

## PROXIMATE COMPOSITION, TOTAL PHENOL CONTENT AND SENSORY PROPERTIES OF SWEET BASIL (*OCIMUM BASILICUM* L.) LEAVES DRIED USING DIFFERENT METHODS

Akah, N.P. Eze, K. and Omah, E.C.

Department of Food Science and Technology, University of Nigeria, Nsukka.

\*nkechi.akah@unn.edu.ng

### ABSTRACT

*O. basilicum* L. samples were sun dried (SUD), solar dried (SOD), shade dried (SD) and oven-dried at 50°C, 60°C, 70°C and 80°C (OV<sub>5</sub>-OV<sub>8</sub>, respectively). The samples were evaluated for proximate composition, polyphenol content, soluble extract, appearance, aroma and general acceptability. Fresh sample served as the control. All the drying methods reduced the moisture levels of the samples to that (<12%) suitable for shelf stability, and led to significantly ( $p < 0.05$ ) higher content of protein, ash and crude fiber in dried samples. The polyphenol content of water extract of dried samples (1.55 mg GAE/100 ml in OV<sub>5</sub> to 2.25 mg GAE/100 ml in OV<sub>6</sub>) were significantly ( $p < 0.05$ ) higher than that of fresh sample (1.13 mg GAE/100 ml) and those of SUD, OV<sub>5</sub> and OV<sub>8</sub> were significantly ( $p < 0.05$ ) lower than that of OV<sub>6</sub>. Sample OV<sub>6</sub> was higher in water and ethanol soluble extracts (69% and 61%, respectively) than the fresh sample (37%, respectively) and the other dried samples (16-37% and 2-19%, respectively). The scores of the dried samples for appearance (5.15 in SUD to 6.40 in OV<sub>6</sub>), aroma (5.30 in SUD to 6.85 in OV<sub>6</sub>) and general acceptability (5.10 in OV<sub>5</sub> to 7.25 in OV<sub>8</sub>) were significantly ( $p < 0.05$ ) lower than those of the fresh sample (8.65, 8.45 and 8.55, respectively). The aroma score for OV<sub>6</sub> (6.85) was significantly ( $p < 0.05$ ) higher than the aroma scores for OV<sub>5</sub>, SUD, SOD and SD (5.30-5.55). Oven drying at 60°C was identified as the best drying method for *O. basilicum* in terms of aroma and soluble extracts contents.

**Keywords:** *O. basilicum*, sensory attributes, drying methods, physicochemical Properties

### INTRODUCTION

*Ocimum basilicum* L. (sweet basil) belongs to the Lamiaceae family and is a popular culinary herb with highly aromatic leaves that has a pleasant and vigorous flavor (Di-Cesare *et al.*, 2003; Sullivan, 2009). The leaves and their essential oils are both used as flavoring agents. Linalool (44.18%), 1, 8-cineole (13.65%), eugenol (8.59%), methyl cinnamate (4.26%), isocaryophyllene (3.10%) and  $\alpha$ -cubebene (4.97%) are the main flavor components (Loughrin and Kasperbauer, 2003; Ismail, 2006; Soković *et al.*, 2007; Nurzyńska-Wierdak *et al.*, 2012). Sweet basil is native to Africa and Asia and today exists in a number of varieties varying in size, color and flavor. They range from large to dwarf forms, tiny-leaved to large succulent leaves which could be green, purple, or variegated (Sullivan, 2009). Sweet basil is one of the most important herbs to many cultures and cuisine. It is used in many vegetable, meat and fish dishes, sauces, stews, dressings, herbal teas, liqueurs, and mixed drinks, and frequently as complimentary

flavor to tomatoes (Sullivan, 2009). It also has several medicinal uses and strong antimicrobial activities against pathogenic bacteria, virus and fungi which are attributed mainly to its bioactive compounds: terpenes and polyphenols. It has been used as a folk remedy for an enormous number of ailments, including boredom, cancer, convulsion, deafness, diarrhea, epilepsy, gout, impotency, insanity, nausea, toothaches, and respiratory diseases including whooping cough (Ismail, 2006; Soković *et al.*, 2007; Sullivan, 2009; Rocha *et al.*, 2011; Eferpi *et al.*, 2012). Basil is also rich in basic nutrients— vitamins and minerals, especially calcium (177 mg/100 g), iron (3.17 mg/100 g), magnesium (64 mg/100 g), phosphorus (56 mg/100 g), potassium (295 mg/100 g), vitamin A (5275 IU), and vitamin K (415 µg/100 g) (USDA, 2013).

In Nigeria, basil is usually grown in home gardens, and can be used fresh or dry. However, it is mostly used and enjoyed fresh by many, especially in flavoring rice dishes

and tomato-based sauces and stews. Fresh *O. basilicum* has low keeping quality and is scarce during some seasons of the year limiting its availability and use. For these reasons, attempts are made locally by people to sun-dry it for later use. Drying reduces water activity, inhibits microbial, biological and chemical degradation reactions, and consequently improves stability of products. It is judged the most commonly used method for enhancing the shelf life of leafy vegetables and aromatic/medicinal plants. However, drying, especially sun drying also affects the sensory and nutritional characteristics of products, promoting the collapse of vegetable tissue, degradation of vital nutrients, and reduction of predominant flavors (Di-Cesare *et al.*, 2003; Loughrin and Kasperbauer, 2003; Sullivan, 2009; Rocha *et al.*, 2011; Anonymous, 2013). Different drying methods have been reported to produce varying quality of dried products. It was recommended that the drying process be as quickly as possible, at temperature levels which do not drive off the volatile flavor compounds. The drying temperature regime was in addition shown to be specific to each crop (Di-Cesare *et al.*, 2003; UNIDO/FAO, 2005; Antal *et al.*, 2011; Rocha *et al.*, 2011).

There is paucity of data in literature relating the adequate drying method(s) and/or temperature for *O. basilicum*. Identifying the method of drying among the common drying methods that produces high quality dried *O. basilicum* is worthwhile. This study, therefore, aimed at evaluating the effect of different drying methods (sun, solar, shade and oven) on the sensory and some chemical properties of *Ocimum basilicum* L. sourced from Nsukka locality and consequently identifying the most suitable drying method.

## MATERIALS AND METHODS

Fresh plants of *O. basilicum* L. (Figure 1) were obtained from a farm at Odenigwe in Nsukka Local Government Area of Enugu State, at the early hours of the morning. The plant was authenticated by a taxonomist in the Department of Plant Science and Biotechnology, University of Nigeria, Nsukka. The leaves were washed, drained and weighed into 200g portions each for drying. Fresh leaves served as control. Sun, solar drier, shade and oven drying were used to obtain the dried samples. Oven drying was carried out at four temperature regimes—50°C, 60°C, 70°C, and 80°C. The plant was solar-dried using a solar tent obtained from the Department of Food Science and Technology, University of Nigeria, Nsukka. Eight samples were obtained in all. The dried samples for analysis were

milled into flour, packaged in polyethylene bags and stored in an airtight container. Fresh samples for analysis were periodically harvested from the same farm. Proximate composition was determined according to the method of AOAC (2010).

### Determination of water and ethanol soluble extracts

Ethanol and water soluble extracts of fresh and dried *O. basilicum* were determined using the method described by Pearson (1976) with some modifications (Dent *et al.*, 2013). A 5g portion each of fresh and dried sweet basil powder was blended with 100 ml of water and 100 ml of 30% ethanol, respectively. The mixture was shaken thoroughly and allowed to stand at room temperature for 48 hours. Afterwards, the mixtures were filtered using a What-man filter paper (No1). The filtrate (20 ml) was respectively evaporated to dryness in small beakers in an oven at 105°C and the amount of water and ethanol extracts respectively calculated and expressed as a percentage of the original sample weight as follows:

$$\text{Percentage (\%)} \text{ yield of extract} = \frac{\text{Weight of extract (g)}}{\text{Weight of sample (g)}} \times 100$$

$$= \frac{\text{Weight of extract per aliquot (g)} \times \text{total volume of extract (ml)}}{\text{volume of aliquot (ml)} \times \text{weight of sample (g)}} \times 100$$

Where aliquot of extract or volume of aliquot= 20 ml.

### Determination of total phenol content

Total phenol content of the water and ethanol extracts were respectively determined using the Folin-Ciocalteu method of Singleton and Rossi (1965). A 1 ml volume of extract solution (filtrates from above) was pipette into test tubes and made up to 5 ml with distilled water. Then, 0.5 ml of Folin-Ciocalteu reagent was added and the content of each test tube mixed thoroughly. The mixture was left to stay for 5 minutes after which 2 ml of 20% Na<sub>2</sub>CO<sub>3</sub> was added and the volume made up to 10 ml with distilled water, mixed properly and allowed to stand for 30 minutes before the absorbance was taken at 760 nm using a UV/Vis spectrophotometer. Results were calculated as gallic acid equivalent (mg GAE/ml) by interpolating on the standard phenol curve.

**Sensory evaluation** was carried out on the fresh and dried leaves using 20-man panel of judges from the Department of Food Science and Technology, University of Nigeria Nsukka. Attributes evaluated were appearance, aroma and general acceptability. A 9-point

Hedonic scale was used in the evaluation, with 9=like extremely and 1=dislike extremely.

#### Data analysis

Experiment was laid out in a completely randomized experimental design (CRD). Analysis of variance was done using SPSS 16.0 version software. Results were presented as mean  $\pm$  standard deviation and Duncan's Multiple Range Test was used for mean separation. Significant difference among sample means was accepted at  $p < 0.05$ .

## RESULTS AND DISCUSSION

### Proximate composition

Table 1 shows the proximate composition of fresh and dried samples of *O. basilicum*. All the drying methods efficiently reduced the moisture level of the dried samples (9.20-11.40%) to that ( $\leq 12\%$ ) reported to be adequate for shelf stability (up to one year) for dry vegetables (Rocha *et al.*, 2011; Anonymous, 2013). Drying also led to higher protein (15-18%), ash (12-15%) and crude fiber (9-11%) in comparison to the protein (5%), ash (2%) and crude fiber (0.7%) contents of the fresh sample. Anonymous (2013) noted that drying concentrated nutrients in vegetables, thereby increasing the quantity per unit weight. The author is also of the view that leaf powder can be used to correct malnutrition or prevent it in vulnerable people by adding it to basic recipes including cookies, cakes, pasta, biscuits, among others. Dried *O. basilicum* may therefore serve as enrichment material in products such as baked goods where these nutrients are usually lacking.



Figure 1: *Ocimum basilicum* L.

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### Polyphenol content

Table 2 shows the polyphenol content and the water- and ethanol-soluble extracts of the fresh and dried *O. basilicum* samples. The polyphenol content of water extract of dried *O. basilicum* samples (1.55 mg GAE/100 ml in OV<sub>5</sub> to 2.25 mg GAE/100 ml in OV<sub>6</sub>) were significantly ( $p < 0.05$ ) higher than that of fresh *O. basilicum* (1.13 mg GAE /100 ml) but those of samples sun-dried (SUD), oven-dried at 50°C (OV<sub>5</sub>) and oven-dried at 80°C (OV<sub>8</sub>) were significantly ( $p < 0.05$ ) lower than that of sample oven-dried at 60°C (OV<sub>6</sub>). The polyphenol content of ethanol extract of shade dried sample (2.04 mg GAE/100 ml) was significantly ( $p < 0.05$ ) higher than those of other dried samples (1.25 mg GAE/100 ml in OV<sub>5</sub> to 1.58 mg GAE/100 ml in OV<sub>8</sub>) and that of fresh sample (1.0 mg GAE/100 ml) but that of fresh sample did not differ significantly ( $p > 0.05$ ) from those of sun, solar and 50°C oven-dried samples.

The lower polyphenol content of fresh sample was generally attributed to high moisture level of the fresh samples. The generally higher polyphenol content of water extracts of the samples compared with the ethanol extracts was attributed to high polarity or water solubility of *O. basilicum* polyphenols. Polarity of polyphenols has been found to determine their solubility in the extracting solvent and consequently their yield (Dent *et al.*, 2013). Tiwari *et al.* (2011) reported that during extraction, solvents diffuse into the solid plant material and solubilize compounds with similar polarity; and Dent *et al.* (2013) observed that polarities of polyphenols ranged from polar to non polar, thus eliciting a wide range of solvents (water, acetone, methanol, ethanol among others) for their extraction, while Proestos *et al.* (2008) reported that polyphenols were generally water soluble because they often occurred as glycosides. It is, therefore, plausible to say that high polarity of *O. basilicum* polyphenol resulted in higher solubility and consequently higher extraction yield in water which is more polar than aqueous ethanol. Water extract of henna leaves was similarly found to contain higher polyphenol content than the methanol extract (Haddad and Dezashibi, 2007). On the contrary, aqueous ethanol was found the most suitable solvent system for the extraction of sage polyphenols due to the different polarities of their polyphenols (Dent *et al.*, 2013).

## Proximate Composition, Total Phenol Content and Sensory Properties of Sweet Basil

**Table 1:** Proximate composition of fresh and dried *O. basilicum* L. samples (%)

Samples	Moisture	Fat	Protein	Crude fiber	Ash	Carbohydrate
SUD	9.20 <sup>b</sup> ±0.00	1.50 <sup>a</sup> ±0.00	16.43 <sup>bc</sup> ±0.00	9.95 <sup>c</sup> ±0.00	14.15 <sup>f</sup> ±0.00	48.75 <sup>c</sup> ±0.02
SD	9.35 <sup>b</sup> ±0.07	1.65 <sup>c</sup> ±0.00	18.45 <sup>d</sup> ±2.12	10.50 <sup>b</sup> ±0.01	14.60 <sup>e</sup> ±0.00	45.44 <sup>b</sup> ±2.07
SOD	11.40 <sup>c</sup> ±0.07	1.60 <sup>b</sup> ±0.00	17.20 <sup>bc</sup> ±0.00	10.30 <sup>e</sup> ±0.01	14.70 <sup>b</sup> ±0.00	44.79 <sup>b</sup> ±0.02
OV5	11.21 <sup>c</sup> ±0.01	1.97 <sup>d</sup> ±0.03	18.20 <sup>cd</sup> ±0.00	9.36 <sup>c</sup> ±0.01	13.64 <sup>d</sup> ±0.05	45.61 <sup>b</sup> ±0.12
OV6	11.40 <sup>c</sup> ±0.00	2.22 <sup>e</sup> ±0.00	18.20 <sup>cd</sup> ±0.00	9.45 <sup>d</sup> ±0.00	13.31 <sup>c</sup> ±0.01	45.41 <sup>b</sup> ±0.02
OV7	8.55 <sup>a</sup> ±0.00	3.55 <sup>e</sup> ±0.00	18.10 <sup>cd</sup> ±0.02	10.10 <sup>f</sup> ±0.00	13.89 <sup>e</sup> ±0.01	45.79 <sup>b</sup> ±0.04
OV8	9.20 <sup>b</sup> ±0.00	3.51 <sup>f</sup> ±0.01	15.92 <sup>b</sup> ±0.00	9.16 <sup>b</sup> ±0.01	12.01 <sup>b</sup> ±0.01	50.19 <sup>c</sup> ±0.04
Fresh	85.80 <sup>d</sup> ±0.42	1.97 <sup>d</sup> ±0.00	4.80 <sup>a</sup> ±0.01	0.68 <sup>a</sup> ±0.01	1.57 <sup>a</sup> ±0.04	5.17 <sup>a</sup> ±0.50

Values are means of duplicate determination ± standard deviation. Means with same superscript within the same column are not significantly different at (p>0.05). SUD= sun dried sample, SD=shed dried sample, SOD=solar dried sample, OV5=oven dried at 50°C, OV6=oven dried at 60°C, OV7=oven dried at 70°C, OV8=oven dried at 80°C.

**Table 2:** Total phenol content, water and ethanol soluble extracts of fresh and dried *O. basilicum* L.

Samples	Total phenol content of water extract (mg GAE/ml)	Total phenol content of ethanol extract (mg GAE/ml)	Water soluble extracts (%)	Ethanol soluble extracts (%)
SUD	1.83 <sup>bc</sup> ±0.02	1.44 <sup>ab</sup> ±0.02	31.32 <sup>bc</sup>	17.05 <sup>cd</sup>
SD	1.97 <sup>cd</sup> ±0.00	2.04 <sup>c</sup> ±0.52	37.37 <sup>b</sup>	9.14 <sup>e</sup>
SOD	2.02 <sup>cd</sup> ±0.09	1.47 <sup>ab</sup> ±0.11	15.73 <sup>c</sup>	19.49 <sup>c</sup>
OV5	1.55 <sup>b</sup> ±0.02	1.25 <sup>ab</sup> ±0.02	23.11 <sup>d</sup>	19.05 <sup>c</sup>
OV6	2.25 <sup>d</sup> ±0.07	1.51 <sup>b</sup> ±0.02	68.85 <sup>a</sup>	60.91 <sup>a</sup>
OV7	2.01 <sup>cd</sup> ±0.01	1.54 <sup>b</sup> ±0.02	21.64 <sup>d</sup>	19.49 <sup>c</sup>
OV8	1.83 <sup>bc</sup> ±0.07	1.58 <sup>b</sup> ±0.02	25.24 <sup>cd</sup>	2.44 <sup>f</sup>
Fresh	1.13 <sup>a</sup> ±0.39	1.00 <sup>a</sup> ±0.05	36.72 <sup>b</sup>	36.55 <sup>b</sup>

Values are means of duplicate determination ± standard deviation. Means with same superscript within the same column are not significantly different at (p>0.05). SUD= sun dried sample, SD=shed dried sample, SOD=solar dried sample, OV5=oven dried at 50°C, OV6=oven dried at 60°C, OV7=oven dried at 70°C, OV8=oven dried at 80°C.

**Table 3:** Scores for appearance, aroma and general acceptability of samples of fresh and dried *Ocimum basilicum*

Samples	Appearance	Aroma	General acceptability
SUD	5.15 <sup>a</sup> ±1.42	5.30 <sup>a</sup> ±1.65	5.25 <sup>a</sup> ±1.91
SD	6.15 <sup>a</sup> ±1.69	5.40 <sup>a</sup> ±1.93	5.15 <sup>a</sup> ±2.00
SOD	6.45 <sup>a</sup> ±2.18	5.55 <sup>a</sup> ±2.11	5.15 <sup>a</sup> ±2.05
OV5	5.35 <sup>a</sup> ±2.36	5.55 <sup>a</sup> ±2.08	5.10 <sup>a</sup> ±2.26
OV6	6.40 <sup>a</sup> ±2.20	6.85 <sup>b</sup> ±1.56	5.45 <sup>a</sup> ±2.01
OV7	5.85 <sup>a</sup> ±1.95	6.05 <sup>ab</sup> ±1.98	5.85 <sup>a</sup> ±2.41
OV8	6.35 <sup>a</sup> ±1.89	6.05 <sup>ab</sup> ±2.28	7.25 <sup>b</sup> ±2.35
Fresh	8.65 <sup>b</sup> ±0.48	8.45 <sup>b</sup> ±0.60	8.55 <sup>c</sup> ±0.51

Values are means of duplicate determination ± standard deviation. Means with same superscript within the same column are not significantly different at (p>0.05). SUD= sun dried sample, SD=shed dried sample, SOD=solar dried sample, OV5=oven dried at 50°C, OV6=oven dried at 60°C, OV7=oven dried at 70°C, OV8=oven dried at 80°C.

The higher polyphenol content of water extract of *O. basilicum* oven-dried at 60°C was similarly observed in sage leaves extracted with different solvents at temperatures of 60°C and 90°C. Optimal polyphenol yield of dry sage leaves was observed at 60°C. This was attributed to increased solubility and reduced degradation of active compounds at this temperature (Rocha *et al.*, 2011; Dent *et al.*, 2013). The yields of water- and ethanol-soluble extracts of samples dried at 60°C (68.85% and 60.91%, respectively) were significantly (p<0.05) higher than the yield of water- and ethanol-soluble extracts of the fresh sample (36.72% and 36.55%, respectively) and those of the other dried samples (15.73–37.37% and 2.44–19.49%, respectively). The yields of water-soluble extracts of the samples were generally higher than the yields of their

ethanol-soluble extracts. The high yield observed in extracts of samples oven dried at 60°C was attributed to gentle disruption of cell walls at this temperature, but without cell damage, for easier penetration of solvents to the cellular membrane to extract the intracellular ingredients from the plant material.

Temperature has repeatedly been listed as a key factor that affected quantity and composition of extracts among other factors such as type of solvent, solvent concentration, polarity of extracted compounds and particle size of material for extraction (Tiwari *et al.*, 2011). The lower yield of soluble extracts of samples oven dried at higher temperatures of 70°C and 80°C were attributed to degradation, oxidation and/or polymerization of components such as polyphenols at these elevated temperatures (Rocha *et al.*, 2011;

Dent *et al.*, 2013). Compounds such as polyphenols according to Dent *et al.* (2013) are susceptible to oxidation and degradation from high temperature and alkaline environment. The low yield of soluble extracts for SUD, SOD, SD and OV<sub>5</sub> could be attributed to enzymatic breakdown or hydrolysis of susceptible components due to prolonged drying period of up to 4 days. According to Tiwari *et al.* (2011), the polyphenol oxidase caused degradation of polyphenols under favorable conditions. Demir *et al.* (2004), UNIDO/FAO (2005) and Anonymous (2013) also reported that longer drying time (at low temperature) gave microbes and enzymes more time to destroy susceptible components before the leaves were fully dried. The generally higher yield of water soluble extracts of the samples was attributed to high polarity of compounds of *O. basilicum* resulting in higher solubility and consequently higher extraction yield in water which is more polar than aqueous ethanol (Tiwari *et al.*, 2011; Dent *et al.*, 2013).

#### Sensory scores

The sensory scores of the samples are presented in Table 3. The scores for appearance (8.65), aroma (8.45) and general acceptability (8.55) for fresh *O. basilicum* were significantly ( $p < 0.05$ ) higher than the scores for appearance (5.15 in SUD to 6.40 in OV<sub>6</sub>), aroma (5.30 in SUD to 6.85 in OV<sub>6</sub>) and general acceptability (5.10 in OV<sub>5</sub> to 7.25 in OV<sub>8</sub>) for the dried samples. The score for aroma for the sample oven dried at 60°C (6.85) was significantly ( $p < 0.05$ ) higher than that of the sample oven dried at 50°C (5.55) and those dried using sun (5.30), solar (5.55) and shade (5.40). The lower scores for appearance and aroma in the dried *O. basilicum* samples were respectively attributed to breakdown of chlorophyll pigment and losses in aroma compounds during drying (Di-Cesare *et al.*, 2003; Loughrin and Kasperbauer, 2003; Antal *et al.*, 2011; Rocha *et al.*, 2011). Di-Cesare *et al.* (2003) reported that during drying the desirable green chlorophyll pigment in fresh *O. basilicum* was degraded to brown colored pheophytin pigment due to the loss of Mg<sup>2+</sup> while Loughrin and Kasperbauer (2003) and Antal *et al.* (2011) reported up to 50-fold decrease and 43% loss in the concentration of volatile compounds in fresh *O. basilicum* and spearmint leaves, respectively, as a result of drying.

The lower aroma scores for the sample oven dried at 50°C and those dried using sun, solar and shade relative to the aroma score for the sample oven dried at 60°C

was attributed to higher loss of volatile aromatic compounds from these samples due to longer drying time which exacerbated higher enzymatic activity. Rocha *et al.* (2011) reported that longer drying time of *Taxus baccata* at 30°C resulted in higher enzymatic activity, degradation and very low yield of its main aromatic compound, taxol. They also reported higher loss of essential volatile aromatic compounds in *Cymbopogon winterianus* dried at 30°C, 40°C, 50°C and 70°C relative to the sample of *Cymbopogon winterianus* dried at 60°C while Di-Cesare *et al.* (2003) reported better retention of color and flavor in *O. basilicum* dried at 60°C. Dwivedy *et al.* (2012) also observed a similar result in a medicinal Indian Borage (*Coleus aromaticus*) leaves dried at the temperature regimes of 50-80°C using hot air drying. The study proposed drying the leaves of Indian Borage at 60°C in hot air dryer in order to obtain an acceptable product.

These literatures showed that drying at a temperature of 60°C preserved quality of many aromatic and medicinal herbs especially in terms of their appearance and flavor/aroma. Aroma may be considered the most important sensory attribute in spices and herbs since they are primarily used to impart flavor to food. Appearance is also desirable especially in fresh herbs, although it is often lost in fresh *O. basilicum* during cooking. *O. basilicum* oven-dried at 60°C may, therefore, serve as a good substitute for the fresh ones in culinary uses as it appeared there was least degradation of the aroma/flavor compounds of *O. basilicum* at this temperature.

#### CONCLUSION

Drying led to lower scores in the sensory attributes of the dried samples; however, their scores were also generally high in comparison to those of the fresh sample. Sample oven-dried at 60°C showed the highest score for aroma among the dried samples, with a score close to that of the fresh sample. Sample oven dried at 60°C also contained higher polyphenol and soluble extracts than the other dried samples. All the drying methods reduced the moisture levels of the samples to that suitable for shelf stability and led to significantly ( $p < 0.05$ ) higher content of protein, ash and crude fiber in dried samples. Oven drying at 60°C was found to favor the samples more than the other drying methods in the qualities evaluated. It was, therefore, identified as the drying method most suitable for *O. basilicum*.

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