



## Using Extracts from Odor-transmitting Gland of Civet as Fixative Substance in Fragrance

Le Huy Hai<sup>1\*</sup>, Le Mai Xuan Truc<sup>2</sup> and Nguyen Quoc Trung<sup>3</sup>

<sup>1</sup>Faculty of Chemical Engineering and Food Technology, Nguyen Tat Thanh University, Vietnam.

<sup>2</sup>Faculty of Chemical Engineering and Food Technology, Ho Chi Minh City University of Technology (HCMUT), Vietnam.

<sup>3</sup>Faculty of Chemistry, VNUHCM-University of Science, Ho Chi Minh City, Vietnam.

### Authors' contributions

*This work was carried out in collaboration among all authors. Author LHH designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors LMXT and NQT performed the statistical analysis, managed the analyses of the study, managed the literature searches. All authors read and approved the final manuscript.*

### Article Information

#### Editor(s):

- (1) Dr. Osama Anwer Saeed, University of Anbar, Iraq.
- (2) Dr. Jean Beguinot, University of Burgundy, France.
- (3) Prof. Jean-Marie Exbrayat, Catholic University of Lyon, France.

#### Reviewers:

- (1) Siti Nuurul Huda Mohammad Azmin, University Malaysia Kelantan, Malaysia.
- (2) Gunavathy Selvarajh, University Malaysia Kelantan, Malaysia.
- (3) Shipra Jha, Amity University, India.
- (4) Ritesh Kumar Tiwari, SRMS College of Engineering and Technology, India.
- (5) Krishna Sujeethasai, University of Jaffna, Sri Lanka.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/66993>

Original Research Article

Received 01 March 2021  
Accepted 06 May 2021  
Published 13 May 2021

### ABSTRACT

**Aim and Objectives:** Civet with the scientific name *Viverricula indica* was found in Southeast Asia, Vietnam. The Civet has an odor-transmitting gland from the musk bag. The Civet musk sac is in the abdomen, about 2 cm in front of the scrotum and in front of the penis. In the field of aromatherapy, Civet musk is a precious fixative that has been researched and widely used. In Vietnam, there are very few studies about the usage of Civet musk. Therefore, our goal in this paper was to study musk from Civet and use it as a fixative in the aroma.

**Materials and Methods:** Material has been used to separate the odor-transmitting gland from the Civet is in Dak Nong, Vietnam. The musk was fabricated into musk Civet absolute by means of 96% alcohol impregnation and then distillation to remove solvents at low pressure. The fragrance was

\*Corresponding author: E-mail: [haihuongviet@gmail.com](mailto:haihuongviet@gmail.com);

diluted with solvents to evaluate the scent based on the sensory for odor evaluation.

**Results:** The results indicated that the fixative ability of Civet absolute was better than traditional artificial musk such as musk ambrette, musk xylol, musk ketone.

**Conclusion:** This research has proven that musk from Civet in Vietnam is a very good fixative.

*Keywords: Civet; extraction; fixative; fragrance; natural.*

## 1. INTRODUCTION

The smell of animal origin is being studied because animal-based perfumes are often expensive fragrances. Odor-transmitting glands to seduce female reproduction such as musk from Deer and Civet, waste from many animals such as Whales and Mice has been studied and used in aromatherapy. Some animals have odor-transmitting glands that are used for their survival purposes. The best-known civet species is the African civet (*Civettictis civetta*) [1] which historically has been the main species from which a musky scent used in perfumery was obtained. Many mammal species in ovulation often have a strange odor than normal to signal or seduce males. Deer, Civet is the animal species characteristic for animal groups with odor-transmitting gland, which emitted to attract females during the breeding season to maintain their breeding [2,3,4].

A Civet is a small, lithe-bodied, mammal native to Asia, Africa and Europe, especially the tropical forests as Philippines, Lao, Vietnam, Malaysia, southern China, Sri Lanka, India, western Ethiopia [5,6,7,8]. There are many different Civet species, of the families *Viverridae* and *Nandiniidae*. There have been many studies on evolutionary history, spatial organization, and activity, the influence of Food distribution on the behavior of Civet [9,10,11,12]. A number of Civet species secrete Civet musk in their perineal glands. Musk from Civet is a soft, almost liquid material, having pale yellow when fresh, darkening in the light. Its odor is strong, but once diluted it is pleasantly and sweetly aromatic. It is used in perfumery by solvent extraction as an absolute, or a resinoid [13,14]. Civet rearing is a means of livelihood for farmers and is also economically important to commercial civetone exporters. Civet musk is also traditionally used as medicine to treat various ailments [15,16].

Musk is the kind of advanced aromatherapy because it gives long and lasting fragrance soluble in organic solvents such as benzene, ether, kerosene, chloroform slightly alcoholic, insoluble in water. The chemical composition in

musk that gives it most of its distinctive odor is civetone. It includes various other ketones such as cyclopentadecanone, cyclohexadecanone, cycloheptadecanone and 6-cis-cycloheptadecanone. Musk contains methylindole, fatty substances, potassium and calcium salts [17,18].

Raising Civet for meat, Musk and Civet Coffee has brought many economic benefits. Civet Coffee is popular with many people in the world [19,20,21]. Musk Civet is the "backbone" of the modern perfume, which makes perfumes become glamorous, spread in the space, warm and lively and widely used in cosmetics, aromatherapy.

The Civet in Vietnam of the families Viverridae is found in most of the mountainous and midland provinces. In Vietnam, there are many Civets that are the rich source of musk but they get less attention in the research field. In the field of fragrance in Vietnam, it is hard to see musk taken from Civet to make the fixative substance. Therefore, the paper "Research use odor-transmitting gland from Civet processing into the perfume fixatives for fragrance from the natural substance in Vietnam" is required to exploit this resource application for the field of aromatherapy [22].

The purpose of the research is to get musk from Civet in Dak Nong farming of Vietnam. From the odor-transmitting glands, we have Civet absolute using as the fixative in fragrance.

The research of using odor-transmitting gland from Civet in Vietnam to do fixatives for the fragrance provides scientific and practical value. It contributes to research on the field of fixative and the field of fragrance that has not been noticed in Vietnam. This is the natural source of material from animals available in Vietnam [23].

## 2. MATERIALS AND METHODS

### 2.1 Materials

Civet was raised on a family farm in Dak Lak district, Dak Nong province. The raw material

used in the experiment was taken from Gupta & Company Private Limited (India) as Cinnamic aldehyde, Citronellal, Ionone, Methyl ionone, Absolute Jasmine, Ylang-Ylang oil, Sandalwood oil, Oranges oil, Mandarin oil, Hydrocy citronellal, Vanillin, Palmarosa oil, Citronellol, Citronellyl butyrate, Citronellyl formate, Geraniol, Geranyl acetate, Geranyl butyrate, Geranyl formate, Vetiver oil, Cedarwood oil, Poumu oil, Terpeneol, Terpinyl acetate, Linalool, Linanyl acetate, Eugenol, Isoeugenol, Musk ambrette, Musk xylol, Musk ketone. In our experiments, we used volatile solvent alcohol 96% and odorless solvent diethyl phthalate (DEP).

## 2.2 Extract from Odor-transmitting Gland of Civet

The Civet has an odor-transmitting gland from the musk bag. Musk sac is in the abdomen, about 2 cm in front of the scrotum and in front of the penis. The bag is spherical, about 3.5-6 cm in diameter, weighing about 30g. The bag mouth is slightly flat with grayish-brown hairs, which are very close together and form a vortex; in the middle of which there is a small hole about 5mm in diameter. Inside the bag is musk in the form of thick milky like milk. When the musk is dried into a powder, the granules lumpy with irregular size, glossy and provide very special scent. That scent does not lose in a long time [24].

We had cut out musk bags from Civet that were raised on a farm, then remove excess skin, shave off remaining hair, rinse with alcohol 96%, exposure in the shady for dry, wrap the bag in a paper moisture absorption and hang in that airy until dry. When the bag of musk dried, it was chopped, crushed to a very small, soaked in alcohol 96%. After 10 days, musk substances were completely dissolved. Then, we performed a distillation process to remove the solvent and receive the musk Civet absolute [25].

## 2.3 Method of Assessment of Product Quality

Nowadays, in the field of aromatherapy, smell is mainly measured by the olfactory of humans. Although many modern types of equipment such as gas chromatography/mass spectrometric (GC/MS), electronic nose... but the Perfumer still has to evaluate the quality of fragrance with the human sense. The machinery can analyze the

chemical composition of the aroma but cannot recognize the aroma that the human likes or not. People use an odorless solvent to evaluate the quality of diluted fragrance 10-20 times, then use specialized paper to evaluate aromatherapy. Record of odor quality and odor retention time for comparative assessment. The aroma quality assessment method in this study was to use the sense of smell to evaluate the odor of the sample over time based on the assessment of Jiang John et al. to record the odor quality and the retention time [26].

## 3. RESULTS AND DISCUSSION

### 3.1 Using Civet Absolute as Fixative Substance in Fragrance

We use Civet absolute as the fixative substance in fragrance for floral odor CH.1 (Table 2). The fragrance structure of CH.1 includes Top group, Body group, and Fixative group. The Top group is aromatics based on aldehydes with very strong smells as Cinnamic aldehyde, Citronellal. Body group is the main aroma of violet odor such as Ionone, Methyl ionone and mixed rose scent as Palmarosa oil, Citronellol, Citronellyl butyrate, Citronellyl formate, Geraniol, Geranyl acetate, Geranyl butyrate, Geranyl formate. The fixative group is musk Civet absolute.

### 3.2 Evaluation of the Fixative Ability of Civet Absolute

From Table 2, we see that fragrances CH.1, CH.2, CH.3 and CH.4 having the same composition in the Top group, Body group, but different in the Fixative group. The Fixative group of fragrance CH.1 is Musk Civet absolute, CH.2 is musk ambrette, CH.3 is musk xylol, and CH.4 is musk ketone. Musk ambrette, musk xylol, and musk ketone are artificial musks that are widely used as fixative substances in fragrance [27]. Each fragrance showed the behavior of showing no fragrance after a certain time because it depends on the composition of the components of a fragrance. Components with chemical structures that are difficult to evaporate and high boiling points like resins are usually good fixative abilities. The fixative capabilities of musk Civet absolute, musk ambrette, musk xylol, and musk ketone are different and depend on their chemical structure.

**Table 1. Describe the ability to retain the fragrance by the sense of smell**

Rating level	Classifying fragrance rating	Description of aroma
5	Odor very strong	The original odor of the sample
4	Odor quiet strong	Odor initially decreased less
3	Average odor	Odor initially decreased significantly
2	Odor weak	Odor initially is a little bit
1	Odor poor	Odor initially is very little
0	No odor	Odor initially is no longer

**Table 2. The component structure of the fragrance and the other fixatives**

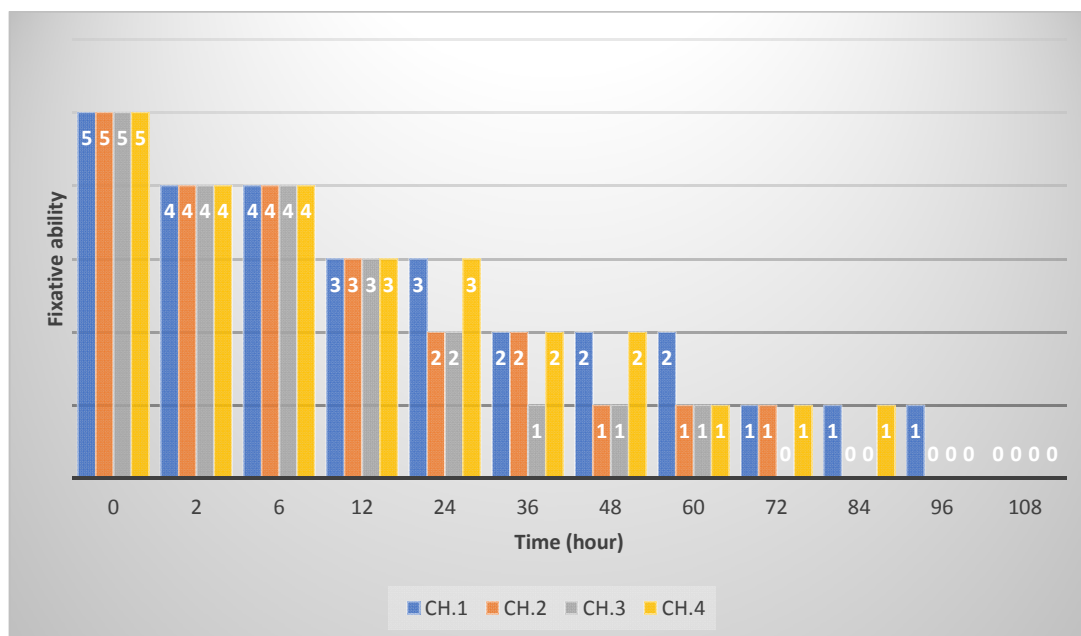
No.	Material	Violet fragrances % weight				Notes
		CH.1	CH.2	CH.3	CH.4	
1	Cinnamic aldehyde	1	1	1	1	Top group
2	Citronellal	1	1	1	1	
3	Ionone	28	28	28	28	Body group
4	Methyl ionone	20	20	20	20	
5	Absolute Jasmine	4	4	4	4	
6	Ylang-Ylang oil	5	5	5	5	
7	Sandalwood oil	5	5	5	5	
8	Oranges oil	1	1	1	1	
9	Mandarin oil	1	1	1	1	
10	Hydrocy citronellal	1	1	1	1	
11	Vanillin	4	4	4	4	
12	Palmarosa oil	2	2	2	2	
13	Citronellol	1	1	1	1	
14	Citronellyl butyrate	1	1	1	1	
15	Citronellyl formate	1	1	1	1	
16	Geraniol	1	1	1	1	
17	Geranyl acetate	1	1	1	1	
18	Geranyl butyrate	1	1	1	1	
19	Geranyl formate	1	1	1	1	
20	Vetiver oil	4	4	4	4	
21	Cedarwood oil	3	3	3	3	
22	Poumu oil	2	2	2	2	
23	Terpineol	1	1	1	1	
24	Terpinyl acetate	1	1	1	1	
25	Linalool	1	1	1	1	
26	Linanyl acetate	1	1	1	1	
27	Eugenol	1	1	1	1	
28	Isoeugenol	1	1	1	1	
29	Musk Civet absolute	5				Fixative group
30	Musk ambrette		5			
31	Musk xylol			5		
32	Musk ketone				5	
	Total	100	100	100	100	

From Fig.1. shows that in the first 12 hours, all 4 types of odors CH.1, CH.2, CH.3, CH.4 have the same aroma intensity, and the olfactory can not distinguish the difference. After 24 hours, odor intensity of CH.2 and CH.3 is reduced more than the other fragrances. After 72 hours, fragrance CH.3 with a fixative group of musk xylene is no odor. After 84 hours of fragrance CH.2 with a

fixative group of musk ambrette is no odor. After 84 hours, fragrance of CH.4 is no odor. After 96 hours, fragrance CH.4 with a fixative group of musk ketone is no odor. After 108 hours, fragrance CH.1 with a fixative group of musk Civet absolute is no odor. Therefore, it can be concluded that the fixative ability of musk Civet absolute is better than artificial musk substances.

**Table 3. Assessment of fragrance retention ability**

<b>Time (hour)</b>	<b>CH.1</b>	<b>CH.2</b>	<b>CH.3</b>	<b>CH.4</b>
0	Fragrance very strong	Fragrance very strong	Fragrance very strong	Fragrance very strong
2	Fragrance quiet strong	Fragrance quiet strong	Fragrance quiet strong	Fragrance quiet strong
6	Fragrance quiet strong	Fragrance quiet strong	Fragrance quiet strong	Fragrance quiet strong
12	Average fragrance	Average fragrance	Average fragrance	Average fragrance
24	Average fragrance	Fragrance weak	Fragrance weak	Average fragrance
36	Fragrance weak	Fragrance weak	Fragrance poor	Fragrance weak
48	Fragrance weak	Fragrance poor	Fragrance poor	Fragrance weak
60	Fragrance weak	Fragrance poor	Fragrance poor	Fragrance poor
72	Fragrance poor	Fragrance poor	No Fragrance	Fragrance poor
84	Fragrance poor	No Fragrance	No Fragrance	Fragrance poor
96	Fragrance poor	No Fragrance	No Fragrance	No Fragrance
108	No Fragrance	No Fragrance	No Fragrance	No Fragrance



**Fig.1. Fixative ability of fragrance CH.1, CH.2, CH.3 and CH.4**

From the data in Table 3 and the rating level in Table 1, we have Fig.1.

The above experiments show that musk Civet absolute was used as a good fixative for fragrance. The ability fixative of Civet absolute is better than traditional artificial musk. Many published studies have shown that musk from Civet has a variety of substances with the fixative ability. Tadesse H et al. who studied the chemical composition of musk from Civet, showed that the majority of the identified musk components were from four classes of organic compounds; Carboxylic Acids (38.5%), Alcohols (12.8), ketones (12.8%), and Aldehydes (5.1%). Five musk components 9- Cycloheptadecen-1-one, (Z); Octadecanoic acid; 9- Octadecenoic acid (E); 9- -Cycloheptadecen-1-ol; and ycloheptadecanone) were more abundant than the rest. Due to their chemical structure, the musk ketone compounds are very suitable for the fixative group [28]. Ruzica et al. reported cyclic ketones, and non-specific free fatty acids, alcohols, indols, and other compound classes in the musk from the three civet genera, Civettictis, Viverra, and Viverricula [29] Later, these were also reported by other workers [30,31]. Because the chemical structure of musk Civet absolute, musk ambrette, musk xylol, musk ketone is different, therefore, fixative ability of them is different, that is why fragrance CH.1, CH.2, CH.3, and CH. 4 gave no odor after a certain

time. Today Civet musk is an important export commodity. Perfume-producing countries import much of musk Civet because of the outstanding characteristic of musk civet compared to artificial musk.

#### 4. CONCLUSION

We have taken the Odor-transmitting Gland of Civet in Vietnam to make musk Civet absolute. From experimentation, we find that musk Civet absolute is a good fixative substance for fragrance. Fragrance CH.1 with the fixative group is musk Civet absolute has a violet flower fragrance that is more like a natural violet fragrance than fragrance CH.2, CH.3, CH.4 with artificial fixative as musk ambrette, musk xylol, musk ketone. The ability fixative of musk Civet absolute is better than traditional artificial musk as musk ambrette, musk xylol, and musk ketone. This research has proven that musk from Civet in Vietnam is a very good fixative. This is the natural source of material from animals available in Vietnam.

Using musk from Civet in the aromatherapy field will make it more effective for Civet breeders to both get meat and musk. Breeders can raise Civet on a large scale in farms in the midlands with favorable climate and conditions. The research direction is to use musk from Civet for Civet coffee is opening up great potential for the Civet livestock industry in Vietnam.

## DISCLAIMER

The company name used for this research is commonly and predominantly selected in our area of research and country. There is absolutely no conflict of interest between the authors and company because we do not intend to use this company as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the company rather it was funded by personal efforts of the authors.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable

## ACKNOWLEDGEMENTS

The authors would like to thank Nguyen Tan Phat, Thai Phuong Bao Linh, Faculty of Chemical Engineering and Food Technology, Nguyen Tat Thanh University, Viet Nam.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Mullu D, Balakrishnan M. Ecology of African Civet (*Civettictis civetta*) in Arba Minch Forest, Arba Minch, Ethiopia. *Science Technology and Arts Research Journal*. 2014;3(3):99–102.
2. Hien NTT, Thao NTP, Binh NT. A non-invasive technique to monitor reproductive hormone levels in common palm civets, *Paradoxurus hermaphroditus* Pallas, 1777. *Academia Journal of Biology*. 2018;40(3):74-81.
3. Hien NTT, Thao NTP, Binh NT. Study on hematological parameters of common palm civets (*Paradoxurus hermaphroditus* Pallas, 1777) in captivity. *Journal of biotechnology*. 2017;15(3A):71-76.
4. Hien NTT, Thao NTP, Binh NT. Blood and urinary biochemical parameters of the Common Palm Civets (*Paradoxurus hermaphroditus*, Pallas 1777) in captivity, *Journal of Animal Husbandry Sciences and Technics*. 2018;235:90-96.
5. Piper PJ, Ochoa J, Robles EC, Lewis H, Paz V. Palaeozoology of Palawan Island, Philippines. *Quaternary International*. 2011;233(2):142–158.
6. Tolosa T, Ragassa F. The husbandry Welfare and health of Captive African Civets (*Vivera Civetica*) in Western Ethiopia. *Animal Welfare Journal*. 2007; 16(1):15-19.
7. Admasu E, Thirgood SJ, Bekele A, Laurenson MK. A note on the spatial ecology of African Civet *Civettictis civetta* and Common Genet (*Genetta genetta*) in farmland in the Ethiopian Highlands. *African Journal of Ecology*. 2004;42:160–162.
8. Bekele T, Afework B, Balakrishnan M. Feeding ecology of the African Civet *Civettictis civetta* in the Menagesha–Suba State Forest, Ethiopia. *Small Carnivore Conservation*. 2008;39:19–24.
9. Patou ML, Wilting A, Gaubert P, Esselstyn JA, Cruaud C, Jennings A.P, Fickel J, Veron G et al. Evolutionary history of the *Paradoxurus* palm civets—a new model for Asian biogeography. *Journal of Biogeography*. 2010;37:2092–2093.
10. Jennings AP, Seymour AS, Dunstone N. Ranging behaviour, spatial organization and activity of the Malay civet (*Viverra zibethica*) on Buton Island, Sulawesi". *Journal of Zoology*. 2006;268:63–71.
11. Dagnachew M, Mundantra B. Ecology of African Civet (*Civettictis civetta*) in Arba Minch Forest Arba Minch Ethiopia. *Science, Technology and Arts Research Journal*. 2014;3(3):99-102.
12. Tadesse H, Afework B, Raya A, Tsegaye G, Belay B, Taye T, Berhanu B. Diets of the African Civet *Civettictis civetta* (Schreber, 1778) in selected coffee forest habitat, south-western Ethiopia. *African Journal of Ecology*. 2017;55(4):573-579.
13. Wakjira K. Better handling of African Civet for quality musk extraction. *Agriculture and Rural Development Journal*. 2005;2:31–34.
14. Wondimagegn D, Afework B, Balakrishnan M, Gurja B. Collection of African Civet *Civettictis civetta* perineal gland secretion from naturally scent marked sites. *Small Carnivores Conservation*. 2011;44:14-18.
15. Kumera W. Improving civet cat farming for quality musk production (Amharic version). *Agriculture and Rural Development Bulletin*. 2005;6:31-34.

16. Dannenfeldt K.H. Europe Discovers Civet Cats and Civet. *Journal of the History of Biology*. 1985;18(3):403-431.
17. Duangyod T, Palanuvej C, Ruangrung N. Quantitative analysis of civetone and normuscone in secretion from *Viverricula indica* and in aromatic remedies by gas chromatography-mass spectrometry. *Journal of Chemical and Pharmaceutical Research*. 2011;3:196-204.
18. Ifmalinda I, Imas SS, Mimin M. Chemical Characteristics Comparison of Palm Civet Coffee (Kopi Luwak) and Arabica Coffee Beans. *Journal of Applied Agricultural Science and Technology*. 2019;3(2):280-288.
19. UdiJumhawan, Sastia P, Yusianto, Takeshi B, Eiichiro F. Quantification of coffee blends for authentication of Asian palm civet coffee (Kopi Luwak) via metabolomics: A proof of concept. *Journal of Bioscience and Bioengineering*. 2016; 122(1):79-84.
20. Murna M, Dian H, Anshar P, Febriani, Amhar A. Sensory and Microbial Characteristics of Civet Coffee. *International journal on advanced science engineering information ternology*. 2018; 8(1): 65-171.
21. Jesusimo L, Dioses J. Discrimination of Civet Coffee Using Image Processing and Machine Learning. *International Journal of Emerging Trends in Engineering Research*. 2020;8(4):1067-1072.
22. Nguyễn Thanh Bình, Ảnh hưởng của kích dục tố hCG và PMSG đến kết quả sinh sản của cây vòi hương *Paradoxurus hermaphroditus* trong điều kiện nuôi nhốt. *Tạp chí KHKT Thú y*. 2015;17(8):54.
23. Đỗ Tất Lợi. Những cây thuốc và vị thuốc Việt nam. Nhà xuất bản Khoa học và kỹ thuật. 1981;978-980.
24. Fahlbusch, Karl-Georg; et al. "Flavors and Fragrances". *Ullmann's Encyclopedia of Industrial Chemistry* (7th ed.). Wiley. 2007; 86.
25. Robertet. Civet absolute; 2021.
26. Jiang J, Coffey P, Toohey B. Improvement of odor intensity measurement using dynamic olfactometry. *Journal of the Air & Waste Management Association*. 2006; 56(5):675–83.
27. Wisneski HH. Determination of musk ambrette, musk xylol, and musk ketone in fragrance products by capillary gas chromatography with electron capture detection. *Journal of AOAC International*. 2001;84(2):376-81.
28. Tadesse H, Tesfaye S, Afework B and Jeffrey R. The composition of perineal gland secretion (musk) from the african civet *civettictis civetta*. *International Journal of Current Research*. 2016;8(3): 27787-27794.
29. Ruzika, L., Schinz, H. and Ceidel, C.F. Constitution of Civetone, Civetol and Civetane. *Helvetica Chimica Acta*. 1927; 10:695-706
30. Jacob J. and Schliemann H. Chemical composition of the secretion from the anal sac of *Civettictis civetta* (Schreber, 1776). *Zeit naturalismus*. 1983;38:497-500.
31. Buesching CD, Waterhous JS and Macdonald DW. Gas chromatographic analyses of the sub-caudal gland secretion of the European badger (*Meles meles*), Part I: chemical differences related to individual parameters. *Journal of Chemical Ecology*. 2000; 28: 41-56.

© 2021 Hai et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*  
 The peer review history for this paper can be accessed here:  
<http://www.sdiarticle4.com/review-history/66993>