
Aromatic Effectiveness for the Elderly at Day Care Service Center: Toward Regional Vitalization Using the Wastes

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ABSTRACT

Objective of study was to find out a beneficially recycling of the thinned and chopped woods massively produced in mountainous regions Japan. Essential oil extraction was one of the effective approaches to overcome its issues. Materials from *Cryptomeria japonica*, *Lindera umbellata*, *Thujopsis dolabrata* and *Anise magnolia* chips was applied for oil extraction by steam distillation and was chemically analyzed by Gas Chromatography. Preclinical studies of the essential oil were done with a support of the elderly commuting to the Day Care Service Center. Test room was created with the forest pictures, bird singing and water flowing sound as back ground music. Essential oil-flavored test was done to know the elderly preference using the questionnaire test.

The most favorite flavor by the elderly was *Lindera umbellata* due to make them refreshing. But they selected *Thujopsis dolabrata* flavor instead of *Lindera umbellata*, when changing the napkin. It implies that "Different flavor for Different situation". Based on these results the flavored-napkin with anti-bacteria potency is a potential candidate to develop for the aged along with well-being and amenity life.

Keywords: *Essential oil; Cryptomeria japonica; Lindera umbellata; Thujopsis dolabrata; gas chromatography.*

1. INTRODUCTION

North-eastern part in Japan is nation-widely known as a refine lumber supplying region to be used for house construction, and for it constant tree care is unavoidable by thinning of wood branches. Further the house construction produces much lumber scraps as a worthless. The effective recycling of the tree-originated wastes of such the felled woods, thinning branches and waste timbers is a globally required environmental issue to be overcome.

Meanwhile WHO reported that the proportion of the world's population over 60 years will nearly double from 12 to 22%, and by 2020, the number of the aged 60 years and older will outnumber children younger than 5 years. Further reports postulates a gradual decrease in physical and mental capacity that grows risk of disease [1]. This tendency eventually means increase of the number of the elderly who need the day care nursing center or long term health service facility, coming with well-being and amenity there.

Aroma (Aromatherapy) is currently diffusing its efficacy into people who are living in stress-full society, result in the medical area as a therapeutic strategy in mental caused disorders like poor sleep, depression, anxiety, muscle tension, and pain [2,3]. Based on the above reasons we initiated a study on recycling of the prudent branches for the essential oil extraction first, followed by an application for the well-being life at the day care service center.

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2. MATERIALS AND METHODS

2.1 Lumber Scraps and Branches of Woods for Essential Oil Extraction

Cryptomeria japonica, *Lindera umbellata*, *Thujopsis dolabrata* and *Anise magnolia* shown in Photo 1 were used for the essential oil extraction by steam distillation system.

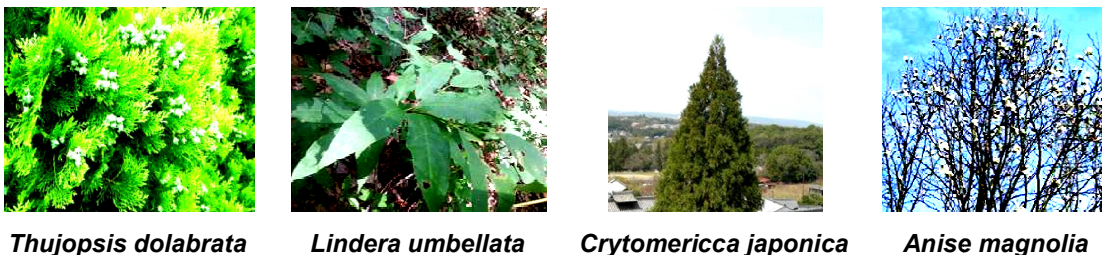


Photo 1. Lumber scraps of these tree were used for essential oil extraction by the steam distillation

2.2 Extraction of Essential Oil and Analysis of Chemical Constituent

Essential oil was extracted from twigs and scrap heaps (Photo 2) by the standard method “Steam Distillation System”. Chemical composites of the essential oil was analyzed after dilution in ethanol (dilution degree; 10^{-5}) for Gas Chromatography at Aomori Prefectural Industrial Technology Research Center, Japan.



Photo 2. *Lindera umbellata* twigs in a baskets and dried leaves surrounded (left), scrap heaps (middle) and steam distillation system for oil extraction (right)



Photo 3. Essential oil and leaf (from left; *Thujopsis dolabrata*, *Lindera umbellata*, *Cryptomeria japonica*)

2.3 Assessment of the Essential Oils Effectiveness by the Elderly at the Day Care Service Center

Number of the elderly enrolled for the study and age-distribution:

Gender	Age (y) & No.
Female; 12	70s; 3
Male; 6	80s; 9
	90s; 6

Questionnaire method was employed to evaluate essential oil effectiveness for amenity. Eighteen elderly who used the day care service center (Female; 12, Male; 6) were subjected to the tests. Recreation room at service center was arranged by surroundings with forest pictures to create forest atmosphere for the aroma test. During slide displaying *Lindera umbellata* leaf tea was served to the elderly and bird singing and water running sound were also elaborated (Photo 4).



Lindera umbellata leaf tea

Photo 4. Recreation room arranged for the test at the day care service center (left and center) and *Lindera umbellata* leaf tea (right) served to the elderly during tests

2.4 Items for Questionnaire Survey System

Q1. How did you like the *Lindera umbellata* leaf tea?

Q2. What flavor did you like the most in the recreation room?

Q3. Did you like to use the *Lindera umbellata* flavor in your own room?

Q4. What flavor did you select, when changing napkin?

These studies were made with an approval by the individual elderly and President of the day care service center.

Notification; Questionnaire investigation was conducted to the commuters to the day care service center and the elderly who live in the nursing home. Data from the day care service center were provided for analyses, but nursing home data were insufficient for analyses due to less number of answer sheets collected.

3. RESULTS

3.1 Chemical Constituent in the Essential Oil

Essential oils were offered for Gas Chromatography analysis on the 20 items considered to be included in oil. Top 7 constituents covered 70-80% in total amount included as shown in Table 1, and individual component included smells like citrus, fruit, herb, grass, vegetable, flower, lavender, and eucalyptus and the like. These smells mixed each other in the essential oil to produce natural flavor.

Table 1. Chemical constituent of the essential oil (%)

<i>Cryptomeria japonica</i>	<i>Lindera umbellata</i>	<i>Thujaopsis dolabrata</i>	<i>Amise magnolia</i>
β-fhellandrene 12.5%	Linalool 25%	cis-Thujopsene 49%	o - Cymene 35%
Bicyclo3.1.0hexane 11%	Eucalypto 11%	Cedrol 10.5%	Cyclohexane 15%
Cyclohexanemethanol 10%	Cyclohexene 11%	α-Cuprenene 4.6.	γ- Terpinene 9.5%
γ-Terpinene 9%	Geranyl acetate 9.6%	7-Isopropenyl 3.6%	Bicyclo.2.0 5.8%
3-Carene 6.4%	Bicyclo3.1.1hept 7%	Benzocyclohepten 3%	Naphthalene 4.7%
Cyclohexane 6%	Cyclohexanone 4.4%	Benzen 3%	α- Cadinol 4%
4-Carene 6%	o-Cymene 3.8%	Isopropyl-4,10-di 3%	Camphene 3%
3-Bicyclo2.2.1heptan 5.4%	Camphene 3.7%	1H-Benzocyclohex-2.7%	(+)-4-Carene 3%
β-Myrcene 5.2%	2,2,4-trimethyl- 3.3%	α-Bisabolol 2.3%	tau-Muurolol 2.5%
Subtotal 71.5%	78.8%	81.7%	82.5%

Component smell; Bicyclo (citrus), 3-Carene (citrus, herb), Cedrol (grass), Cyclohexane (citrus, fruit), Cyclohexanemethanol (vegetable, fruit), α-Cadinol (citrus fruit), Camphene (pesticide), Eucalyptol (eucalyptus), Linalool (flower, fruit, wine), Geranyl (lavender), γ-Terpinene (citrus)

3.2 Questionnaire Result on the Flavor by the Elderly

Q1. How did you enjoyed the *Lindera umbellata* leaf tea?

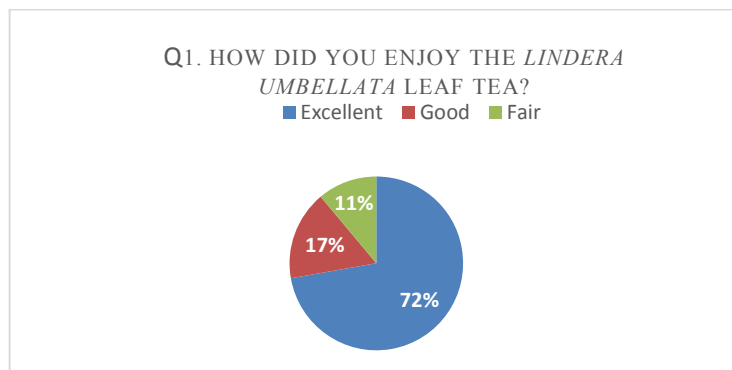


Fig. 1. Results of Question 1

The *Lindera umbellata* leaf tea gained high score at 72% by the elderly, and it came to 90% including score of good. The elderly replied “*Lindera umbellata* flavor and its leaf tea made us recall the good old days”.

Q2. What flavor did you like the best when using in the recreation room or own room?

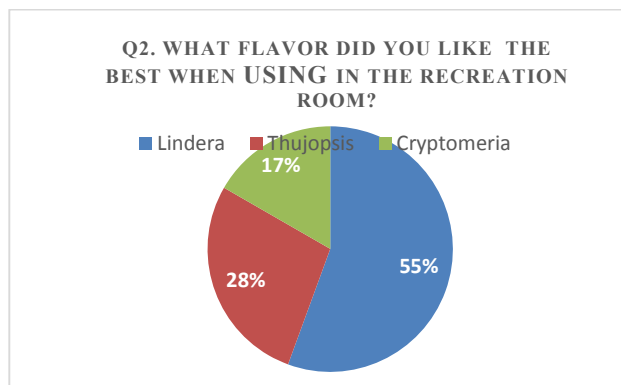


Fig. 2. Results of Question 2

The most favorite flavor when using in the recreation room (Photo 2) was the *Lindera umbellata* (55%), *Thujopsis dolabrata* (28%) and *Cryptomeria japonica* (17%). The elderly selected the *Lindera umbellata* in the first place, the subsequent works were then progressed by using of the *Lindera umbellata* flavor.

Q3. How did you feel in use of the *Lindera umbellata* flavor in your own room and the reason why?

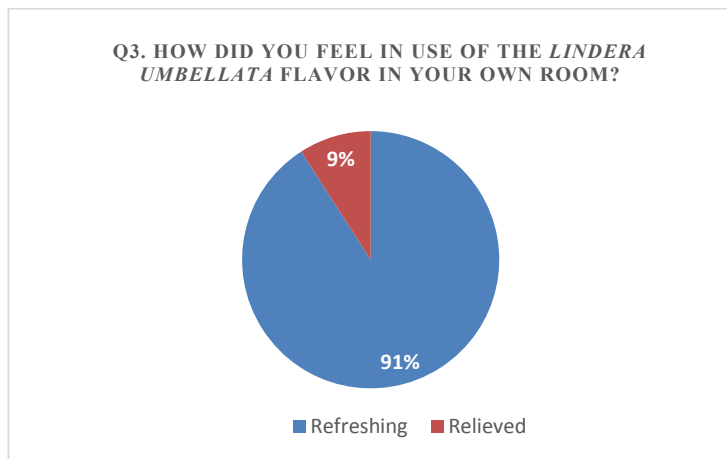


Fig. 3. Results of Question 3

Q4. What flavor did you choose, when changing napkin?

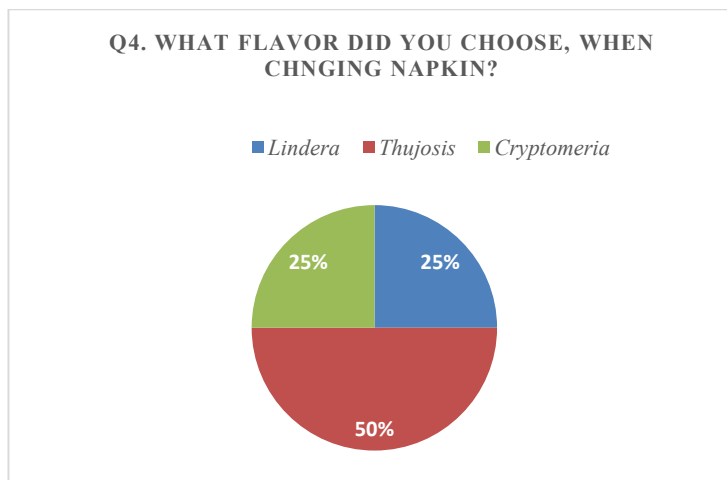


Fig. 4. Results of Question 4

The elderly selected the *Thujopsis dolabrata* flavor for napkin changing instead of the *Lindera umbellata*, indicating “Different choice of flavor to different situation in use”.

4. DISCUSSION

Chemical constituents of aromas have been used as fragrances and perfumes for several thousand years, dating back to ancients Egyptian civilization [4]. Currently these components are chemically synthesized in use in variety of areas such as food service and the like. However natural plant-aroma consist of complex elements in flavor that create profounder flavors than the synthesized (Table 1).

Chemical components of the essential oils *Cryptomeria japonica*, *Lindera umbellata*, *Thujopsis dolabrata* produce a variety of flavors likely to be citrus, vegetable, herb, grass, fruit, flower, wine, lavender, eucalyptus.

Essential oil occasionally posses the medicinal activity likely reducing pain, and affecting to physiological parameter such as pulse, blood pressure, skin temperature, and brain activity [2,3]. Studies of aromatherapy have shown mixed results. There have been some reports of improved mood, anxiety, sleep, nausea, and pains. Other studies reported that aromatherapy showed no change in symptoms [5].

Currently bacteria killing activity of essential oil flavor (volatile) was demonstrated in the our experiments using by essential oil of the *Thujopsis dolabrata*, *Lavender*, and *Citoronellal* (*Rosa rugosa*) [6]. Antibacterial potency of the *Thujopsis dolabrata* was well known, but its flavor's bacteria killing potency was not well understood due to lack of report. Mode of action of the *Thujopsis dolabrata* flavor was to induce tiny bubble projection from cell wall, which was different from formaldehyde-induced deformation as shown in Photos 5 and 6 [7].



Photo 5. Report on Aroma's Power. "Bacteria killing potency of *Thujopsis dolabrata* flavor" (left, 2005) (Sasaki's research), and "Health improvement potency of *Lindera umbellata*" (Right, 2020)



Control

***Thujopsis* flavor-exposed**

Formaldehyde-exposed

Photo 6. Scanning electron micrographs of O157 exposed to *Thujopsis* flavor (center). Control (left) and formaldehyde exposed (left). *Thujopsis* flavor-exposed foamed and formaldehyde exposed were a sheet-shape being different from *Thujopsis* flavor treated [7]

Based on these facts we are now considering to develop the aroma applied napkin with infection protective activity, expecting usage in hospitals, own house, nursing home facilities for the aged to maintain amenity life after confirming safety test mainly to skin.

Safety of essential oils shows very few effect or risk when they are used as directed but allergic reaction and skin irritation may occur when essential oils are in contact with the skin for a long period of time [5,8], but our own test will be require before using for the elderly skin [9].

5. CONCLUSION

Essential oils preferences using the extracts from the *Cryptomeria japonica*, *Lindera umbellata*, and *Thujopsis dolabrata* were studied by the elderly commuters to the day care center. The elderly preferred *Lindera umbellata* flavor the most when used in the recreation room, and their own room. The *Thujopsis dolabrata* flavor was selected in use when changing their napkin in their own room. Since the *Thujopsis dolabrata* has bacteria killing potency, it is a possible candidate in use for development of the napkin (diaper) for the elderly.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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