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Research Article

Effect of Drying Methods and Drying Days on Essential Oil Content and Physicochemical Properties of Basil (*Ocimumbasilicum*) Varieties in Ethiopia

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Abstract: Basil (*Ocimumbasilicum L.*) is an herbaceous annual aromatic herb that belongs to the Lamiaceae family. This study aimed to analyze the essential oil content and physicochemical properties of basil varieties stored under different drying methods and dried on different drying days. The fresh leaf of basil varieties was collected from the Wondo Genet Agriculture research center experimental field and subjected to open sun and shade drying methods and four drying days (0,5, 10, and 15). The sample was subjected to oven and hydrodistillation methods on each four particular drying days. The obtained essential oils were analyzed for physical properties (specific gravity and refractive index) and chemical composition using GC-MSD. As shown in the result of all-cause drying methods and drying days significantly affect the essential oil content and physicochemical properties of Basil Variety. In the case of Variety, Basil 02 has a high essential oil content than Basil 05 in the chemical composition, and different chemical compositions exist in both. In the case of drying methods, the sample dried under the shade is higher than in the open sun in essential oil content and physicochemical properties. In the case of different drying days, as the drying days increase, the essential oil content is significantly affected. The essential oil content and physicochemical properties of essential oil decrease as drying days increase for both basil varieties. Drying affects the chemical composition of the two variables, which means, as in the cause of open sun drying, affects the chemical composition more than shade drying as the drying days increase, and the chemical composition decrease. Therefore, this study provides evidence that drying herbs on different drying days and under drying conditions affect the essential oil content and physicochemical properties of essential oil.

Keywords: Basil; Essential oil; Hydro distillation; Open sun; Shade

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1. Introduction

Common Basil (*Ocimumbasilicum L.*) is an herbaceous annual aromatic herb that belongs to the Lamiaceae family [1]. This plant is native to Iran, India, and the Mediterranean region and is under cultivation in nearly all parts of the world [2]. Common basil is a multipurpose medicinal and aromatic herb with great applications in the perfume, food, cosmetic and pharmaceutical industries [2]. For therapeutic purposes, this plant and its volatile oil have been used as a sedative, antitussive, diuretic, carminative, and spasmodic [2]. Different chemo varieties and major components have been reported for this plant such as estragole, linalool, methyl eugenol, geraniol, methyl cinnamate, bergamotene, α-cubebene, β-elemene, cinnamic acid, and limonene [2].

Apart from growing conditions, its related geographical and environmental parameters, and the plant's intrinsic biochemical and secondary metabolite pool, harvest and postharvest processes play a vital role in essential oils content/composition and subsequently [3]. Harvesting medicinal plants with maximum accumulated essential oil as well as immediate drying of the harvested material is a key step in retaining the high metabolite content/composition of medicinal plants and presumably an easy way to increase their quality. Since in the majority of production methods and areas, high fresh material supply in a short period is out of secondary metabolites extraction facility capacity, there are crucial needs for drying of plant materials following different extraction times [3].

Furthermore, drying of plant material allows the producer the long-term storage and easy manipulation of plant materials and finally cost-effective and year-long supply of secondary metabolites [4]. In addition, consumer demand has increased for processed products that keep more of their original characteristics without substantial effects on texture, color, flavor, aroma, taste, and mineral and biochemical profile [5].

A literature survey revealed that divergent drying methods have been used for drying different medicinal and aromatic plants. Some of them include conventional shade and sun drying, oven drying under diverse temperatures, solar drying, microwave-assisted drying, freeze-drying, and fire heat drying [5–10]. However, no further work has been done on the drying condition and drying time of basil varieties in Ethiopia so far. Therefore, the study aimed to evaluate the effect of sun and shade drying conditions and different drying days on the essential oil yield and chemical composition of basil varieties existing in Ethiopia.

2. Materials and Methods

2.1. Sample Collection and Preparation

The Experiment was carried out in the Wondo Genet Agricultural Research Center. The sample of two basil varieties was collected from the Wondo Genet Agricultural Research Center experimental field at optimum harvesting age. The sampling site was located at an altitude of 1800 m a.s.l., latitude and longitude of N 39° 1' 44" E 8° 25' 59". The collected samples were weighed and taken to Wondo Genet Food Science and Nutrition Research Laboratory for extraction and further analysis. The samples were subjected to open sun and shade drying conditions and four drying days (0 days, 5 days, 10 days, and 15 days) after harvesting.

2.2. Essential Oil Extraction and Content

The essential oil was extracted from fresh and dried leaves of basil varieties using the Clevenger apparatus for 3 hours by hydro-distillation method and dried with anhydrous Na_2SO_4 [11].

The Essential oil content of basil samples was calculated by the following formula.

$$\text{Oil content (w/w (\%)} = \frac{massofextractedoil\ (g)}{massofextractedsample\ (g)} \times 100$$

2.3. Moisture Content

The moisture content of basil variety samples was determined from the fresh leaf by using a drying oven according to the method described by [12]. The moisture content was calculated as follows:

$$\text{Moisture content (\%)} = \frac{massoffreshsample - massofdrysample}{massoffreshsample} \text{ x } 100$$

2.4. Physical Properties of Essential Oil

2.4.1. The Specific Gravity of the Essential Oil

The specific gravity was determined according to the method described by[13]. The 5ml of distilled water was added to the cleaned pycnometer. The distilled water was weighed (M_{water}) (make sure that there is no bubble or air inside the pycnometer while weighing). The distilled water was removed and the pycnometer was dried. Then the same volume of oil was added to the pycnometer and weighed (M_{oil}). Finally, the specific gravity or relative density was calculated using the following formula

$$\text{Specific gravity/relative density} = \frac{massofoil}{massofwater} \times 100$$

2.4.2. Refractive Index Determination

The refractive indexes of the essential oils were measured by a Refractometer (Reichert, AR200) according to the method described by [13,14]. The prism of the digital spectrophotometer was cleaned and the red button was pressed first to make sure that it was cleaned well. The sample was applied to the prism of a digital spectrophotometer using a micropipette. Finally, the result of the refractive index was read and recorded. The triplicate analysis occurred and the result was the average triplicate value in all cases.

2.5. Chemical Composition of Essential oil

The chemical composition of the extracted essential oil was analyzed according to [15] with some modifications. EO samples in hexane (1:1000) were analyzed on an Agilent 7820A Gas Chromatography system equipped with Agilent 5975C mass spectrometer detector. The HP-5 ms capillary column (30 m x 0.25 mm, film thickness 0.25 µm) was used. Adam's analytical conditions were as follows: oven temperature at 60 °C (0 min), 3 °C/min to 240 °C (1 min), and at the end increased to 280 °C at a rate of 10 °C/min (1 min) (Adams, 2007); helium, as the carrier gas, at a flow rate of 1 ml/min; injector temperature 220 °C. One ml of each sample was injected at a split ratio of 1:1. The mass spectrometry conditions were: ionization voltage 70 eV, ion source temperature 230 °C, transfer line temperature 280 °C, and mass range from 50 to 550 Da. The MS was operated in scan mode.

2.6. Data Analysis

Significant differences in the physical properties of the essential oil extracted from basil varieties were subjected to JMP software.

3. Result and Discussion

3.1. Physical properties

The physical properties of essential oil and moisture content of the two basil varieties were analyzed at different drying conditions and drying days. Their significant difference was analyzed as shown in Table 1. The mean value of all physical properties of essential oil by variety was large in Basil 05 variety and small in Basil 02 variety. All physical properties of the essential oil except specific gravity were significantly different between the two varieties. The mean value of all physical properties of essential oil by drying condition was large in shade dry and small in open sundry. All physical properties of essential oil except moisture content were significantly different between the two drying conditions. The mean value of all physical properties of essential oil by drying days was large in 0 days followed by 5 days, 10 days, and small in 15 days. All physical properties of the essential oil except specific gravity and refractive index were significantly different between the four drying days. The value of essential oil content in this study was slightly greater than the research finding [16]. The small differences may be because of the difference in agroecology and variety between the two samples [16]. The finding of specific gravity in this study was within the range of the research finding [17], slightly smaller than the research finding [18], and slightly less than the research finding [16]. The small differences between the two studies arise because of the agroecology and the variety of differences between the two samples [2]. The value of the refractive index of this activity was slightly less than the research finding reported by [19] and slightly greater than the report of [16]. The slight difference between the two results may be because of the variation of the two samples by variety and agroecology [5].

Table 1. Mean values of the effect of drying days and drying conditions on the physical properties of basil varieties

Variables	MC (%)	VW EOC (%)	WW EOC (%)	SPG	RI
Variety					
Basil 02	27.18[a]	0.58[a]	0.52[a]	0.924[a]	1.49864[a]
Basil 05	29.93[b]	1.02[b]	0.91[b]	0.930[a]	1.51168[b]
SE	0.0615	0.0029	0.0059	0.0026	0.0008
Drying Conditions					
Shade	29.97[a]	0.81[a]	0.72[a]	0.929[a]	1.50544[a]
Open Sun	27.14[b]	0.80[a]	0.71[a]	0.926[a]	1.50488[a]
SE	0.0615	0.0029	0.0059	0.0026	0.0008
Drying Days					
Day 0	83.37[a]	0.90[a]	0.80[a]	0.92[a]	1.505[a]
Day 5	12.26[b]	0.84[b]	0.75[b]	0.93[a]	1.505[a]
Day 10	10.09[c]	0.77[c]	0.69[c]	0.93[a]	1.504[a]
Day 15	8.51[d]	0.69[d]	0.61[d]	0.92[a]	1.504[a]
SE	0.0870	0.0042	0.0084	0.0037	0.0012

Means with a different letter in the column of superscripts are significantly different at p<0.05. Where; - %MC = Percent of moisture content, %VW = Percent of Volume by weight, %WW = percent of weight by weight, Spg= Specific gravity, RI=Refractive Index, D0=Day zero, D5= Day=5, D10=Day 10, and D15=day 15.

3.2. Interaction Effects of physical properties

As shown in **Table 2**, the mean value of the interaction effect of basil variety on drying conditions, and all physical properties of the essential oil except specific gravity are significantly different between varieties and drying days. The highest value of moisture content was observed in Basil 05, shade dry with a value of 31.78%, and the lowest value was observed in Basil 02, open sundry with a value of 26.19%. The highest volume by weight of essential oil content was found in Basel 05, open sundry (1.03%), and the lowest was found in Basil 02, open sundry (0.58%). The highest weight by weight essential oil content was found in Basil 05, shade dry (0.91%) and the lowest was found in Basil 02, open sundry (0.51%). The highest specific gravity was observed in Basil 05, shade dry (0.93) and the lowest value was observed in Basil 02, open sundry (0.92). The highest Refractive index was found in Basil 05, shade dry (1.512), and the smallest value was found in Basil 02 shade dry (1.50). All physical properties of the essential oil except specific gravity were significantly different between variety and drying conditions.

All physical properties of the essential oil except specific gravity were significantly different between varieties and drying days. In the interaction effect of basil varieties on drying days, the highest value of moisture content was observed in Basil 02 day 0 (83.77%), and the lowest value was observed in Basil 02, day 15(7.00%). The highest value of essential volume by weight and weight by weight was observed in Basil 05, day 0 (1.17%,1.04%), and the lowest value was observed in Basil 02, day 15(0.54%,0.48%) respectively. The highest value of specific gravity was 0.94 and the lowest value was 0.92. The highest RI value was found in Basil 05, day 10 (1.5125), and the lowest value was found in Basil 02, D10 (1.4965).

As shown in Table 2, the interaction effect of drying conditions with drying days is significant, and all causes expect specific gravity and refractive index. The highest moisture content was recorded in shade dry D0, and Open sundry (83.37%), and the lowest value was recorded in open sundry, D15 (6.40%). The highest essential oil volume by weight was recorded in shade dry D0 and Open sundry D0 (0.90%).and the lowest was recorded in shade dry D15, and Open sundry, D15 (0.71% and 0.68%) respectively. The highest essential weight by weight was recorded in shade dryD0 and Open sundry D0 (0.80%), and the lowest was recorded in shade dry D15, and Open sundry, D15 (0.63% and 0.59%) respectively. The highest value of specific gravity was 0.94 and the lowest was 0.92. All physical properties of the essential oil except specific gravity and refractive index were significantly different between drying conditions and drying days.

The interaction effect of varieties with drying conditions with drying days the highest moisture content was recorded in Basil 02, shade dry D0 and Basil 02, open sundry D0 (83.77%), and the lowest was recorded in Basil 02, open sundry, D15, and Basil 05 open sundry D15 (5.77%). The highest essential oil content volume by weight was recorded in Basil 05, shade dry D0 and Basil 05, open sundry D0 (1.17%), and the lowest were recorded in Basil 02, shade dry, D15, and Basil 02, open sundry, D15 (0.55% and 0.52%) respectively. The highest volume by weight essential oil content was recorded in Basil 05, shade dry D0 and Basil 05, open sundry, D0 (1.04%), and the lowest was recorded in Basil 02, shade dry, D15, and Basil 02, open sundry, D15 (0.49%,0.46%) respectively.

Table 2. Mean value of the interaction effect of drying method and drying days on the physical properties of basil varieties.

Variables	MC (%)	VW EOC (%)	WW EOC (%)	SPG	RI
Variety by drying conditions					
Basil 02, Shade	28.17^{b}	0.59^{b}	0.52^{b}	0.925^{a}	1.4970^{b}
Basil 02, Open Sun	26.19^{c}	0.58^{b}	0.51^{b}	0.924^{a}	1.5002^{b}
Basil 05, Shade	31.78^{a}	1.02^{a}	0.91^{a}	0.933^{a}	1.5127^{a}
Basil 05, Open Sun	28.09^{b}	1.03^{a}	0.90^{a}	0.928^{a}	1.5106^{a}
SE	0.0870	0.0042	0.0084	0.0037	0.0012
Variety by drying days					
Basil 02, D0	83.77^{a}	0.63^{e}	0.56^{e}	0.92^{a}	1.4992^{b}
Basil 02, D5	9.88^{e}	0.60^{f}	0.53e^{f}	0.93^{a}	1.4997^{b}
Basil 02, D10	8.08^{f}	0.57^{g}	0.51^{f}	0.93^{a}	1.4965^{b}
Basil 02, D15	7.00^{g}	0.54^{h}	0.48^{f}	0.92^{a}	1.4991^{b}
Basil 05, D0	82.97^{b}	1.17^{a}	1.04^{a}	0.93^{a}	1.5116^{a}
Basil 05, D5	14.64^{c}	1.09^{b}	0.98^{b}	0.94^{a}	1.5119^{a}
Basil 05, D10	12.11^{d}	0.97^{c}	0.87^{c}	0.94^{a}	1.5125^{a}
Basil 05, D15	10.02^{e}	0.85^{d}	0.75^{d}	0.93^{a}	1.5107^{a}
SE	0.1231	0.0059	0.0119	0.0052	0.0016
Drying conditions by days					
Shade, D0	83.37^{a}	0.90^{a}	0.80^{a}	0.92^{a}	1.5054^{a}
Shade, D5	13.53^{b}	0.843^{b}	0.76a^{b}	0.94^{a}	1.5046^{a}
Shade, D10	12.39^{c}	0.76^{c}	0.68d^{e}	0.93^{a}	1.5055^{a}
Shade, D15	10.60^{d}	0.71^{d}	0.63e^{f}	0.93^{a}	1.5041^{a}
Open Sun, D0	83.37^{a}	0.90^{a}	0.80^{a}	0.92^{a}	1.5054^{a}
Open Sun, D5	10.98^{d}	0.840^{b}	0.74^{bc}	0.93a	1.5070^{a}
Open Sun, D10	7.80^{e}	0.78^{c}	0.69^{cd}	0.93^{a}	1.5036^{a}
Open Sun, D15	6.40f	0.68^{d}	0.59^{f}	0.92^{a}	1.5057^{a}
SE	0.1231	0.0059	0.0119	0.0052	0.0016
Variety by drying conditions and days					
Basil 02, Shade, D0	83.77^{a}	0.63^{f}	0.56^{f}	0.920^{a}	1.4992^{bcd}
Basil 02, Shade, D5	10.86^{e}	0.60^{fg}	0.53^{g}	0.933^{a}	1.4969^{cd}
Basil 02, Shade, D10	9.82^{f}	0.57^{gh}	0.51^{fg}	0.937^{a}	1.4962^{d}

Variables	MC (%)	VW EOC (%)	WW EOC (%)	SPG	RI
Basil 02, Shade, D15	8.22[h]	0.55[h]i	0.49[fg]	0.927[a]	1.4958[d]
Basil 02, Open Sun, D0	83.77[a]	0.63[f]	0.56[f]	0.920[a]	1.4992[bcd]
Basil 02, Open Sun, D5	8.89[gh]	0.59[fgh]	0.52[fg]	0.923[a]	1.5026[abcd]
Basil 02, Open Sun, D10	6.33[ij]	0.56[ghi]	0.50[fg]	0.937[a]	1.4969[cd]
Basil 02, Open Sun, D15	5.77[j]	0.52[i]	0.46[g]	0.917[a]	1.5023[abcd]
Basil 05, Shade, D0	82.97[a]	1.17[a]	1.04[a]	0.927[a]	1.5116[ab]
Basil 05, Shade, D5	16.20[b]	1.086[b]	0.96[a]	0.937[a]	1.5122[a]
Basil 05, Shade, D10	14.96[c]	0.994[d]	0.85[cd]	0.943[a]	1.5148[a]
Basil 05, Shade, D15	12.99[d]	0.86[e]	0.77[de]	0.927[a]	1.5123[a]
Basil 05, Open Sun, D0	82.97[a]	1.17[a]	1.04[a]	0.927[a]	1.5116[ab]
Basil 05, Open Sun, D5	13.08[d]	1.090[b]	0.99[ab]	0.933[a]	1.5115[ab]
Basil 05, Open Sun, D10	9.27f[g]	0.996[c]	0.88[bc]	0.927[a]	1.5102[ab]
Basil 05, Open Sun, D15	5.77[j]	0.84[e]	0.72[e]	0.927[a]	1.5091[abc]
SE					

Means with a different letter in the column of superscripts are significantly different at p<0.05. Where; -%MC = Percent of moisture content, %VW = Percent of Volume by weight, %WW = percent of weight by weight, Spg= Specific gravity, RI=Refractive Index, D0=Day zero, D5= Day=5, D10=Day 10, and D15=day 15.

3.3. Chemical Composition of Essential oil

The relative percentages of the major constituents of essential oil of basil variety are affected by drying methods and drying days are shown in **Table 3**. The major constituents of the basil 02 oil samples were found to be Butyl acrylate, Eucalyptol, Linalool, and Epi-camphor. beta. -Camphor, Estragole, phenylpropionate, cinnamic acid, beta. -Bisabolene, Eugenol, Caryophyllene, Humulene, beta. -Cubebene and alpha-Bergamotene ranged from 2.22 to 15.16%. The major constituents of the basil 05 oil samples were found to be 1Butyl acrylate Eucalyptol. Linalool, Epi-camphor. beta. -Camphor, Estragole, phenylpropionate CINNAMIC ACID,. beta. -Bisabolene, alpha-Bergamotene, beta-cubebene, cis-beta-Elemene,5β-Androsterone,1H- naphthalene, Quinoxalinone, E-sesquisabinene hydrate and Eugenol ranged from 2.28 to 32.96 %.

Table 3. Chemical composition of two Basil Variety essential oil

No	Compound name	Basil 02		Basil 05	
		RT (min)	% Area	RT (min)	% Area
1	Butyl acrylate	4.32	2.76	4.32	3.12
2	Eucalyptol	7.94	7.39	7.93	2.49
3	Linalool	10.34	4.93	10.40	14.08
4	Epi-camphor. beta. -Camphor	12.04	4.22	12.04	3.00
5	Estragole	14.24	5.96	14.23	2.47
6	phenylpropionate CINNAMIC ACID	21.95	10.16	22.09	32.96
7	. beta. –Bisabolene	27.07	14.26	27.01	4.32
8	Eugenol	20.95	15.16	20.87	3.70
9	Caryophyllene	23.36	2.99	ND	ND
10	Humulene	24.73	2.22	ND	ND
11	beta. –Cubebene	25.85	3.63	ND	ND
12	alpha-Bergamotene	28.39	12.32	ND	ND
13	alpha-Bergamotene	ND	ND	24.08	3.94
14	beta cubebene	ND	ND	25.85	2.28
15	cis-beta-Elemene	ND	ND	26.44	2.80
16	5β-Androsterone	ND	ND	28.33	3.40
17	1H- naphthalene	ND	ND	31.67	5.25
18	Quinoxalinone	ND	ND	31.97	2.07
19	E- sesquisabinene hydrate	ND	ND	32.7	3.16

3.4. Effect Of Drying Methods and Drying Days on Chemical Composition of Basil Essential Oil Variety

As shown in the as shown in Tables (4 and 5), all chromatograms of drying methods and drying days (0,5,10, and 15), open sun and shade drying conditions can affect the amount of compound that exists in both basil varieties in the cause of relative percentages. However, shade drying gave a higher percentage of the chemical composition than open sun drying and sun drying gave the lowest one in both varieties. There were also disappearances of some chemicals shown in both varieties and a severe decrease in the compound. It can be concluded from the above-mentioned results that shade drying was the best treatment to obtain the best yield of volatile oil with the highest quality. The finding is the same as the finding of [2] and different from the finding of [20].

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Table 4. Effect of different drying methods and drying days on the chemical composition of Basil 02 essential oil.

N0	Compound Name	Basil 02 0D		Basil 02, 5D, Open Sun		Basil 02, 10 D, Open Sun		Basil 02,15D, Open Sun		Basil 02,5D, Shade		Basil 02,10D, Shade		Basil 02,15D, Shade	
		RT	PA	RT	PA	RT	PA	RT	PA	RT	PA	RT	PA	RT	PA
1	Butyl acrylate	4.32	2.76	4.31	2.79	ND	ND	4.32	5.31	ND	ND	ND	ND	4.31	2.71
2	Eucalyptol	7.94	7.39	7.92	6.40	4.69	2.10	7.92	1.54	4.70	2.41	4.69	2.10	7.92	2.16
3	Linalool	10.34	4.93	10.37	10.72	6.55	4.94	10.36	11.63	6.64	19.38	6.55	4.94	10.36	7.50
4	Epi-camphor. beta. -Camphor	12.04	4.22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	Estragole	14.24	5.96	14.25	9.81	9.72	8.72	14.24	6.90	9.70	2.86	9.72	8.72	14.25	10.34
5	Eugenol	20.95	15.16	20.94	14.22	15.76	9.33	20.88	8.09	15.73	1.37	15.76	9.33	20.90	10.22
6	phenylpropionate CINNAMIC ACID	21.95	10.16	22.02	20.78	16.74	15.83	22.00	25.42	16.87	34.02	16.74	15.83	21.99	19.45
7	Caryophyllene	23.36	2.99	ND	ND	17.90	1.61	ND	ND	17.92	0.68	17.90	1.61	ND	ND
8	Humulene	24.73	2.22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	beta cubebene	25.85	3.63	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10	. beta. –Bisabolene	27.07	14.26	27.09	15.90	21.68	17.23	27.08	17.31	21.68	17.45	21.68	17.23	27.11	23.69
11	alpha-Bergamotene	28.39	12.32	28.39	8.44	22.95	8.34	24.07	3.96	18.76	3.52	22.95	8.34	28.39	11.04

Where; - D = Day, RT = Retention time, PA = percent Percentage area and ND=Not detected

Table 5: Effect of different drying methods and drying days on the chemical composition of Basil 05 essential oil.

N0.	Compound Name	Basil 05, 0D		Basil 05, 5D, Open Sun		Basil 05, 10 D, Open Sun		Basil 05,15D, Open Sun		Basil 05,5D, Shade		Basil 05,10D, Shade		Basil 05,15D, Shade	
		RT	PA	RT	PA	RT	PA	RT	PA	RT	PA	RT	PA	RT	PA
1	Butyl acrylate	4.32	3.12	4.32	3.11			4.31	3.35	4.31	3.51	4.31	3.03	4.32	4.19
2	Eucalyptol	7.93	2.49	7.92	2.55	4.69	6.30	7.92	2.62	7.92	2.59	7.92	2.76	7.94	9.90
3	Linalool	10.40	14.08	10.43	21.99	6.84	17.57	10.41	17.60	10.43	21.65	10.43	24.84	10.35	7.60
4	Epi-camphor. beta. - Camphor	12.04	3.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	Estragole	14.23	2.47	14.23	2.80	9.68	8.79	14.22	4.86	14.21	2.80	14.21	2.90	14.25	10.78
6	Eugenol	20.87	3.70	20.87	4.31	15.70	26.20	20.87	4.98	20.87	4.92	20.86	2.86	20.87	7.35
7	phenylpropenoate CINNAMIC ACID	22.09	32.96	22.11	43.75	16.62	6.85	22.08	37.92	22.13	48.69	22.05	35.59	21.96	16.07
8	alpha-Bergamotene	24.08	3.94	24.08	5.16	24.18	0.26	24.07	3.04	24.07	3.30	24.07	4.81	24.06	3.24
9	beta cubebene	25.85	2.28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10	cis-beta-Elemene	26.44	2.80	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11	. beta. –Bisabolene	27.01	4.32	27.01	4.87	21.59	14.85	27.01	4.54	27.00	2.82	27.00	2.88	27.07	16.65
12	5β-Androsterone	28.33	3.40	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
13	1H- naphthalene	31.67	5.25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
14	E- sesquisabinene hydrate	32.70	3.16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

4. Conclusions

On the essential oil content of the two varieties, Basil 02 has high essential oil content than Basil 05 and in chemical composition, the two varieties have different com, Open sun and shade drying conditions and drying days (0,5,10, and 15) resulting show significant differences in all cases between varieties, drying conditions, drying days, and interaction effect except for specific gravity. Open sun drying has low chemical composition than shade drying conditions. The oil content decreases as drying days increased for both basil varieties and physicochemical composition was also affected. Among the drying methods, shade drying is the best drying method for preserving basil essential oil and physicochemical composition.

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