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## Some studies on assessment of physico-chemical properties of extracted essential oil

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**Abstract**

Patchouli (*Pogostemon cablin*) is an aromatic crop, belonging to the family Lamiaceae and is commonly known as Patchouli. Patchouli oil can be processed in food and perfumery industry of commercial importance. The knowledge about physico-chemical properties of any biomaterial is essential and to produce good quality oil that can compete with the Indonesian oil. Improving the quantity and quality of Patchouli oil with different package of practices, Pilot scale study for enhancement of patchouli essential oil quantity and quality using biotransformation process. In the present investigation, some studies on the physico-chemical properties like Density, refractive index, acid values and ester values for oil extracted from the different sample of Patchouli oil were carried out. 2, 4, 6 and 8 days was found 0.970, 0.972, 0.973, 0.976 0.980 and 0.981 g/ml; 1.5098, 1.5070, 1.5029, 1.5024, 1.5008 and 1.5002; 3.65, 3.07, 3.17, 3.65, 3.77 and 4.40; 9.76, 8.77, 7.71, 6.14, 3.75, and 3.06 respectively for treatment with *Aspergillus foetidus*, 2, 4, 6 and 8 days was found 0.970, 0.972, 0.974, 0.977, 0.981 and 0.984 g/ml; 1.5098, 1.5070, 1.5024, 1.5014, 1.5023 and 1.5008; 2.65, 3.07, 3.12, 3.67, 3.70, and 4.95; 9.76, 8.77, 4.88, 3.28, 3.71 and 3.11 respectively., treatment with *Penicillium citrinum*, 2, 4, 6 and 8 days was found 0.970, 0.972, 0.978, 0.981, 0.986 and 0.989 g/ml; 1.5098, 1.5070, 1.5029, 1.5018, 1.5014 and 1.5014; 2.65, 3.07, 3.14, 3.40, 3.66 and 4.25; 9.76, 8.77, 7.46, 6.11, 5.61 and 5.60 respectively for treatment with *Trichosporon asteroides*.

**Keywords:** physico-chemical properties, patchouli, oil, Density, refractive index, acid values and ester values.

**Introduction**

Patchouli (*Pogostemon cablin*) is an aromatic crop, belonging to the family Lamiaceae and is commonly known as Patchouli. Patchouli oil is an essential ingredient and used as a 'base' material in perfumery industry. Patchoulic alcohol is commonly used as an indicator for the quality assessment of dried *P. cablin*. The leaves constitute the economic part, which contain the oil glands. Leaves constitute the economic part containing patchouli oil that is concentrated on the outer surface of leaves and in the internal tissues; some quantity is also found in the tender parts of the stem. The leaves of patchouli plant contain 1.5-4% volatile oil composed mainly of patchouli alcohol and other sesquiterpenes such as pogostol, bulnesol, norpatchoulinol, a-guaiene, abulnesene and 13-patchoulene (Akhila *et al.* 1984) [1]. The commercial oil of patchouli is obtained by steam distillation of the shade dried leaves. The essential oil is used in food and perfumery industry (Akhila *et al.* 1984) [1]. There is no synthetic substitute for patchouli oil and hence it has a great demand in perfumery industries. The oil is used as a flavoring ingredient in major food products including alcoholic and non-alcoholic beverages, frozen dairy desserts, candy, baked foods, meat and meat products. Dry patchouli leaves are used to scent the wardrobes. Patchouli oil include cycloseychellene, patchouliopyridine, epiguaipyridine, guaipyridine, benzaldehyde, cinnamaldehyde, limonene, camphene, a-pinene, 13-pinene, and eugenol (Avan *et al.* 1973). Indonesia is the major producer of patchouli oil in the world (1100 tonnes per year), contributing more than 91.7% of the total world production. Consumption of Patchouli oil in the world is about 2000 tonnes per annum. In India due to increase in chewing tobacco and pan masala industries, consumption has gone up to about 300 tonnes per annum while the production is below 50 tonnes per annum. The global demand of Patchouli oil is 1600 tonnes per annum with a value of 240 crores. India imports 200 tonnes of Patchouli oil valued at 33 crores annually. Currently, India is producing a very less quantity of patchouli oil and thus is annually importing about 20 tonnes of pure patchouli oil and 100 tonnes of formulated oils (Ramya *et al.* 2013). Patchouli is now becoming popular in Chhattisgarh. In Chhattisgarh it is cultivated in various districts - Surguja, Raigarh, Kabirdham, Durg, Korba, Bilaspur and Jagdalpur (Raghu 2006). In this study, the chemical composition, physico-chemical properties, antimicrobial activity against clinical isolates, and the bioactive property of patchouli oil are evaluated within a framework of standard pharmacological research.

## Material and Methods

The samples of patchouli were purchased from the local market of Raipur and Jagdalpur, Chhattisgarh. It is stored in room temperature. The analysis of physico-chemical properties of tamarind pulp which includes Density, refractive index, acid values and ester values for oil extracted from the different sample. 15 patchouli samples were taken and measurements were done separately.

## Quality Analysis

### Density

Density of an essential oil is defined as the ratio of the weight of a given volume of oil to the volume of oil at constant temperature. This is usually reported at 20°C.

The weight of the oil can be determined with the help of a thoroughly cleaned and dried pycnometer.

$$\text{Density (20 ° C)} = \frac{W_o}{V_o}$$

Where,

W<sub>o</sub> = Weight of oil (gm),

V<sub>o</sub> = Volume of oil (ml)

### 2 Refractive index

This can be determined with the help of a refractometer which gives the reading directly after calibration. The reading can be observed at room temperature with the help of ATC probe.

### Acid value

The acid number of oil is defined as the number of mg of potassium hydroxide required to neutralize the free acids in 1 g of oil. While determining the acid number the alkalis should be quite dilute (0.1 N) as strong alkalis may hydrolyze the esters even in cold conditions, thereby giving a higher acid number.

### Ester value

An ester number is defined as the number of mg of potassium hydroxide required to saponify the esters present in 1g of oil. For the esters of dibasic acids or dihydroxy alcohols, the ester number is divided by 2.

### Density, refractive index, acid values and ester values of patchouli

1. The patchouli oil extracted after treatment with *Aspergillus foetidus*, *Penicillium citrinum*, *Trichosporon asteroides* were analyzed for its physico-chemical quality. Density, refractive index, acid values and ester values for oil extracted from the different sample viz. fresh, control 2, 4, 6 and 8 days was found 0.970, 0.972, 0.973, 0.976 0.980 and 0.981 g/ml; 1.5098, 1.5070, 1.5029, 1.5024, 1.5008 and 1.5002; 3.65, 3.07, 3.17, 3.65, 3.77 and 4.40; 9.76, 8.77, 7.71, 6.14, 3.75, and 3.06 respectively for the treatment with *Aspergillus foetidus*, 2, 4, 6 and 8 days was found 0.970, 0.972, 0.974, 0.977, 0.981 and 0.984 g/ml; 1.5098, 1.5070, 1.5024, 1.5014, 1.5023 and 1.5008; 2.65, 3.07, 3.12, 3.67, 3.70, and 4.95; 9.76, 8.77, 4.88, 3.28, 3.71 and 3.11 respectively for the treatment with, *Penicillium citrinum*, 2, 4, 6 and 8 days was found 0.970, 0.972, 0.978, 0.981, 0.986 and 0.989 g/ml; 1.5098, 1.5070, 1.5029, 1.5018, 1.5014 and 1.5014; 2.65, 3.07, 3.14, 3.40, 3.66 and 4.25; 9.76, 8.77, 7.46, 6.11, 5.61 and 5.60 respectively for the treatment with, *Trichosporon asteroides*

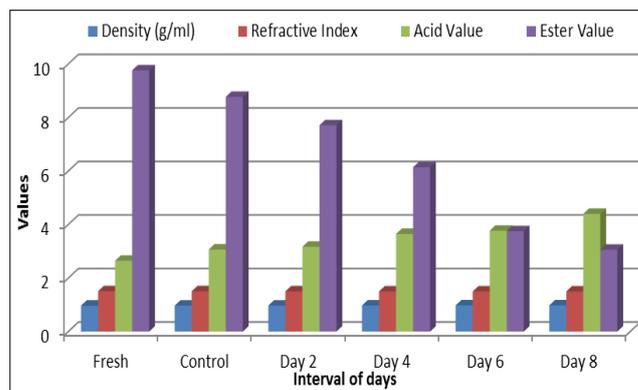
### Physico-chemical Quality of Patchouli Oil

The physico-chemical quality of patchouli essential oil extracted from different samples were analyzed by using standard methods as mention in the materials and methods section 3.2. Density, refractive index, acid value and ester value were analyzed for physico-chemical quality of patchouli oil extracted from different extracts. Data obtained are presented in Table 4.7, 4.8 and 4.9.

**Table 1:** Physico-chemical quality of patchouli oil extracted after incubation with *Aspergillus foetidus*

Treatment	Density (g/ml)	Refractive Index	Acid Value	Ester Value
Fresh	0.970	1.5098	2.65	9.76
Control	0.972	1.5070	3.07	8.77
Day 2	0.973	1.5029	3.17	7.71
Day 4	0.976	1.5024	3.65	6.14
Day 6	0.980	1.5008	3.77	3.75
Day 8	0.981	1.5002	4.40	3.06

Table 1. presents refractive index of patchouli oil samples. The refractive index of the extracted oil were 1.5098, 1.5070, 1.5029, 1.5024, 1.5008 and 1.5002 for fresh, control & 2, 4, 6 and 8 days *Aspergillus foetidus* treated extracts, respectively. The oil extracted from fresh patchouli gives highest refractive index 1.5098 and the oil extracted from 8 days *Aspergillus foetidus* sample gives least value 1.5002 compared to other samples. Acid value of different extracted patchouli oil were found 2.65, 3.07, 3.17, 3.65, 3.77 and 4.40 from fresh, control & 2, 4, 6 and 8 days respectively. The oil extracted from 8 days sample gives highest acid value 4.40 respectively. Ester value of different extracted patchouli oil were found 9.76, 8.77, 7.71, 6.14, 3.75, and 3.06 from fresh, control & 2, 4, 6 and 8 days respectively. The oil extracted from fresh sample gives highest value 9.76 respectively. The oil extracted from 8 days sample gives least ester value compared to other samples.



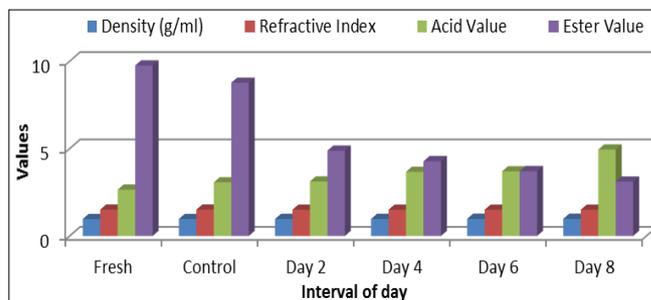
**Fig 1:** Physico-chemical quality of patchouli oil extracted after incubation with *Aspergillus foetidus*

**Table 2:** Physico-chemical quality of patchouli oil extracted after incubation with *Penicillium citrinum*

Treatment	Density (g/ml)	Refractive Index	Acid Value	Ester Value
Fresh	0.970	1.5098	2.65	9.76
Control	0.972	1.5070	3.07	8.77
Day 2	0.974	1.5024	3.12	4.88
Day 4	0.977	1.5014	3.67	4.28
Day 6	0.981	1.5013	3.70	3.71
Day 8	0.984	1.5008	4.95	3.11

From Table 2. Refractive index obtained was 1.5098, 1.5070, 1.5024, 1.5014, 1.5023 and 1.5008 for fresh, control, 2, 4, 6 and 8 days sample incubate with *Penicillium citrinum* extracts. The oil extracted from fresh patchouli gives highest value of refractive index 1.5098 and the oil extracted from sample treated with *Penicillium citrinum* after 8 days sample gives least value 1.5008 compared to other samples. Acid value of oil obtained after different treated and untreated samples were 2.65, 3.07, 3.12, 3.67, 3.70, 4.95 from fresh, control & 2, 4, 6 and 8 days respectively. The oil extracted from 8 days samples gives least value 3.12 as compared to other samples. The oil extracted from 8 days sample gives highest value 4.95 as compared to other samples. Ester value of different extracted oil were 9.76, 8.77, 4.88, 3.28, 3.71 and 3.11 from fresh, control, & 2, 4, 6 and 8 days respectively, when the oil extracted from fresh patchouli gives highest ester value 9.76 and the oil extracted from 8 days *Penicillium*

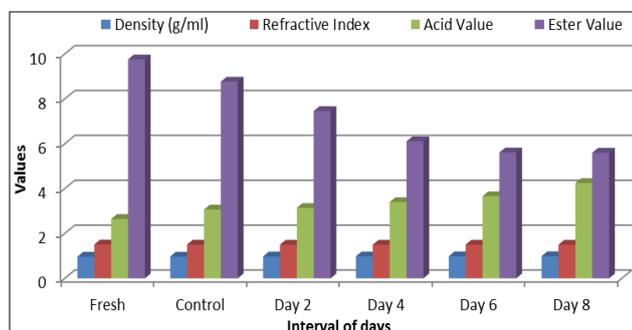
*citrinum* treated sample gives least value 3.11 as compared to other treatment.

**Fig 2:** Physico-chemical quality of patchouli oil extracted after incubation with *Penicillium citrinum***Table 3:** Physico-chemical quality of patchouli oil after incubation with *Trichosporon asteroides*

Treatment	Density (g/ml)	Refractive Index	Acid Value	Ester Value
Fresh	0.970	1.5098	2.65	9.76
Control	0.972	1.5070	3.07	8.77
Day 2	0.978	1.5029	3.14	7.46
Day 4	0.981	1.5018	3.40	6.11
Day 6	0.986	1.5014	3.66	5.61
Day 8	0.989	1.5014	4.25	5.60

From Table 3 Refractive index of patchouli oil obtained was 1.5098, 1.5070, 1.5029, 1.5018, 1.5014 and 1.5014 from fresh, control, 2, 4, 6 and 8 days sample incubated with *Trichosporon asteroides* extracts. Highest oil recovery (1.62%) was recorded in the samples incubated up to 8 day with the *Trichosporon asteroides*. However, increase in the oil recovery is negligible after the 6 day of incubation.

control, 2, 4, 6 and 8 days samples. The oil extracted from fresh sample gives lower acid value 2.65 as compared to others sample. Ester values of different extracted oil were 9.76, 8.77, 7.46, 6.11, 5.61 and 5.60 from fresh, control, 2, 4, 6 and 8 days samples. When the oil extracted from fresh patchouli gives highest ester value 9.76 and the oil extracted from 8 days *Trichosporon asteroides* treated sample gives least value 5.60 as compared to other treatment.

**Fig 3:** Physico-chemical quality of patchouli oil extracted after incubation with *Trichosporon asteroides*

The oil extracted from fresh patchouli gives highest value of refractive index 1.5098 and the oil extracted from sample treated with *Trichosporon asteroides* after 8 days sample gives least value 1.5014 compared to other samples. Acid value of oil obtained after different treated and untreated samples was 2.65, 3.07, 3.14, 3.40, 3.66 and 4.25 from fresh,

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