Nguyen Phuoc Minh et al /J. Pharm. Sci. & Res. Vol. 11(3), 2019, 813-818

ISSN:0975-1459
Journal of Pharmaceutical Sciences and Research
www.jpsr.pharmainfo.in

Investigation of Herbal Tea Production from Purslane (*Portulaca oleracea*)

Nguyen Phuoc Minh[1,*], Tran Thi Yen Nhi[2], Phung Kim Phung[3], Nguyen Thi Phuong Thao[4], Le Van Nam[5]
[1]*Faculty of Chemical Engineering and Food Technology, Nguyen Tat Thanh University, Ho Chi Minh, Vietnam*
[2]*NTT Hi-Tech Institute, Nguyen Tat Thanh University, Ho Chi Minh City, Vietnam*
[3]*Bac Lieu University, Bac Lieu Province, Vietnam*
[4]*Can Tho University, Can Tho City, Vietnam*
[5]*Dong Thap University, Dong Thap Province, Vietnam*

Abstract.
Purslane (*Portulaca oleracea* L.) deserves special attention from agriculturalists and nutritionists. It is a common weed in turfgrass areas as well as in field crops. The mixture of phytochemicals present in many of these plants contributes to their protective and health effects. The stems and leaves of the plant are succulent and edible with a slightly acidic and salty taste similar to spinach. Objective of the present study was focused on the effect of blanching, drying and storage of herbal tea produced from *Portulaca oleracea*. Optimal results found that herbal tea would have stable antioxidant capacity while blanching at 95°C in 4 seconds with the presence of 3% $CaCl_2$ submersed in blanching solution; drying at 40°C with 1.5 cm in dimenstion of *Portulaca oleracea*; storage under vaccum in PET/AL/PE bag within 6 months without any deterioration. Purslane (*Portulaca oleracea*) could be used as a good source of minerals, antioxidants and omega-3 especially for functional food in form of herbal tea.
Keywords: *Portulaca oleracea, herbal tea, blanching, drying, storage, vaccum*

I. Introduction

Portulaca oleracea is a common weed distributed throughout Vietnam. It is a warm climate, annual, green herb, with branched and succulent stems. Tannins, saponins, oxalate, urea, alkaloids, sitosterols, mono, di and triterpenes, phenolic compounds and omega-3 fatty acids are major phyto-constituents present in the plant.[1] The plant is reported to possess many pharmacological activities including antioxidant, anticancer, antidiabetic, hypocholesteremic, neuroprotective, hepatoprotective, nephroprotective, anti-inflammatory, antiulcer, antimicrobial, wound healing, uterine bleeding control and wormicidal and insecticidal activities.[2, 3]

There were presence of alkaloid, flavonoid, phenol, saponin, sterol, tannin and terpenoid in the leaf, stem and root of both extracts. Alkaloid and saponin have highest concentrations in both aqueous and ethanol extracts. High concentrations of calcium, magnesium, phosphorus and potassium were present in the leaf, stem and root, whereas iron content was least in all the parts. Level of crude protein, crude fibre and fat were highest in the leaf while carbohydrate was highest in the stem and least in the leaf at p>0.05 level of significance.[4] Aqueous extract of *Portulaca oleracea* reduced the incidence of liver lesions signs of hepatic toxicity and substantiates its use in various liver disorders as hepato protection.[5, 6] Purslane can attenuate aging alternations induced by D-gal and aging in female reproductive system.[7] Oral intake of alcoholic extract of *Portulaca oleracea* can play an important role in reducing cholesterol levels, similar to the use of atorvastatin.[8] However there are health concerns regarding its oxalic acid content that limit the recommendation of its regular use in human diet. Cultivation practices and breeding selection have been confirmed to allow for managing the content of the main bioactive compounds and consequently increase the added value of the final product.[9]

The dietary inclusion of *Portulaca oleracea* to the diet of laying hens increased the n-3 fatty acids content and reduces the cholesterol content in the egg yolk.[10] One study evaluated the effect of purslane extract on performance, cecal microflora composition and immune responses of broiler chickens. It was concluded that purslane inclusion had a positive significant effect on cecal microflora composition, but had no effect on immune response of broiler chickens.[11] A research examined the effect of drying methods on the antioxidant capacity, color and phytochemicals of *Portulaca oleracea* L. leaves. The fresh purslane leaves had high contents of total phenolics (1447.59 mg GAE/ 100 g) and flavonoids (5011.87 mg QE/ 100 g) on dry weight basis. They exhibited high antioxidant capacity (53.23% and 147.78 μmol trolox/ 100 g) measured by DPPH and ABTS assay, respectively. Chromatic coordinates (L*, a* and b*) as well as total color difference (ΔE) were affected by drying methods. Drying methods caused a significant decrease in total phenolics, total flavonoids and antioxidant capacity of purslane leaves. Drying by hot-air at 50°C and freezedrying had the lowest adverse effects on antioxidant capacities of purslane leaves while microwave drying cannot be a competitive process for preserving antioxidants and antioxidant capacity of purslane leaves. The changes in the antioxidant capacity due to the drying methods were positively correlated with the content of phenolics (R2= 0.9043- 0.9885).[12]

One study concluded that the dietary inclusion of both 100 g/kg and 200 g/kg purslane increases yolk ω-3 fatty acids content without any adverse effect on egg quality traits and productive performance of Rhode Island Red hens.[13]

One study was conducted to determine the effect different levels of purslane (*P. oleracea* L.) meal on broiler performance. The results of weekly performance indicated significant differences (P<0.05) among the dietary treatments (0, 2, 4, 6 and 8% purslane meal) for feed intake, body weight gain and feed conversion ratio. The differences among the dietary treatment for, the overall feed intake, body weight gain, feed conversion ratio and dressing percentage, were significant ($P<0.05$) except feed conversion ratio.[14]

One study was developed gluten free snacks fortified with purslane *(Portulaca oleracea)* powder. The addition of 10% purslane caused an increase in antioxidant to 87.28% compared with 67.44% for control. It can be noticed that, the addition of purslane had significantly increased linolenic (omega 3 fatty acid) and linoleic acid. The fortification with 2% purslane showed to be the most preferable fortified extrudes sample. Therefore, purslane could successfully be used to enrich snacks, giving an alternative utilization and healthy choice.[6]

One study conducted to develop purslane powder from purslane and utilizing the purslane powder for the development of ice-cream and cookies. 2gm purslane powder in ice-cream and 6gm purslane powder in cookies proves enhanced nutritional properties, physicochemical characteristics and organoleptic attributes.[15]

Objective of this research focused on the effect of blanching, drying and storage of herbal tea produced from Portulaca oleracea.

II. MATERIALS AND METHOD

2.1 Material

We collected *Portulaca oleracea* leaves in Mekong Delta, Vietnam. They must be cultivated following VietGAP to ensure food safety. After harvesting, they must be conveyed to laboratory within 4 hours for experiments. They were washed thoroughly under turbulent washing to remove dirt, dust and adhered unwanted material. Besides Portulaca oleracea leaves, we also used other materials during the research such as $CaCl_2$, iodate, potassium chloride, Folin-Ciocalteu's phenol, sodium carbonate. Lab utensils and equipments included steaming oven, refractometer, heat pump dryer, spectrophotometer, incubator.

Figure 1. *Portulaca oleracea* leaves

2.2 Researching procedure

2.2.1 Effect of blanching temperature and time to vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw) and color (sensory score) in the dried Portulaca oleracea leaf tea

Raw *Portulaca oleracea* leaves were blanched in water solution with 2% $CaCl_2$ at different temperature and time (100^{o}C, 2 second; 95^{o}C, 4 seconds; 90^{o}C, 6 seconds; 85^{o}C 8 seconds). Then they were dried by heat pump at 60^{o}C until 6.5% moisture. All samples were analyzed vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw), color (sensory score) to validate the appropriate blanching condition.

2.2.2 Effect of $CaCl_2$ concentration in blanching to vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw) and color (sensory score) in the dried Portulaca oleracea leaf tea

Raw *Portulaca oleracea* leaves were blanched in water solution with different $CaCl_2$ concentration (1.0%, 2.0%, 3.0%, 4.0%, 5.0%) at 95^{o}C, 4 seconds. Then they were dried by heat pump at 60^{o}C until 6.5% moisture. All samples were analyzed vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw), color (sensory score) to validate the appropriate blanching condition.

2.2.3 Effect of Portulaca oleracea leaf size during drying to vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw) and color (sensory score) in the dried Portulaca oleracea leaf tea

Raw *Portulaca oleracea* leaves were blanched in water solution with 4% $CaCl_2$ at 95^{o}C, 4 seconds. Then they were dried at different size (0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm, 2.5 cm) by heat pump at 60^{o}C until 6.5% moisture. All samples were analyzed vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw), color (sensory score) to validate the appropriate blanching condition.

2.2.4 Effect of drying temperature to vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw) and color (sensory score) in the dried Portulaca oleracea leaf tea

Raw *Portulaca oleracea* leaves were blanched in water solution with 4% $CaCl_2$ at 95^{o}C in 4 seconds. Then these samples would be dried in 1.0 cm of size under heat pump dryer at different temperature (10^{o}C, 20^{o}C, 30^{o}C, 40^{o}C, 50^{o}C, 60^{o}C) until 6.5% moisture. All samples were analyzed vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw), color (sensory score) to validate the appropriate drying temperature.

2.2.5 Effect of storage condition to total phenolic (TP, µg GAE/g fw) in the dried leaf tea

After completion of drying treatment, the dried *Portulaca oleracea* leaves were subjected to storage. They were kept in PET/AL/PE (zipper top), PET/AL/PE (vaccum) bag at different 4^{o}C, 28^{o}C. The total phenolic (TP, µg GAE/g fw) will be analyzed in 1 week interval for 6 weeks.

2.3 Physico-chemical and biological analysis

The vitamin C (mg/100g) content of the *Portulaca oleracea* leaves was determined by redox titration using iodate solution. Total phenolic (TP, µg GAE/g fw) contents were measured.[16] Total soluble solids (TSS, %) were measured by refractometry method. Color (sensory score) of *Portulaca oleracea* leaves was assessed by a group of panelist. They were required to evaluate the odour, colour, taste, sweetness and overall acceptance using the 9-point hedonic scale (1 = dislike extremely, 9 = like extremely).

Total phenolic (TP) contents were measured. To determine the levels of TP, 1 ml of each extract was combined with Folin-Ciocalteu's phenol reagent and water 1:1:20 (v/v) and incubated for 8 min, followed by the addition of 10 ml of 7% (w/v) sodium carbonate. After 2 h, the absorbance of each was measured at 750 nm. Values of TP were estimated by comparing the absorbance of each with those of a standard response curve generated with gallic acid.

Results are expressed as micrograms of gallic acid equivalents on a fresh weight basis (µg GAE/g fw).

2.4 Statistical analysis

The experiments were run in triplicate with three different lots of samples. Data were subjected to analysis of variance (ANOVA) and mean comparison was carried out using Duncan's multiple range test (DMRT). Statistical analysis was performed by the Statgraphics Centurion XVI.

III. RESULT & DISCUSSION

3.1 Phytochemical composition in *Portulaca oleracea* leaves

P. oleracea is a rich source of omega-3 fatty acids, which is important in preventing heart attack and strengthening the immune system.[17] *Portulaca oleracea* is very rich in antioxidants and it can have a healthy effect in the human diet. Phytochemical composition in *Portulaca oleracea* leaves was primarily analyzed to determine vitamin C, total phenolic, total soluble solid. Results were mentioned in table 1.

Table 1. Phytochemical composition in *Portulaca oleracea* leaves

Parameter	Vitamin C (mg/100g)	Total phenolic (TP, µg GAE/g fw)	Total soluble solid (%)
Value	**90.37±0.02**	**371.22±0.03**	**4.53±0.01**

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

From table 1, we could see that *Portulaca oleracea* leaves had high amount of vitamin C, total phenolic, total soluble solid which were suitable for herbal tea production. Total phenol content (TPC) varied from 174.5±8.5 to 348.5±7.9 mg GAE/100 g; ascorbic acid (AAC) from 60.5±2.1 to 86.5±3.9 mg/100 g.[18] Dry matter content of leaf varied from 4.25 to 4.71%.[19] One study examined the effect of drying methods on the antioxidant capacity, color and phytochemicals of *Portulaca oleracea* L. leaves. The fresh purslane leaves had high contents of total phenolics (1447.59 mg GAE/ 100 g) and flavonoids (5011.87 mg QE/ 100 g) on dry weight basis.[12]

3.2 Effect of blanching temperature and time to vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw) and color (sensory score) in the dried *Portulaca oleracea* leaf tea

The water extracts of *P. oleracea* showed no cytotoxic or genotoxic effects, and has been certified safe for daily consumption as a vegetable.[20] Such beneficial effects of this valuable weed might be ascribed to the presence of various bioactive and phenolic antioxidants. Raw *Portulaca oleracea* leaves were blanched in water solution with 2% $CaCl_2$ at different temperature and time (100^{o}C, 2 seconds; 95^{o}C, 4 seconds; 90^{o}C, 6 seconds; 85^{o}C 8 seconds). Then they were dried by heat pump at 60^{o}C until 6.5% moisture. All samples were analyzed vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw), color (sensory score) to validate the appropriate blanching condition. Results were depicted in table 2.

Table 2. Effect of blanching temperature and time

Blanching	Vitamin C (mg/100g)	Total phenolic (TP, µg GAE/g fw)	Color (sensory score)
100^{o}C, 2 seconds	70.59±0.01^b	327.48±0.01^b	7.55±0.01^a
95^{o}C, 4 seconds	**77.45±0.02^a**	**340.15±0.02^a**	**7.48±0.03^a**
90^{o}C, 6 seconds	68.05±0.00^c	304.27±0.01^c	6.22±0.01^b
85^{o}C 8 seconds	65.21±0.04^d	284.74±0.03^d	5.30±0.02^c

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Blanching is a pre-treatment thermal process, which is applied in case of raw vegetables and fruits prior to processes such as sterilization/pasteurization, freezing or drying. Blanching determines the quality of the final product.[21] The increase of treatment time caused a vitamin C decrease in samples blanched by boiling water and steam.[22] Blanching deactivates enzymes, so during the further stages of processing, degradation of chlorophyll and carotenoids is limited and, as a consequence, negative impact on colour of vegetables is also reduced.[23] During blanching and the further stages of processing, tissue damage may occur, which contributing to negative changes of colour of processed vegetables, because of chlorophyll degradation.[24] One study examined the optimization of purslane plant using cooking and pickling processes for reducing oxalate content. They focused on the effect of cooking of purslane at different temperatures (60, 80 and 100 °C), for various durations (5, 10, 15 and 20 minute), and pickling for various durations (3, 6 and 9 days) on oxalate content. the soluble fraction of total oxalate content of purslane cooked for 20 minutes at 60, 80 and 100 °C were 34.65, 19.84 and 15.84 %, respectively. While, the soluble fraction of total oxalate content of purslane pickled for 0, 3, 6 and 9 days were 47.80, 36.23, 25.60 and 14.39 %, respectively. Fortification of biscuits using purslane powder after treatments led to improvement of the quality characteristics of product.[25]

3.3 Effect of $CaCl_2$ concentration in blanching to vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw) and color (sensory score) in the dried *Portulaca oleracea* leaf tea

Consumption of flowers and vegetables high in antioxidants contribute to the prevention of degenerative processes caused by oxidative stress.[26]

Raw *Portulaca oleracea* leaves were blanched in water solution with different $CaCl_2$ concentration (1.0%, 2.0%, 3.0%, 4.0%, 5.0%) at 95^{o}C, 4 seconds. Then they were dried by heat pump at 60^{o}C until 6.5% moisture. All samples were analyzed vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw), color (sensory score) to validate the appropriate blanching condition. Results were depicted in table 3.

Table 3. Effect of $CaCl_2$ concentration in blanching

$CaCl_2$ concentration in blanching	Vitamin C (mg/100g)	Total phenolic (TP, µg GAE/g fw)	Color (sensory score)
1%	77.45±0.02^{c}	340.15±0.02^{c}	7.48±0.03^{bc}
2%	78.03±0.03^{bc}	342.05±0.04^{bc}	7.90±0.01^{b}
3%	**78.41±0.01^{b}**	**343.25±0.02^{b}**	**8.45±0.00^{a}**
4%	78.95±0.01^{ab}	344.19±0.01^{ab}	7.01±0.02^{c}
5%	79.22±0.03^{a}	345.02±0.03^{a}	6.34±0.01^{d}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

The main aim of the blanching process is to deactivate enzymes (e.g. polyphenol oxidase, ascorbic acid oxidase, peroxidase, chlorophyllase, lipoxygenase) that may catalyse reactions responsible for deteriorating the quality of the final product, including colour degradation or undesirable flavour and texture changes.[27, 28, 29] Soaking in 1% calcium chloride solution prior to low-temperature blanching resulted in obtaining a colour more attractive for consumers, compared to the use of conventional technology.[21] Addition of calcium salts during the blanching improves the texture of plant products, as calcium ions enter into cross-bindings between polymers of pectin and stabilize them.[30]

3.4 Effect of *Portulaca oleracea* leaf size during drying to vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw) and color (sensory score) in the dried *Portulaca oleracea* leaf tea

Raw *Portulaca oleracea* leaves were blanched in water solution with 4% $CaCl_2$ at 95°C, 4 seconds. Then they were dried at different size (0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm, 2.5 cm) by heat pump at 60°C until 6.5% moisture. All samples were analyzed vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw), color (sensory score) to validate the appropriate blanching condition. Results were depicted in table 4.

Table 4. Effect of *Portulaca oleracea* leaf size during drying

Portulaca oleracea leaf size	Vitamin C (mg/100g)	Total phenolic (TP, µg GAE/g fw)	Color (sensory score)
0.5 cm	62.35±0.03^{d}	175.21±0.01^{d}	6.23±0.02^{c}
1.0 cm	70.01±0.01^{c}	298.14±0.00^{c}	6.98±0.04^{bc}
1.5 cm	**78.41±0.01^{ab}**	**343.25±0.02^{b}**	**8.45±0.00^{a}**
2.0 cm	79.79±0.04^{b}	344.19±0.03^{ab}	7.26±0.02^{b}
2.5 cm	80.59±0.02^{a}	345.47±0.01^{a}	5.11±0.01^{d}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Plant samples were dried in an oven at 70 °C for 72 h. Oven-dried samples of Purslane were ground and stored in plastic vials. The findings of this study are important for selecting *Portulaca olerecea* cultivars at the appropriate maturity stage for use as a source of valuable minerals and antioxidants, especially for functional food and nutraceutical applications.[18]

3.5 Effect of drying temperature to vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw) and color (sensory score) in the dried *Portulaca oleracea* leaf tea

Raw *Portulaca oleracea* leaves were blanched in water solution with 4% $CaCl_2$ at 95°C in 4 seconds. Then these samples would be dried in 1.0 cm of size under heat pump dryer at different temperature (10°C, 20°C, 30°C, 40°C, 50°C, 60°C) until 6.5% moisture. All samples were analyzed vitamin C (mg/100g), total phenolic (TP, µg GAE/g fw), color (sensory score) to validate the appropriate drying temperature. Results were depicted in table 5.

Table 5. Effect of drying temperature

Drying temperature	Vitamin C (mg/100g)	Total phenolic (TP, µg GAE/g fw)	Color (sensory score)
10°C	68.79±0.02^{d}	305.37±0.03^{d}	6.34±0.01^{c}
20°C	70.07±0.04^{c}	313.32±0.01^{c}	7.05±0.04^{bc}
30°C	74.14±0.00^{bc}	320.29±0.01^{bc}	7.44±0.02^{b}
40°C	80.27±0.02^{a}	349.07±0.03^{a}	8.59±0.01^{a}
50°C	79.39±0.03^{ab}	345.11±0.00^{ab}	8.55±0.03^{ab}
60°C	78.41±0.01^{b}	343.25±0.02^{b}	8.45±0.00^{ab}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

One study investigated the effects of microwave drying on moisture content, moisture ratio, drying time and effective moisture diffusivity of purslane leaves (*Portulaca oleracea L.*). By increasing the microwave output power (180–900W) and the sample amounts (25–100 g), the drying time decreased from 43 to 12.5 minutes and increased from 27 to 54 minutes, respectively. Among the models proposed, the semi-empirical Midilli et al. model gave a better fit for all drying conditions applied. By increasing the microwave output power and decreasing the sample amount, the effective moisture diffusivity values ranged from 5.913×10^{-11} to 1.872×10^{-10} m^2/s and from 9.889×10^{-11} to 3.292×10^{-11} m^2/s, respectively.[31]

One study examined the effect of drying methods on the antioxidant capacity, color and phytochemicals of *Portulaca oleracea* L. leaves. Drying methods caused a significant decrease in total phenolics, total flavonoids and antioxidant capacity of purslane leaves. Drying by hot-air at 50oC and freezedrying had the lowest adverse effects on antioxidant capacities of purslane leaves while microwave drying cannot be a competitive process for preserving antioxidants and antioxidant capacity of purslane leaves.[12]

One research investigated the effect of different drying on retention of bioactive molecules, such as omega-3 fatty acids, total phenolic content and antiradical activity of purslane. Five different dehydration methods including microwave (100 MW, 5 min), tray, vacuum, low temperature low humidity, infrared were used at 55–60 °C for 5–7 h for dehydration of purslane. Three solvents, viz. water, ethanol and methanol were used for extraction of bioactive molecules from purslane. Total polyphenol content, antiradical activity and rehydration ratio of the bioactive molecules were determined. Results revealed that total PUFA, α-linolenic acid (ALA), total polyphenol content and antiradical activity were found to retain in the dried purslane in the range of (47.9–59.9 %), (42.5–50 %), (188–408GAE/100 g) and (33.0–88.8 mg/100 g) respectively. The highest values of ALA, total polyphenol content and antiradical activity were found to obtain in the vacuum dried sample. Rehydration ratio was found in the range of 3.2–4.3 and vacuum dried purslane showed maximum rehydration. It could be concluded that vacuum dehydration of purslane is an effective method for retention of bioactive molecules and good rehydration behaviour of dried purslane.[32]

One study determined the best way to dry purslane leaves and estimate the nutritional value of purslane leaves powder, wheat flour and pan bread, prepared by replacing 2, 4 and 6% of wheat flour by purslane leaves powder and determine the best replacement ratios that lead to obtain properties of sensory acceptable and study the effect of feeding rats with basal diet and pan bread prepared using purslane leaves powder on biochemical characteristics of rats after 28 days, the results revealed that using 50 °C in the drying was one of the best used methods.[33]

3.6 Effect of storage condition to total phenolic (TP, µg GAE/g fw) in the dried *Portulaca oleracea* leaf tea

After completion of drying treatment, the dried *Portulaca oleracea* leaves were subjected to storage. They were kept in PET/AL/PE (zipper top), PET/AL/PE (vaccum) bag at different 4^oC, 28^oC. The total phenolic (TP, µg GAE/g fw) will be analyzed in 1 week interval for 6 weeks. Results were depicted in table 6.

Table 6. Effect of storage condition to total phenolic (TP, µg GAE/g fw) in the dried *Portulaca oleracea* leaf tea

Storage duration	Storage temperature (4^oC)	Storage temperature (28^oC)
0	349.07 ± 0.03^{a}	349.07 ± 0.03^{a}
1	347.44 ± 0.02^{ab}	344.25 ± 0.02^{ab}
2	345.35 ± 0.00^{b}	340.78 ± 0.02^{b}
3	349.40 ± 0.01^{bc}	328.49 ± 0.00^{bc}
4	330.59 ± 0.02^{c}	310.22 ± 0.04^{c}
5	322.19 ± 0.02^{cd}	301.15 ± 0.01^{cd}
6	314.40 ± 0.00^{d}	298.48 ± 0.03^{d}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

One research determined the chemical composition, minerals, fatty acid analysis, phenolic compounds and radical scavenging activity of purslane plant. Total phenolic and radical scavenging activity of purslane were 193.22 mg/100g gallic acid equivalent and 87.29 %, respectively.[25] Purslane contains high percentage of unsaturated fatty acids, especially linolenic acid (40.4 % of total fatty acids). Protein, fat, ash and fiber contents of purslane were 5.64, 5.30, 23.42 and 16.03 %, respectively on dry matter basis. The highest concentration mineral was K (4694.0 mg/100g), while the lowest concentration mineral was Zn (0.93 mg/100g).[34] One study developed value added products by using purslane (*Portulaca oleracea*). Purslane powder is prepared by using tray dryer at 60^oC temperature.[15]

IV. Conclusion

Purslane is a reasonable choice due to its high nutritive and antioxidant properties as human food, animal feed and medical utilization. It is believed that the regular consumption of dietary antioxidants may reduce the risk of several serious diseases. Diets rich in fruits and vegetables have always been associated with health benefits. Purslane comprises of a higher nutritive value than other vegetables due to its omega-3 fatty acid, α-tocopherol, ascorbic acid, β-carotene and glutathione rich shoots. We have successfully optimized the effect of blanching, drying and storage of herbal tea produced from *Portulaca oleracea*. Samples are nutritious and could be consumed by all age group people. It will also help in improving the health of consumers.

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