Quantitative Assessment of Juice Content, Citric Acid and Sugar Content in Oranges, Sweet Lime, Lemon and Grapes Available in Fresh Fruit Market of Quetta City

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Abstract— The reported study was performed to address the nutritional analysis viz., Juice contents, Total Sugar and citric acid contents of various fruit juices. The fruit juices that were tested included orange, Sweet lime, Lemon and grape. The fruit samples were brought at various intervals to laboratory of SBK Women’s University, Quetta. The samples were washed with distilled water and were kept at room temperature. The selected physiochemical characteristics of the fruits were then evaluated on the same day. The results for all the selected physiochemical parameters were found significant at different intervals. Being an acidic fruit lemon contained highest concentration of citric acid as compared to other fruits but in contrast grapes and orange were found to be highly rich in contents of total soluble solids respectively. It is concluded from the study that all the fruits were highly juicy but lemon were found as a rich source of citric acid and grapes and orange can be used as a rich source of sugar.

Index Term-- Sugar, Citric acid, juice content, brix value, titrable acidity.

INTRODUCTION

The flowering plants which possess seeds produce fruits which are beneficial for health. Fruits are ready and rich source of fibers, vitamins, minerals and anti-oxidants water and vitamin C at a high content (Usha, 2010). Many people consume juice of fruits daily considering it beneficial for health (France, 2000). They are considered as good food supplement because they contain high amount of carbohydrates, sugars, water different vitamins which include A, C, D, B1 and B2 as well as minerals Potassium, Sodium, Calcium, Magnesium and iron. Fruit play an important role in cellular health and disease prevention. Intake of fruits can reduce the risk of cancer, cardiovascular diseases, cataracts and some functional diseases (Usha, 2010). Citrus fruits are those fruits which contain sufficient amount of citric acid and are classified as acid fruits which include (Orange, grapefruit, strawberry, pineapple, lemon, lime) Sub-acid Fruits (Mango, apricot, peach, Grapes, Raisins, apple, pear) and Sweet Fruit (Banana, papaya). Citrus is a weak organic acid which occurs naturally. It can be easily manufactured and easily soluble. It is used as flavoring agent and increase the stability of the fruit. (ECAMA 2012). Carbohydrates are one of most abundant compounds found in nature. There are many different analytical techniques for the evaluation of carbohydrates (Blanco et al., 1998).

_Citrus sinuus_ is the botanical name of orange and is ever green fruit (Pereira, 1857). Oranges are one of the most widely used fruits in the world. They are available in most of the countries of the world. It is known as one of the best citrus fruits which is rich in vitamin C. Oranges are sweet as well bitter in taste (Nagy et al., 1997). Oranges contain different type of carbohydrates, fats and proteins and have a quite high nutritional value than other fruits (Rampersaud, 2007). Vitamin C is present in a high amount about 45mg or 75%per 100g of oranges. Orange is a fruit of warm climate. It has a variation of taste (Elizibetael et al., 2000). There are different uses of oranges such as the waste of orange can be used as animal feed. It is also used as a flavoring agent. It is used as a skin bleaching agent. Except these uses there is some medical importance as well. Orange and its juice are use as energetic drinks. It gives relief when someone is exposed to heat (Braun and Cohen, 2007). It is an excellent anti-oxidant. The juice of ripened orange is good for all types of fever. It contains potassium in high amount which reduces blood pressure. Orange juice is good for arthritis. It is good medicine for skin bleaching agent. Except these uses there is some medical importance as well. Orange and its juice are use as energetic drinks. It gives relief when someone is exposed to heat (Braun and Cohen, 2007). It is an excellent anti-oxidant. The juice of ripened orange is good for all types of fever. It contains potassium in high amount which reduces blood pressure. Orange juice is good for arthritis. It is good medicine for
are used for many purposes for example it is suitable for eating and contains amount of oil includes peel oil as well as juice oil and they are volatile in nature. It contains high amount of ascorbic acid (Sandhu & Minhas, 2006).

*Vitis vinifera* is specie of vitis and is native to Mediterranean region, central Europe, and southwestern Asia and has 5000 to 10,000 varieties (Wine & Spirits Education Trust). Fructose and glucose are present in large amount in grapes. Sweetness of grapes depend on it ripening time as grapes ripen fructose level will increase (Thoukis & Amerine, 1958). Grapes is categorized into four classes they include table grapes, juice grapes, wine grapes, raisin grapes (Patil et al., 1995). Grapes always occur in cluster of 15 to 300. They can be black, blue, yellow, green, orange or pink. Food and Agriculture Organization have found that 75,866sqkm of world comprises of grapes. In which 71% of grapes for making of wine and 27% is sold as fresh fruits and 2% as dried fruits. Grapes are seedless as well as grapes bearing seeds (Soyer et al., 2003). Grapes are also used for making juice by crushing and blending. Juice of grapes is also sold in stores or it may be fermented to convert it into wine or vinegar (Gomez & Lopez, 1996).

*Citrus lemon* is the botanical name of lemon. It is essential specie of citrus family. In last few years it is produced on large scale in all over the world. In lemon juice processing the by-product obtained is the peel of lemons. The peel contains high dietary fiber content. Other beneficial components beneficial for health present in lemon. It is a essential source of protein, fats and macro minerals (Janati, et al 2012). Lemons used for juice extraction and also in different spray and dish washers (Sandhu & Minhas, 2006).

Present study aims to determine the percentage of juice present in the citrus Fruit, soluble solids (Brix value or percentage sugar) and total citric acid content or acidity.

**MATERIALS AND METHODS**

**Determination of juice contents**

The juice contents were weighed and recorded in grams (Lacey et al., 2009; Grewal et al., 2000). The percent juice contents were calculated by using the following formula;

\[
\% \text{ juice contents} = \frac{\text{juice weight}}{\text{fruit weight}} \times 100
\]

**Determination of acidity:** Acidity of the juices was determined (in triplicate) by acid base titration (Lacey et al., 2009).

\[
\text{Percentage acid} = \frac{\text{Titer} \times \text{acid factor}}{10/10} \text{ (ml juice)}
\]

Factor for citric acid is 0.0064 (citrus fruit)

**Determination of total soluble solids**

Total soluble solids of the fruit juice were determined (in triplicate) as °Brix by using Abbe’s refractometer (NAR- IT, Japan) under the protocol previously adopted by (Lacey et al., 2009).

**Estimation of the TSS to Acid Ratio**

Total soluble solid to acidity ratio (TSS: acidity) was calculated by dividing the total soluble solids by percent acid (Lacey et al., 2009; Grewal et al., 2000).

\[
\text{TSS: Acid} = \frac{\text{°Brix value}}{\text{Percentage acid}}
\]

**Determination of sugars:** The sugars were estimated (in triplicate) by using chemical estimation method (Sethi, 2003).

\[
\text{Strength of unknown glucose solution} = 4 \times \text{W} \times \text{V1}/\text{V} \text{ gm. / litter}
\]

Where

\[
\text{W} = \text{Weight of glucose in 250 ml standard solution}
\]

\[
\text{V1} = \text{Volume of standard glucose solution used for 25 ml Fehling’s solution}
\]

\[
\text{V} = \text{Volume of unknown glucose solution used for 25 ml Fehling’s solution}
\]

**RESULTS AND DISCUSSION**

It was observed that the juice content of oranges was greater in percentage while it was lower in case of grapes comparatively (Table I).

<table>
<thead>
<tr>
<th>Samples</th>
<th>Citric acid content (g/ml)</th>
<th>Juice content (%)</th>
<th>TSS Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample A (orange)</td>
<td>2.13±0.026</td>
<td>39.13±0.14</td>
<td>11.47±0.14</td>
</tr>
<tr>
<td>Sample B (sweet lime)</td>
<td>1.6±0.12</td>
<td>32.46±0.17</td>
<td>4.5±0.05</td>
</tr>
<tr>
<td>Sample C (lemon)</td>
<td>3.3±0.08</td>
<td>30.26±0.12</td>
<td>4.5±0.11</td>
</tr>
<tr>
<td>Sample D (grapes)</td>
<td>1.06±0.07</td>
<td>24.13±0.26</td>
<td>16±0.05</td>
</tr>
</tbody>
</table>
So it was evaluated that orange contain higher amount of juice content because of its larger size but it was also found that sugar content and citric acid is not present in same amount.

Orange > sweet lime > lemon > grapes

The TSS present in grapes was higher as 16% (Soyer, 2003) than in oranges (Table 1) which is 11.47% while sweet limes and lemons have values equals to 4.5% (Sandel & Minahs, 2006). From this study it was found that grapes can provide four times more sugar content than sweet limes and lemon, so it may help to control sugar level more rapidly as compare to other three fruits.

Grapes > Orange > lemon = sweet lime.

Titration results showed that lemon contain highest amount of citric acid content which was 3.3g/ml which is in the range of standard value of citric acid content (3.82g/ml) also evaluated by Pennistion et al. (2009). While grapes contain small amount of citric acid content equals to 1.06g/ml. Thetitritable acidity varies from the values in previous works where the value ranges from 3.33-5.55g/ml (Soyer et al., 2003). Orange and sweet lime contains 2.13g/ml and 1.6g/ml of citric acid concentration respectively and these results are in line with Pennistion (2009). Regarding citric acid content in the samples it was concluded that lemon is useful for the protection of kidney stones and it also maintains the pH of urine.

Lemon > orange > sweet lime > grapes

CONCLUSION AND RECOMMENDATION

This study is likely to represent the data on the juice contents, TSS and total acidity in orange, sweet lime, lemon and grapes available in fresh fruit market of Quetta city. Higher concentration of juice content was observed in oranges while in case of grapes it was low comparatively. Citric acid content was found larger in lemon while TSS is in grapes. From all the obtained results, it is revealed that lemon from juice concentrates; provide more citric acid and grapes the more sugar content. It is recommended that these fruits should be used widely to meet the nutritional demand of the local communities as well as exported to generate revenue. Same methods can be repeated with other citrus fruits. Numerous parameters could be checked such as age of fruit, temperature of storage, effect of other gases such as carbon dioxide.

REFERENCES


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