75	25	0	0	50.0	50.0	0.0	0.0	
Hung Phu	7.5	2,927	2 (0.1)***	100	0	0	0	100.0	0.0	0.0	0.0	
Total	24.9	12,829	135 (1.1)	67.4 ^a	21.5 ^b	7.4 ^c	2.2 ^c	39.3 ^a	41.5 ^a	16.3 ^b	3.0 ^c	

Numbers within the same column with the different superscripts *, ** and *** were significantly different at p< 0.01. Numbers of the plant population or plant age within the same row with the different superscripts a, b and c were significantly different at p< 0.01, respectively.

1): Source; People's Committee of Cantho city (2001).

2): The numbers of the households in the studied wards and village. All of the households were studied.

3): Number of the households that cultivated the plant (% of the households studied).

4): % of the households with plant cultivation.

5): No plant older than 36 months was cultivated.

Table 3. The percentage of the households that dosed *Pseuderanthemum palatiferum* leaves for prevention or treatment of human diseases and the amount of the dosage

Wards/village	n	Frequency ¹⁾	Amount (leaves/day) ²⁾		
			3–6	7–9	>9
Prevention					
City center					
Xuan Khanh	91	20 (22.0)**	50.0 ^a	35.0 ^a	15.0 ^a
Hung Loi	38	9 (23.7)***	55.6 ^a	44.4 ^{ab}	0.0 ^b
Suburb					
An Binh	4	0 (0.0)***	—	—	—
Hung Phu	2	0 (0.0)***	—	—	—
Total		29 (21.5)	51.7 ^a	38 ^{ab}	10.3 ^b
Treatment					
City center					
Xuan Khanh	91	60 (65.9)*	5.0 ^b	81.7 ^a	13.3 ^b
Hung Loi	38	26 (68.4)**	15.4 ^b	80.8 ^a	3.8 ^b
Suburb					
An Binh	4	3 (75.0)***	33.3	66.7	0.0
Hung Phu	2	0 (0.0)***	—	—	—
Total		89 (65.9)	9.0 ^b	80.9 ^a	10.1 ^b

Numbers within the same column with the different superscripts *, ** and *** were significantly different at p< 0.01.

Numbers within the same row with the different superscripts a, b and c were significantly different at p< 0.01.

1): Number of the households that dosed the *Pseuderanthemum palatiferum* leaves for prevention or treatment (% of the households that cultivated the plant).

2): % of the households that dosed the leaves for prevention or treatment in the households that cultivated the plant.

the leaves for treatment) were significantly ($p < 0.01$) more than the households with the other dosages. The results in the city center households corresponded with the above results in all areas. The households in the suburb didn't use the leaves for prevention, and those in Hung Phu ward didn't use it for treatment or prevention. In An Binh village, all of the households using the leaves for treatment used no more than 9 leaves. Seven to 9 leaves were dosed in 66.7% of households for treatment, 33.3% of household dosed less than 6 leaves, though the number of replicates was only 3 in total.

P. palatiferum leaves were dosed for both treatment and prevention of a total of 25 human diseases such as blood pressure, diarrhea, arthritis, pharyngitis, and so on (Table 4). The duration of the dose differed by the disease and ranged from only one day to every day.

However, the durations the households dosed the plant were the same by the diseases.

The frequencies that the leaves were used for treatment and prevention of animal diseases were very low (7.4% and 3.7%, respectively, of the households cultivating the plant) and lower than those for humans (Table 5). On the other hand, the leaves were used more often for treatment than for prevention, similar with the results for humans. And the leaves were mostly used in the households in the city center for animal diseases such as pigs' diarrhea, chicken's wound, fowl cholera and dog's blood diarrhea. In the suburb area, only two households in An Binh village dosed for treating fowl cholera of chicken and duck, respectively. The amount of the dosage was only 1 to 3 leaves per day in each case. Duration of the dosage was 2 to 3 days in most cases.

Table 4. The types of human diseases that *Pseuderanthemum palatiferum* leaves were dosed for both prevention and treatment, and the duration of the dosage

Disease	Frequency ¹⁾	Duration of dosage (day)			
		1-3	4-30	>30	Continuous
Blood pressure	42				x ²⁾
Diarrhea	38	x			
Arthritis	16		x		
Pharyngitis	15			x	
Gastritis	12			x	
Tumor caused by cancer	8			x	
Colitis	7			x	
Bleeding	5	x			
Wound	4	x			
Constipation	3	x			
Ischidic nerve	2			x	
Buccoglossopharyngitis	2	x			
Flu	2	x			
Colon cancer	2			x	
Dento-alveolitis	2	x			
Hemorrhoids	2		x		
Mastitis	1	x			
Serum hepatitis	1				x
Rhinitis	1		x		
Heart muscle anemia	1		x		
Dysentery	1	x			
Gynecopathy	1				x
Rheumatism	1				x
Nephritis	1				x
Encephalomalacia	1				x

1): The number of cases that were dosed *Pseuderanthemum palatiferum* leaves for either the prevention or the treatment of human disease, or for both in the households cultivating the plant.

2): *Pseuderanthemum palatiferum* leaves were dosed.

Table 5. Application of *Pseuderanthemum palatiferum* leaves for treatment or prevention of animal diseases

Ward/village	n	Frequency ¹⁾	Recipients	Disease	Dose (leave/day)	Duration (day)	
						2-3	Continuous
Prevention							
City center							
Xuan Khanh	91	2 (2.2)	Pig	Diarrhea	1		x ²⁾
			Dog	Diarrhea	1	x	
Hung Loi	38	2 (5.3)	Chicken	Diseases ³⁾	1-2		x
Suburb							
An Binh	4	0 (0.0)	-	-			
Hung Phu	2	0 (0.0)	-	-			
Total	135	5 (3.7)					
Treatment							
City center							
Xuan Khanh	91	2 (2.2)	Pig	Diarrhea	2	x	
			Dog	Blood diarrhea	2	x	
			Chicken	Wound	1-3	x	
Hung Loi	38	1 (2.6)	Pig	Diarrhea	2	x	
			Chicken	Fowl cholera	1-3	x	
			Chicken	Wound	1-3	x	
Suburb							
An Binh	4	1 (25)	Chicken	Fowl cholera	1-3	x	
			Duck	Fowl cholera	2	x	
Hung Phu	2	0 (0.0)	-	-			
Total	135	10 (7.4)	-	-			

1): The number of the households that dosed the *Pseuderanthemum palatiferum* leaves for preventing or treating animal diseases (% of the households that cultivated the plant).

2): *Pseuderanthemum palatiferum* leaves were dosed.

3): The informant didn't make clear the name of the diseases.

Table 6. The growth of *Pseuderanthemum palatiferum*¹⁾

	Age (day)			
	0	14	44	134
No. of leaves	3-5 ²⁾	5-8 ²⁾	100-200 ³⁾	700-1,000 ³⁾
Cauline height (cm)	8-12	15-20	40-50	80-120
No. of axillary buds (pieces)	-	-	>15	-
Diameter of canopy (cm)	-	-	30-40	70-100
Green yield (kg/1,000 m ²)	-	-	-	500-700

1): The plants during age 0 and 15 day grew in pots. The plants at age 15 day were transplanted to the experimental farm of Cantho University.

2): Pairs of opposite leaves.

3): Leaves.

2. Botanical study

The growth of *P. palatiferum* is shown in Table 6. The young caulis was green, but the brown wood and multi branches grew. The leaves were 12-17 cm long and 3.5-5.0 cm wide. The petioles were 1.0-2.5 cm long. The plant grew very fast: it grew 80-120 cm in height

and produced 700-1,000 leaves/plant, leaf production was equivalent to 500-700 kg of leaves/1,000 m² at day 135. It grew as a bush with a height of 1 to 2 m. At the end of the test for flowering, April 2004, the 3 years old *P. palatiferum* bloomed for the first time.

Discussion

1. Ethnobotanical study

More households in the city center cultivated more plant populations; the duration of the cultivation was longer in the city center households; the city center households dosed the plant not only for treatment but also for prevention of human diseases; the suburb households dosed the plant only for treatment; and the amount of the dosage was more at the city center households. The above results would be explained from the following two points. Firstly, the ease of access to new information, or rumor, in the city center compared to the suburb should be mentioned, as the plant has been known only very recently. The information on the plant as a mysterious medical plant would have been first known in the city center, and then next, gradually spreading in the city center at the same time diffusing to the suburb. Second, the purposes and the recipients of the dose of the plant would be widening from only treatment to prevention and from human to animal diseases. It was also supposed that a small amount of this plant, at the early stages after its discovery and introduction to households, had been mainly used only for treatment of human diseases such as blood pressure and diarrhea because those are common or prevalent as human diseases. The persons who examined the effects had been able to know the benefits. Somewhere along the line of the spread of the rumors, the applications of the plant would also spread depending on the situation: the application to other minor human diseases; the comparably higher dosages for serious diseases; the application to prevent disease with lower dosages; and application to animal diseases. The duration of the dosage would be determined by the terms of the diseases' symptoms.

2. Botanical study

The plant observed grew easily and very fast as do plants in northern Vietnam³. In the growth parameters, exponential increase of the number of leaves was remarkable, and the number of leaves had reached 700–1,000/plant at day 135. It means that once households grow only one *P. palatiferum* plant during 4 months, the amount of the supply of leaves would be beyond the household consumption. The ease of planting and rapid growth would have helped the quick spread of the cultivation⁵. On the other hand, most of the households had thought that this plant had no flower, because they had never seen the blossom although some of them have

planted it for over 5 years. However, the plant of this study bloomed. The plants harvested for leaves won't bloom, but plants no longer harvested, like the plant in this study that was not harvested for 6 months, would be able to bloom in the same way as in northern regions of the country^{2,5,7}.

Conclusion

Cultivation and application of *P. palatiferum*, as a new medicinal plant, would have gradually spread from the city center to the suburb of the city, from treatment to prevention of diseases, and from humans to animals as recipients. The plant could grow very fast and bloom in southern Vietnam in the same way as in the northern areas of the country. The botanical characteristics of the plant helped the quick spread of the cultivation.

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