EFFECT OF ORANGE “Citrus sinensis” PEEL FROM ALGERIA IN FOOD

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Abstract. Due to rapid growth of the food processing industry and the consumption of processed foods, the demand for natural antimicrobial agents is on the rise. Consumers have become more aware about the health effects of the synthetic preservatives used in food. Hence natural preservatives are developed to meet the demand of consumers. These natural antimicrobials are developed either from plants or their parts, animals or even microorganisms. Even the waste generated from the food industries is being considered as an alternative to produce natural antimicrobials. The aim of the present study was to utilize the waste generated from the citrus fruit processing (peel) industry. This study was to utilize the powder from the peel of Citrus sinensis in food (Oil of olive and cream dessert) to preserve their quality, this peel can be used as antimicrobial and antioxidant activity so food preservation purpose.

Keyword: Citrus sinensis peel, powder, food, antimicrobial activity, antioxidant activity.

Introduction

The genus Citrus, belonging to the Rutaceae or Rue family [LOUSSERT, 1989] comprises of about 140 genera and 1,300 species.

Citrus sinensis (Orange), Citrus paradisi (Grapefruit), Citrus limon (Lemon), Citrus reticulate (tangerine), Citrus grandis (shaddock), Citrus aurantium (sour orange), Citrus medica (Citron), and Citrus aurantifolia (lime) are some important fruits of genus Citrus.

Citrus are well known as one of the world’s major fruit crops that are produced in many countries with tropical or subtropical climate. Brazil, USA, Japan, China, Mexico, Pakistan, and countries of the Mediterranean region, are the major Citrus producers [CLEMENT, 1981].

Worldwide, Citrus production is estimated to be at levels as high as 105 million metric tons (MMT) per annum, Brazil being the largest producer with contribution of 19.2 MMT followed by the United States.

Pakistan with an annual production ca. 1.76 MMT of Citrus fruits stands among the ten top Citrus producing countries of the world.

Citrus fruits and their by–products are of high economic and medicinal value because of their multiple uses, such as in the food industry, cosmetics and folk medicine [BUTNARIU et al., 2014].

In addition to large scale consumption as fresh fruits, the Citrus fruits are mainly processed to produce juice [BUTNARIU and GIUCHICI, 2011]. The waste of Citrus processing industry left after juice extraction, such as peels, seeds and pulps, corresponding to about 50 % of raw processed fruit, can be used as a potential source of valuable by–products.

Specifically, Citrus peels, commonly treated as agro–industrial waste, are a potential source of valuable secondary plant metabolites and essential oils [BUTNARIU et al., 2012, PUTNOKY et al., 2013].

The orange fruit is composed of an external layer (peel) formed by flavado (epicarp or exocarp) and albedo (mesocarp), and an inner material called endocarp that contains vesicles with juice.

The seeds are usually embedded at centre of the fruit, in direct contact with the juice sacs [BOUHADI, 2000, BAGIU et al., 2012].

These health benefits are as a result of vitamins, especially vitamin C [HOFFMANN, 1971], phytochemical compounds like liminoids, synephrine, hesperidin flavonoid, polyphenols, pectin etc. [BUTNARIU
A single orange is said to have about 170 phytonutrients and over 60 flavonoids [GUIGNARD, 2000].

This study was to utilize the powder from the peel of *Citrus sinensis* in food (Oil of olive and cream dessert) to preserve their quality, this peel can be used as antimicrobial and antioxidant activity so food preservation purpose.

**Material and methods**

The study was conducted in the University of Mustapha Stambouli—Mascara—Algeria.

**Plant materials**

Oranges (*Citrus sinensis*) were purchased from local market in February and March 2016.

**Samples**

Oil of olive and cream dessert

**Preparation of Plant Materials**

The peels were carefully washed under running tap water followed by sterile distilled water.

These were sun dried for seven days, pulverized to a fine powder using a manual grinder.

**Preparation of samples of olive oil**

For our analysis Carry on meeting in bottles of olive oil with doses of different powders, bottles are well closed and put in place non-opaque pendant 48 hours.

**Preparation cream dessert**

The custard is produced thick consistency June presenting OR LESS, made from pasteurized milk, sugar, cocoa, starch and gelling then adding powder orange peel.

**Results and discussion**

The results are presented in tables (Table 1, 2, 3, 4, 5, 6 and 7).

**Table 1. Peroxide Index**

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Samples</th>
<th>Witness</th>
<th>With powder of orange peel</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>15</td>
<td>8,5</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>6,5</td>
<td>08</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>5,5</td>
<td>06</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Saponification Index**

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Samples</th>
<th>Witness</th>
<th>With powder of orange peel</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>182,32</td>
<td>187,23</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>183,02</td>
<td>185,13</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>186,53</td>
<td>185,83</td>
<td></td>
</tr>
</tbody>
</table>

We notice that this index in the control increases with increasing temperature but the added sample Orange peel powder, saponification decreases with the increase of the treatment temperature.

**Table 3. Acid Index**

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Samples</th>
<th>Witness</th>
<th>With powder of orange peel</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>0,44</td>
<td>1,24</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>0,96</td>
<td>1,48</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>2,28</td>
<td>1,72</td>
<td></td>
</tr>
</tbody>
</table>
According to our results, the acid number augments prominently among samples when temperatures rise. This imperative means that olive oil does not remain insensitive to the possible hydrolysis of fats, including glycerides.

**Table 4.**

<table>
<thead>
<tr>
<th>Storage time (days)</th>
<th>Samples</th>
<th>Witness</th>
<th>With powder of orange peel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st day</td>
<td>9</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Day 7</td>
<td>10</td>
<td>04</td>
<td></td>
</tr>
<tr>
<td>Day 15</td>
<td>uncountable</td>
<td>52</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5.**

<table>
<thead>
<tr>
<th>Storage time (days)</th>
<th>Samples</th>
<th>Witness</th>
<th>With powder of orange peel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st day</td>
<td>00</td>
<td>00</td>
<td></td>
</tr>
<tr>
<td>Day 7</td>
<td>21</td>
<td>02</td>
<td></td>
</tr>
<tr>
<td>Day 15</td>
<td>66</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

**Table 6.**

<table>
<thead>
<tr>
<th>Storage time (days)</th>
<th>Samples</th>
<th>Witness</th>
<th>With powder of orange peel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st day</td>
<td>02</td>
<td>00</td>
<td></td>
</tr>
<tr>
<td>Day 7</td>
<td>uncountable</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Day 15</td>
<td>37</td>
<td>00</td>
<td></td>
</tr>
</tbody>
</table>

**Table 7.**

<table>
<thead>
<tr>
<th>Storage time (days)</th>
<th>Samples</th>
<th>Witness</th>
<th>With powder of orange peel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st day</td>
<td>10</td>
<td>00</td>
<td></td>
</tr>
<tr>
<td>Day 7</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Day 15</td>
<td>140</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Absence of pathogens:**

*Staphylococcus aureus*, *Salmonella* and *Clostridium* sulfite reducers.

It appears that the heat treatment was effective and good hygiene Maintenance at the production line [APRIL, 1997]. The antimicrobial potency of plants is believed to be due to tannins [CHEFTEL, 1977], saponins, phenolic compounds, essential oils and flavonoids [DUPAIGNE, 1972, PETRACHE et al., 2014]. These compounds are known to be biologically active and therefore aid the antimicrobial activities of the plants.

These secondary metabolites exert antimicrobial activity through different mechanisms.

Tannin as observed in *Citrus cinnensis* peel extract have been found to form irreversible complexes with proline rich protein resulting in the inhibition of cell protein synthesis.

*Citrus* plants could be regarded as medicinal due to high level of flavonoid content in them [EZEASARA et al., 2013].

A high quality orange is one that is mature with good color intensity uniformly distributed over the surface.

Such oranges must be firm with a fairly smooth texture and shape that is characteristic of the variety, free from decay, defects and other blemishes.

The biological activity and the healthy effects of citrus flavonoids as antioxidants have been reported.

These group of pigments as found in plants and together with anthocyanin play a role in flower and fruit colouration.

Also, they are present in dietary fruits and vegetable, and exercise their antioxidant activity in several ways, including the activities of metal chelation.

Studies indicate that flavonoids are excellent radical–scavengers of the hydroxyl radical, due to their to ability to inhibit the hydroxyl radical and donate hydrogen atom.

**Conclusions**

The citrus peels are rich in nutrients and contain many phytochemicals with strong potential for use in drug production or as food supplements.
Our results are in agreement with these assertions as a range of phytochemicals viz; alkaloids, terpenoids, tannins, flavonoids, saponins, cardiac glycosides, steroids were detected in the orange peels and seeds extracts.

References

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