



## The Study Of Producing Functional Herbal Drink From Ziziphora Tenuior extract

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Received: 01.02.2015; Accepted: 05.05.2015

**Abstract.** In the study, the plant Ziziphora extract was used for noncarbonated beverages. Thus, the plant powder of Ziziphora was treated in different intensity ultrasound and microwave, and 10 different extracts were obtained. Then extract with the high phenolic compounds was selected and 8 different formulations according to different ratios of Ziziphora extract, apple and peppermint juice were prepared. In all these formulas, sugar and citric acid were added to a fixed amount. The organoleptic was done by a panel test to evaluate the color, flavor, taste and overall acceptability based on a 5-point Hedonic scale and the best formulation was selected to the beverages. Next step, to evaluate the remaining duration, beverage samples were stored for three months at 25 ° C; and within a month, it was experimented on pH, acidity, turbidity, TSS, color, total phenolic compounds, free radical scavenging ability, antioxidant activity and vitamin C and compared with the value at the time the beverage was producing, as control. Finally, it was found that pH, turbidity and color reduced within the three months to remaining the pH, but acidity and amounts of solid showed an increasing trend. The results showed that the amount of phenolic compounds and antioxidant activity of the samples was not affected by storage duration and environmental conditions and remained constant; however, environmental and time conditions had a significant effect on the amount of vitamin C and reduced it significantly. The results observed from the organoleptic, after the end of the storage period, showed that stored samples in terms of flavor, taste and appearance has not changed much compared to fresh samples and it was acceptable in Panelist's opinion, and if remained in the refrigerator temperature, quality and nutritional characteristics of the product should be better maintained.

**Key words:** herbal beverages, Ziziphora extract, hyper-productive, phenolic compounds

### 1. INTRODUCTION

Beverages has been producing around the world since more than 150 years ago, and the history comes back to 1953 in Iran, which, in this year, it began mass production of beverage as an industry. Constituents include water, sugar, extracts, preservatives and carbon dioxide (gas CO<sub>2</sub>) and this material having prepared at the different units, would import in production lines separately or combined with together and are then completely mixed and they would make base liquid of beverage that after packaged in bottles, are stored until public wide use later. In many of developed countries, due to problems such as industrially beverages production like management and technical problems in production, problems of raw material, consumption market and exports, as well as contaminants attributed to drinking industrial beverage from the perspective of consumer health [1], many researchers are seeking ways to optimize their use of traditional and natural beverages. For example, in a study conducted by the Vest, it was revealed Herbal Drink's corrosive effect on tooth enamel is lower than that of acidic beverages [2]. Unfortunately, many of the factories' models are based on Pepsi and Coca-Cola beverage companies in the US and the major components are of the same compounds as used in the 70s and 80s [3]. Medicinal herbs are ones that some the traditional consumption history is more than a thousand years. Considering optimizing the medicinal plants consumptions through producing different kinds of chocolate, nectar and beverages could be a suitable solution in order to

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encourage consumers to use nutrition that is of natural origin with productive and causing health effects. Tendency to use medicinal plants because of the lack of adverse effects, and a variety of active compounds within is being increased [4]. Among the types of medicinal plants existing, in this study due to the suitable properties and the availability, the plant *Ziziphora* was used to prepare the beverages. It with a scientific name “*Thymus migricus* Klokov” belongs to spearmint family which in terms of appearance, is a perennial plant with height of 28-12 cm, and highly branched and woody at the base, its branches are in height of 4-11 cm and tomentose. The leaves shapes are egg-triangle and sometimes eggs-arrow. Color of upper surface is olive green and lower surface color, light green to olive green. Sepals are a green and flowers, pink, white-pink, and rarely white, which are of integrated and compact shapes [5]. This plant in its distribution is called by local people as kahlik otu [6] that the distribution domain is in addition to the North West, the East of Turkey, Armenia and Nakhichevan [5]. Of course, there are varieties of *Ziziphora* in the North Khorasan that the indigenous people call "Anounokh". *Ziziphora* contains 2.6-0.8% (usually 1%) extract [7] and the major compounds identified in its extract are mono-terpene hydrocarbons (30%), oxygenated mono-terpenes (65%) and hydrocarbons seskowi-terpenes (2%) [8]. Of *Ziziphora* traditionally are used as a carminative, food digesting, antispasmodic, anti-cough and expectorant and in food, pharmaceutical, cosmetic and toiletry industries, due to the combination of thymol. The aqueous, aqueous-alcoholic and propylene glycol extracts are used in the preparation of shampoos, creams and ointments [9]. Moussavi et al (2004), the mountain *Ziziphora* steam was extracted by steam distillation method and its antimicrobial effects were investigated in the different dilutions, by the disc plate method, on 9 microorganisms. The extract showed the best effect within a maximum of 45 minutes in terms of the time. Then by Gas Chromatography / Mass Spectrometry Machine, 17 compounds were identified in the mountain *Ziziphora* extract [6]. Due to the large number of indigenous medicinal herbals in Iran and easily and inexpensive availability as well as nutritious consumption and medicinal of these in the country as of long ago, this can be an introduction to the practical use of plants in food industry and specially plant beverage production until it is possible to both use a resource to be accessible and cost-effective and prevent loss of product and its damage, finally, we hope to promote community health and food security. In this study, using *Ziziphora* extract, water and flavoring with various ratios of constant values of sugar and citric acid, formulations were produced; and by organoleptic on, the optimum formulation was selected to the beverage; and after production, under the storage conditions, product quality indicators, including changes in polyphenolic compounds, antioxidant activity, turbidity, pH and acidity were assessed at regular intervals.

## 2. MATERIALS AND METHODS

### 2.1. Extracting *Ziziphora* Juice

10 kg *Ziziphora* dried was purchased from one of the groceries in the city Ajabshir one of the most important production centers in the Sahand hillside. Since *Ziziphora* contains a lot of wood, branches and other plants, first of all waste all was separated as much as possible. To obtain *Ziziphora* powder required, leaves isolated from *Ziziphora* was crushed by the industrial milling. Then to separate the particles in constant and desired size, the powder was passed through two sieves of 10 and 100 meshes. Powders with a diameter between 10 and 100 were selected for testing and much finer powder was removed and the powder larger than 10 mesh sieve was crushed again.

To extract, the powder and Beaker distilled water with ratio of 1 to 40 (5 g per 200 cc) were mixed within and placed exposure to ultrasound for 30 min at 40 ° C (the considered temperature supplied with Ben Mary) with different intensities (40, 60, 100) and microwave for 1 minute at different intensities (100, 200 and 300) and after soaking for 48 hours (stirred for per 12 hours) the resulting extract to remove any possible residues was filtered by the thin cloth. *Ziziphora* extract obtained was smoothed twice by Buchner funnel and using a vacuum pump.

Then to determine the best extract before production, 10 samples was tested on phenolic contents and the extracts which were exposure to ultrasound at 40 (30 min at 40 ° C) and 200 in the microwave for 1 minute had the highest phenolic compounds, so that was selected for the formulation of beverages.

## 2.2. Formulation of Beverages

By different values of selected extracts and apple juice of spearmint oil with constant amounts of sugar and citric acid, it was formulated 8 beverage types (Table 1). The raw materials after formulating were mixed by stirring. The transparent bottles were poured by the beverage prepared of 280 ml and were capped by hand capping machine. The information contained in each bottle including its manufacturing date and formulation number was registered on the bottle's label [10].

**Table 1:** the produced beverage formulation

Formula number	Extract volume (ml)	Water volume (ml)	Spearmint essence (gr)	Apple juice (gr)	Surge (gr)	Citric acid (gr)
1	50	150	-	-	150	1/5
2	50	150	0/0035	-	150	1/5
3	50	150	-	0/0065	150	1/5
4	50	150	0/0035	0/0065	150	1/5
5	100	100	-	-	150	1/5
6	100	100	0/0035	-	150	1/5
7	100	100	-	0/0065	150	1/5
8	100	100	0/0035	0/0065	150	1/5

## 2.3. Pasteurized beverages

After completion of the capping operation, the bottles for 10 minutes at 75 ° C (Ben Mary) was pasteurized by hot water and then quickly cooled up to 35 ° C [3].

## 2.4. Physicochemical tests

To evaluate the consistency of the beverage prepared, the samples were stored for 3 months at environmental conditions, during storage in the range of zero (immediately after production), 30, 60 and 90 days physicochemical experiments including pH, Brix, pH, turbidity, the color, the amount of phenolic compounds, the antioxidant amount and vitamin C on sample produced beverages were performed according to standards [3].

To determine PH, PH meter device was used, so that after calibrating the device by buffer 4 and 7, pH of subjects was measured in 20° C [11]. Brix of prepared samples were measured by a re-factor-meter at 20° C [12]. To measure the total acidity, 25 ml of beverage was dropped into the Beaker some phenol Ftalein was added (about 5 drops). Next step, then the beverage with normal soda of 0.1 was titrated until titration gets continuous until it is discolored. To calculate the acidity in terms of citric acid, consumption volume of 1.0 normal solution (v) can be used in the following formula [12].

$$TotalAcidity = \frac{V \times 0.028}{25} \times 100$$

Turbidity in samples of beverages using Panderez et al (1998) were measured [13]. For this purpose, samples were poured in the cell placed in a spectrophotometer and the absorbance

amount was read at 800 nm wavelength. Measuring the color intensity of samples was performed by using a spectrophotometer machine. That is, first, putting the cell with sterile water put in an absorption chamber, the absorption amount was zero (by menu Auto zero). Then samples were poured into the cell and at two different wavelengths of 520 and 700 nm, absorbance was measured and the color intensity was calculated according to the following equation [14].

Dilution degree  $\times$  (absorbance at 700 nm - absorbance at 520 nm) = TA

#### 2.4.1. Measurement of Phenolic Compounds

The total amount of phenolic compounds was determined using the Folin ciocalteo. For this purpose, the calibration curve of gallic acid as standard in concentrations of 20, 40, 60, 80 and 100 ppm were drawn. Substituting the absorptions and concentrations of gallic acid in the graph of the equation  $y = 0.0023x - 0.0073$  was obtained. X is as absorption read in wavelength by 765 nm and Y is values of the phenolic compounds. To determine the total phenolic compounds, absorption of the beverage was read on the basis of gallic acid in percent by a spectrophotometer at a wavelength 765 nm and was substituted. For the control samples, 0.5 ml distilled water was used [15].

#### 2.4.2. Measuring the inhibitory activity of free radical (DPPH)

Evaluation of antioxidant activity of the inhibitory activity of free radicals (DPPH) was measured. 2 and 2-D Fny11- Pecril Hidrazil or (DPPH) is a stable free radical with a violet color which by revival of the elements giving an electron or hydrogen (antioxidant compounds) in turns to diphenyl Pecril Hidrazil in yellow. The ability in giving a hydrogen atom or an electron by a compounds and different extracts of the test is measured by discoloring or reducing the amount of light absorbance of the violet solution (DPPH) in methanol. In this method, as the stable radical compound, the material (DPPH) was used as a reagent [5]. The method in this case was that the 0.5 ml of the sample ethanol extract was added in 3.5 ml soluble of DPPH in 0.004%. After 30 minutes, making the dark at room temperature, the sample absorbance at 517 nm was read. Percent inhibition of free radicals was calculated using the following equation [16].

$$I\% = (A_{Blank} - A_{Sample} / A_{Blank}) \times 100$$

On this formula, A-Blank- shows absorbance of control light (distilled water) ASample shows absorbance of light from the Ziziphora drinks.

#### 2.4.3. Determination of Vitamin C

To evaluate the effect of storage time on changes in vitamin C, it was measured during production and at the end of the storage period (90 days after production). Vitamin C concentrations were measured by HPLC devices with uv visible detector. In this experiment, the flow rate in the HPLC was one ml per minute and the wavelength used in detector was of 210 nm. The sample injection value of 20 micro liters and the apparatus was set for 20 minutes.

#### 2.5. Organoleptic

Organoleptic methods were based on analysis of the characteristics of food products using human senses, during this evaluation what are criteria are personal opinions and desires. The differences in sensory and instrumental methods are that the devices evaluate components of a food item separately and without considering their interactions with each other, however, about

organoleptic, the human's perception ability and the five senses were applied, and all properties with regard to their interactions were evaluated [11]. To study the characteristics of taste, color, turbidity, odor and sediment in drinking Ziziphora, the samples were evaluated by trained Panelist. The sensory characteristics were measured on a 5 point Hedonic scale.

## 2.6. Statistical analysis

In order to evaluate the results, unilateral completely randomized statistical plan was used. Data using statistical software Mststc were analyzed; comparing the means with each other and control sample was analyzed using Duncan test at alpha level equal to 0.05 with the same software and the experiments were performed in triplicate. Microsoft Excel was used to draw diagrams.

## 3. RESULTS AND DISCUSSION

### 3.1. The quality properties of Ziziphora beverage

After producing different formulations on Ziziphora beverage, to determine the qualitative characteristics including taste, color, turbidity, taste and sediment, the samples were evaluated by trained judges on a 5 point Hedonic scale. As mentioned above, the organoleptic methods were done based on analysis of the properties of food products using human senses; and the evaluation criteria is the opinions and desires of the individual, which depending on the type of evaluation, these people may be trained or non-trained. For example, when the goal of sensory tests would be one product to be preferred to another one which planned to distribute on the market, the real consumer is with no instruction and those with no training are employed as a judge in relation to food and their comments are based on experience, interpersonal preference, relish and distinguish ability, however, in cases where the objective is to determine the difference between, those trained so-called a jury are hired [11, 17].

The results showed that formulation No. 4 (containing Ziziphora extract of 50 ml, 150 ml water, 0.0035 warm peppermint, 0.0065 warm apple juice, 150 grams of sugar, 1.5 grams of citric acid) obtained the greatest acceptance and admiration among 8 formulations, thus for storage and conducting physicochemical tests during 90 days, storage at room temperature was selected. The average scores of the judges on the quality characteristics of the formulation No.4 are given in Table 2

**Table 2.** Average scores of the panelists to the organoleptic of the formulation selected.

Quality characteristics	5	4	3	2	1
Color	*				
turbidity		*			
Taste	*				
Sediment		*			
smell		*			

### 3.2. Changes in the physicochemical properties of stored beverages of Ziziphora over different days

#### 3.2.1. pH

ANOVA results showed that storage time had a significant effect on the pH of Ziziphora beverage samples. The changes in pH trend of Ziziphora beverage during different days in room temperature is shown in Figure 1. The results show a decreasing trend in pH in Ziziphora beverages so that the statistical analysis showed that the over maintaining time, pH of the samples was significantly decreased. In this case, the storage of Ziziphora beverages to 30 days after production it was found a significant difference in pH of the samples ( $P>0.05$ ).

However, increasing the shelf life of up to 60 and then 90 days made statistically significant change at samples pH (Figure 1). As can be seen in the figure, the greatest pH of the samples immediately after production was 3.47 the lowest value of this parameter was to 90 days after maintaining in the pH of 2.58, it is different than the production time as much as 0.90 approximately ( $P<0.05$ ), probably it is due to resistant microorganisms in acid generating heat.

Controlling on PH is important to the beverage, and in carbonated beverages industry, for the control on pH, usually one of the packing materials such as calcium citrate, sodium and ammonium consume was used. Baghaei et al (2009) in a study on the formulation of cantaloupe-based orange drink made with refrigerated storage of samples at room temperature for 6 weeks concluded that pH of the samples have changed little until the second week but over time to the fourth week it due to chemical and biochemical reactions significantly increases and again until the sixth week has significantly decreased, this is because of the acid generating potential growth of microorganism [18]. By analyzing the results of the regression, the following equation to estimate the changes in pH as a function of time was obtained where M represents the storage time in months. The equation is a quadratic equation with a high explanation coefficient (99.8%), which indicates the validity and credibility of this model.

$$pH = 3.47 + 0.16M - 0.15M^2$$

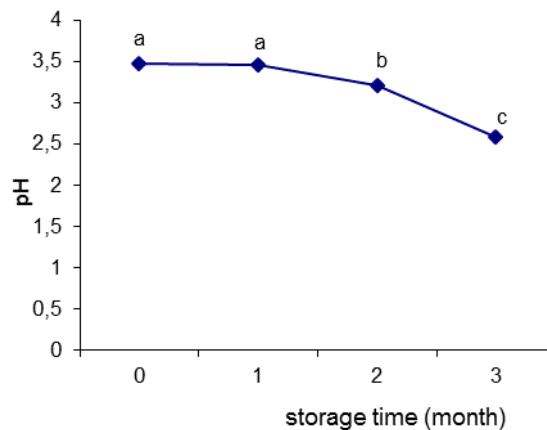


Figure 1. Changes in PH of Ziziphora beverages over different days in store in ambient temperature

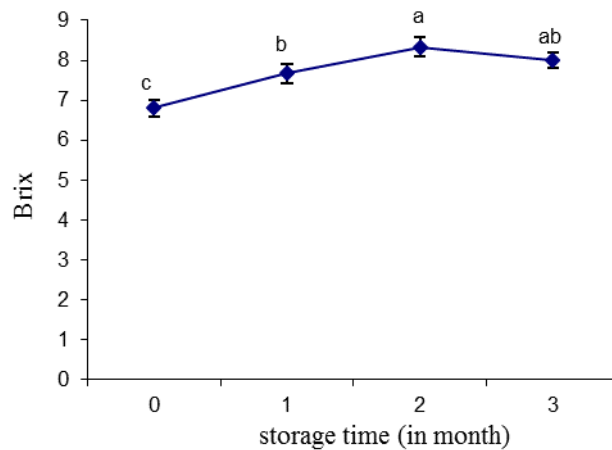
#### 3.2.2. Brix

Trend of changes in Brix on Ziziphora beverage over different days in ambient temperature is shown in Figure 2. ANOVA results showed that over time on the storage up to 60 days after production, Brix in samples significantly increased such that the it increases of 6.8 on first day to 8.33 on day 60 significantly ( $P<0.05$ ). But then with increasing storage time up to 90 days,

Brix showed a slightly decrease, and statistically no significant difference in the value of this parameter on month 2 ( $P>0.05$ ). Thus, based on the results of the lowest and the highest Brix values were related to production time and after two months of storage, respectively. According to the standard 1250, which is related to the chemical carbonated properties, Brix in Cola and Orange beverages at least are 10 and 11, respectively. As can be seen, Brix in Ziziphora beverage formulated is less than standard Brix this is because of sharp and strong taste in extract is extracted from Ziziphora that it was necessary to reduce Ziziphora sharp taste, less amount of extract be used. But over time, Brix in Ziziphora beverage samples increased, probably variations in the sample Brix is consumed due to sugar.

In a study Elhami Rade et al (2006) formulated carbonated beverages with the pussy sweaty and its physicochemical and microbiological changes in the six-month were studied under different environmental conditions. Finally, it was found that pH, acidity, soluble solids (Brix) weren't changed significantly in none of the treatments during 6 months [3]. The regression results revealed a quadratic equation with a high explanation coefficient (87.2%) to estimate changes in Brix as a function of time was obtained where  $M$  represents the storage time in month.

$$\text{Brix} = 6.67 + 1.32M - 0.3M^2$$



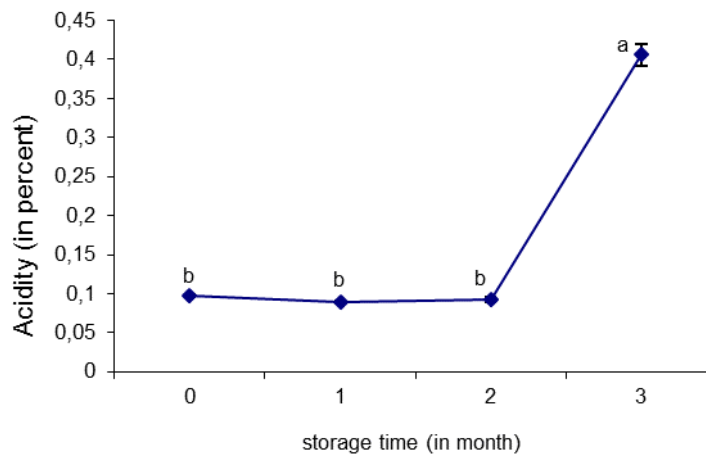
**Figure 2.** Changes in Brix of Ziziphora beverage during different days of storage at ambient temperature

### 3.2.3. Acidity

Primarily in carbonated beverage, for determining acidity, it was used pH, citric acid, phosphoric, ascorbic, malic acid and tartaric acid, total acidity was determined to control how to be consumed. The change in acidity value of Ziziphora beverages during different days in room temperature is shown in Figure 3. ANOVA results showed that it was not changed significantly and almost constant when passing time on the product storage up to 60 days after production ( $P>0.05$ ). But month 2 thereafter, a significant increase was observed in a way that Acidity value increased of 0.09% in controls to 0.4% in month 3 and the difference was statistically significant ( $P<0.05$ ). The change trends of Acidity is similar to pH so that since second month afterwards, it increased considerably and considered by which pH decreased significantly.

By analyzing the results of regression to estimate changes in Acidity as a function of the quadratic relation time with a high explanation coefficient (92.4%) it was obtained the high value of  $R^2$  indicates that the model is appropriate.

$$A = 0.112 - 0.15M + 0.08M^2$$

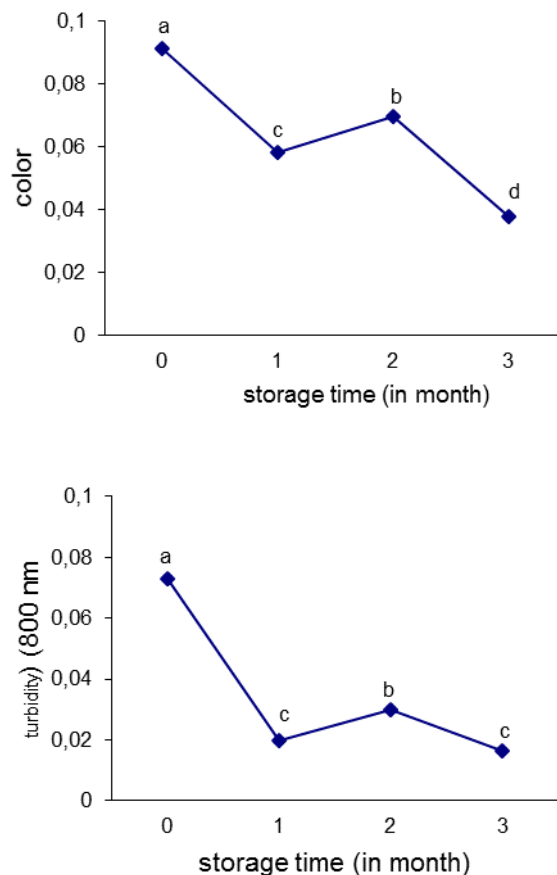


**Figure 3.** Changes in Acidity of Ziziphora beverage during different days of storage at room temperature drinks

#### 4.2.3. Color and turbidity

The ANOVA results showed a significant effect of storage time on the color and turbidity of the beverage containing Ziziphora. The changes trend in color and turbidity of Ziziphora beverage during different days of storage at room temperature is shown in Figure 4. As seen, similar trends took happen in color and turbidity so that these two parameters values on the control samples (the first day of production), have the maximum absorption amount and considered wavelength and therefore the highest color value (0.09) and turbidity (0.07). After a month of storage time, they decreased significantly and then increased again in the second month of storage and over third month have decreased (Figure 4). Thus, the least amount of color (0.03) and turbidity (0.01) was reached at the end of the period, which environmental and time conditions have a significant effect on turbidity in the carbonated beverage produced using pussy sweaty so that the samples maintained in room temperature and transparent bottles the turbidity increased significantly. Based on the regression results, it was not reported the degree with the suitable explanation coefficient (upper than 0.8) on the color and turbidity [3]. Najafi et al (1385) examined the possibility of green tea beverage formulations. They obtained the extracts as in non-continuous manner, and examined the effect of treatments of temperature between 40-100°C and times between 5-120 min on extraction of tea essence form green leaves. Extraction conditions are when being the amount of cream and turbidity formed in the lowest extract. The results showed that compounds extraction main causes in turbidity in juice extraction increases with increasing temperature, so that a sudden increase in temperature above 60°C was observed. According to the researchers, extraction temperature 40 to 60°C and 40°C to 50°C had no significant effect on the turbidity but higher temperatures have positive effects; this is because temperature between 50 and 60°C was determined for extraction of green tea essence in green beverages. Evaluation of the results of turbidity in drinking cold green tea using a spectrophotometer also showed that in common conditions of storage period of 60 days, the turbidity of drinking cold green tea does not change significantly. Therefore, produced beverage remains stable during the storage period of 60 days in terms of turbidity [19]





**Figure 4.** Changes in color and turbidity of the Ziziphora beverage during different storage days in environmental temperature

### 3.2.5. phenolic compounds and antioxidant activity

Since phenols and phenolic compounds are widely found in food and plant products and have significant antioxidant activity are also analyzed and evaluated in this study. As mentioned in extract preparation and selection for the Ziziphora, to the best juice drink before production, to determine the best extract before the beverage production, the samples were experimented under various conditions of ultrasound and microwave in Phenolic test and extract with the high phenolic content was selected for the formulation of the beverages. The produced juice drinks of Ziziphora extract consist of phenolic compounds and at last antioxidant activity, it is one of the advantages of this drink, so changes in these parameters were investigated during the storage. The change trend in phenolic compounds and antioxidant activity of drinks of Ziziphora during different days on storage at room temperature is shown in Figure 5. The ANOVA results showed a significant effect of storage time on these parameters of Ziziphora beverage samples ( $P > 0.05$ ). The amount of phenolic compounds in the samples of Ziziphora beverage immediately after production as a control sample was measured 23.3 mg per ml was measured; the results showed that during the three months of storage at room temperature did not change significantly and the amount of these compounds in the final three months of storage (3.37 mg per ml) had no statistically significant difference. The trend of change in inhibitory activity of Ziziphora beverages was similar phenolic compounds such that over storing with little fluctuation it didn't change considerably; and the amount of 44% on first day of production decreased up to 42% at the end of the third month of maintenance; but this difference was not statistically significant (Fig. 5). Amiri in 2008 produced the mountain Ziziphora extract and

methanol essential oils. The extract obtained by steam distillation method by GC and GC / MS machines analysis. In addition, the antioxidant activity level was evaluated by the method of Betakaroen-linoleic acid. In sum, 23 compounds that included 98.6% of the total extract were identified and main components are: Pulegone (30.1%), thymol (21.3%), para-mentha-3-N-8-L (12.9%), Ppryton (9.3%) and 1&8-cineole (4.1%), and the antioxidant activity amount was achieved 89.3% to methanol extract and 61.6% to the essence [20]. By analyzing the results of the regression, the equations of third degree with a high explanation coefficient to estimate variation of phenolic compounds and antioxidant activity were obtained as a function of time where M represents the storage time in months.

$$Phenol = 3.23 + 0.39M - 0.33M^2 + 0.07M^3$$

$$DPPH = 0.44 - 0.21M + 0.25M^2 - 0.06M^3$$

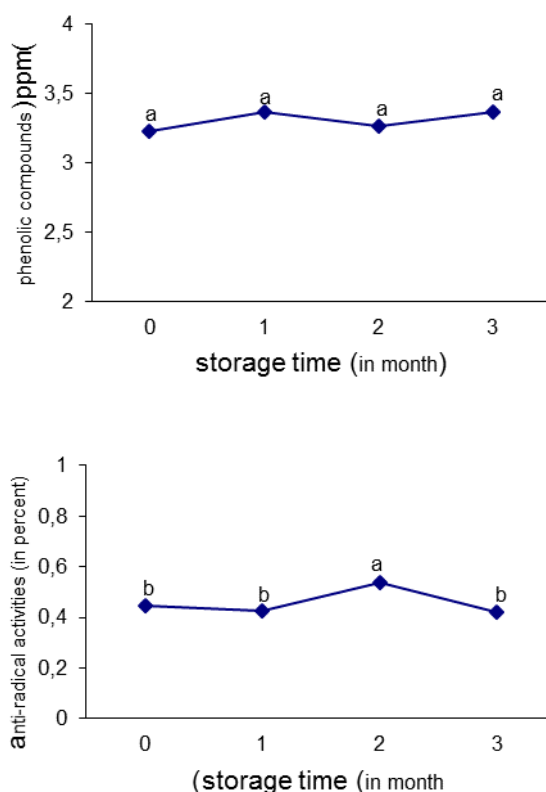


Figure 5. The change of phenolic compounds and antioxidant activity Ziziphora beverage during storage days

### 6.2.3. Vitamin C

Studies on the combinations of Ziziphora show that the its extract is of nutritional and medicinal value, so measurement of vitamin C due to the sensitive nature of the conditions was the same purpose. To evaluate the effect of storage time on changes in vitamin C, its levels during production and at the end of the storage period (90 days after production) was measured using HPLC. The results are shown in Figure 6. As can be seen, the vitamin value over 90 days when the samples stored at ambient temperature reached from the 47.22 to 27.17 mg per ml on the last day of storage, this difference is statistically significant ( $P < 0.05$ ). As mentioned, the amount of phenolic compounds and antioxidant activity remained almost unchanged during storage time.

The reason for the decline is probably due to the low amount of vitamin C in the Oxidation of polyphenolic compounds in the extract and as well as high sensitivity of vitamin C to the environmental conditions. In a similar study Hassani et al (2004), in order to produce the barberry to make fruit drinks and to replace it with a synthetic beverage, 3 formulations were prepared according to the different ratios of sugar concentration and barberry. In each of these formulas, apple concentrate and water were added to a fixed amount. To check the consistency, the beverage produced in both white and colored bottles at 4°C and 25°C for up to 6 months was stored; and at the end of each two-month, some experiments were performed on samples sample such as pH, Brix, turbidity, vitamin C, regenerative sugars, color intensity, sediment, total microbial count and determination of molds and yeasts. At the end of the maintenance period, the panel test was performed to evaluate the color, taste and overall acceptability based on a 5-point Hedonic scale.

The results showed that keeping drinks produced with three different formulas at 25°C due to loss of physical and chemical properties is not suitable and refrigerator temperature for maintaining quality and less variation was the best storage conditions [21].

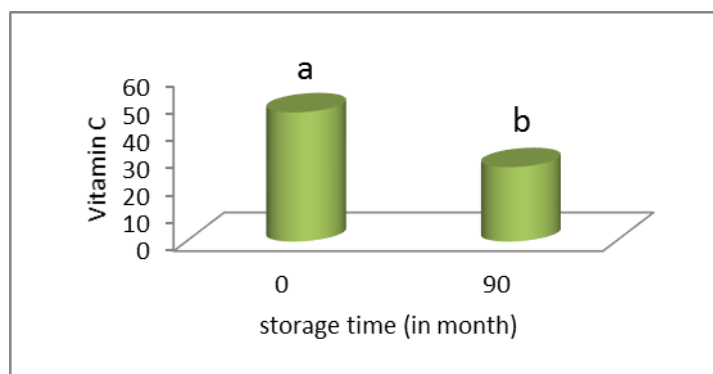


Fig.6. changes in Vitamin C of Ziziphora beverage during different storage days at room temperature

#### 4. CONCLUSION

Due to problems of industrial production of beverages including contaminants that from the perspective of consumer's health has been attributed to these products, many researchers are looking for ways to produce beverages are normal. Use of medicinal herbs by producing products such as beverages would be a suitable solution in order to encourage consumers to use food that is of natural origin and has beneficial effects on the health of consumers.

Among the types of medicinal herbs in the study, plant Ziziphora from spearmint family due to its nutritional properties and easy access to beverage formulation was used.

For this purpose, its extract was placed under different conditions, ultrasound and microwave; and with measuring phenol compounds in the extracts, it was found that the extracts were treated with ultrasound on 400 and microwave on 200 have the highest levels of phenolic compounds, and then for production of beverage natural was selected. Next, the formulations using Ziziphora extract, water and apple juice and mint flavors in different ratios of sugar and citric acid production was constant were performed and by organoleptic, appropriate formulation was selected after production, after the product is stored at ambient temperature under storage conditions, qualitative indicators of the product, including changes in polyphenolic compounds, antioxidant activity, pH, turbidity and pH were measured at three-month intervals. With organoleptic, it was determined after the end of the storage period, the stored samples in terms of taste and flavor did not change significantly than fresh samples that were acceptable in Panelist's viewpoint; however, if stored at refrigerator temperature, the

nutritional and quality properties of the product should be better maintained. According to the results, it may be said that Ziziphora beverage formulated, due to being rich in antioxidant levels and minor changes during storage was appropriate and could be evaluated in industrial-scale production requirements.

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