Phytochemical assessment of five wild edible fruits

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ABSTRACT

Fruits are important ingredients in the human diets. Due to their high nutritive value, they make significant nutritional contribution to human well-being. The perishable fruits are available as seasonal surpluses during certain parts of the year in different regions and are wasted in large quantities due to unawareness, know-how for proper handling, distribution, marketing and storage. To create awareness regarding nutritive and medicinal values from these fruits, present investigation was carried out. The selected wild edible fruits were (Ficus racemosa, Elaeagnus conferta, Antidesma ghasembilla, Grewia tillifolia and Sceichera oleosa) in their mature and ripen stage. Various parameters were carried out like moisture, dry matter, carotenoids, carbohydrate (reducing sugar, starch, soluble sugar) antioxidant enzymes like catalase, peroxidase, superoxide dismutase. All five wild edible fruits were rich in vitamins, proteins and in antioxidant enzymes. The nutritional and phytochemical composition of fruits indicates that, these neglected wild edible fruits can be a valuable source of nutrients under famine conditions and high levels of some vitamins, antioxidants and can be used to prevent diseases.

Keywords: Antioxidants, Phytochemicals, Wild edible fruits.

INTRODUCTION

"Food is the medicine and medicine is the food” said by Hippocrates nearly 2500 years ago (Proper diet is the medicine and there is no medicine like proper diet). Even good medicines will not cure a patient without an appropriate accompanying diet. In fact, Ayurveda says that a well modulated or regulated diet is the best medicine.

Fruit is one of the major dietary sources of various antioxidant phytochemicals for humans. Our daily diet plays a key role in healthy aging and preventing chronic disease including obesity, diabetes, cardiovascular diseases, cancer, and osteoporosis (Heber, 2009). Edible wild fruits play significant role providing nutrient food supplement and
also by generating side income to the poor people. Fruits collected by local people from natural forests are often seen for sell in the market (Malla et al., 1982, Manandhar, 1991) Many valuable fruits which are familiar to certain areas or to certain communities are unknown to others. Therefore research on wild edible fruits has been carried out.

MATERIALS AND METHODS

Selected wild edible fruits were collected from various localities of kohlapur district, viz. FicusRacemosa L., Elaeagnus conferta Roxb., Antidesma ghasembilla Gaertn., Grewia tiliifolia Vahl., Sclericha oleosa Merr. etc. Efforts made to collect these plants in flowering and fruiting conditions for the correct botanical identification. Healthy and disease free fruits selected and some parameters like moisture, dry matter, antioxidant enzymes like catalase, peroxidase and superoxide dismutase were estimated from fresh fruits. Some fruits were dried under shade so as to prevent the decomposition of chemical compounds present in them. All the dried material powdered in blander for further study.

Dry matter, Moisture, Ash- AOAC (1990), catalase – Sadasivam and Manikam, Reducing sugar and Starch- Nelson (1944), Soluble sugar- Day, 1990 Carotenoids- Kirk and Allen, 1965, Polyphenols - Folin and Denis (1915), Peroxidase - Maehly (1954), phytate – Love (1999) and oxalate-(1915), Peroxidase Kirk Nelson (1944), Soluble sugar Sadasivam and Manikam, Crude fibre, Total soluble content, Total sugar, Lipid, refractive index, pH titratable acidity etc. Effort made to collect these plants in flowering and cultivated conditions for the correct botanical identification. Healthy and disease free fruits selected and some parameters like moisture, dry matter, antioxidant enzymes like catalase, peroxidase and superoxide dismutase were estimated from fresh fruits. Some fruits were dried under shade so as to prevent the decomposition of chemical compounds present in them. All the dried material powdered in blander for further study.


RESULTS AND DISCUSSION

I. Proximate analysis: In proximate analysis we have carried out parameters like moisture, dry matter, carotenoid, Carbohydrate i.e. Reducing sugar, starch and total sugar.

Table 1: Phytochemical assessment of five wild edible fruits

<table>
<thead>
<tr>
<th>Name of the plants</th>
<th>Moisture (M)</th>
<th>Dry matter (R)</th>
<th>Carotenoid (M)</th>
<th>Reducing sugar (M)</th>
<th>Starch (M)</th>
<th>Total sugar (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grewia tiliifolia</td>
<td>67 ±0.01</td>
<td>72.66 ±0.25</td>
<td>17.33 ±0.01</td>
<td>5.06 ±0.01</td>
<td>4.6 ±0.09</td>
<td>15.15 ±0.03</td>
</tr>
<tr>
<td>Ficus racemosa</td>
<td>71.66 ±0.01</td>
<td>75.6 ±0.03</td>
<td>24.4 ±0.01</td>
<td>2.5 ±0.01</td>
<td>3.17 ±0.01</td>
<td>9.7 ±0.01</td>
</tr>
<tr>
<td>Elaeagnus conferta</td>
<td>46 ±0.12</td>
<td>77.33 ±0.09</td>
<td>22.6 ±0.03</td>
<td>2.14 ±0.01</td>
<td>4.9 ±0.01</td>
<td>10.63 ±0.02</td>
</tr>
<tr>
<td>Antidesma ghasembilla</td>
<td>60 ±0.02</td>
<td>71.5 ±0.03</td>
<td>29.5 ±0.02</td>
<td>1.4 ±0.01</td>
<td>7.2 ±0.03</td>
<td>11.8 ±0.01</td>
</tr>
<tr>
<td>Sclericha oleosa</td>
<td>52 ±0.0</td>
<td>77.4 ±0.05</td>
<td>22.6 ±0.01</td>
<td>3.1 ±0.01</td>
<td>8.4 ±0.01</td>
<td>11.7 ±0.03</td>
</tr>
</tbody>
</table>

ii. Dry matter:

Dry matter was more in mature fruit of Elaeagnus conferta (51%) and ripened fruits of Ficus racemosa (28.3%). Effiong et al. (2009) carried out the nutritive and energy values of wild fruit in southern Nigerian. The dry matter present in fruits of Xylopia aethiopica was 26.94 ± 0.09%; Tetraplera tetraplera 69.46 ± 0.48%; Piper guineense 16.66 ± 0.74%. The antioxidant capacity and phytochemical properties of wild and cultivated red raspberries (Rubus idaeus L.) were carried out by Cekin and Ozgen (2010). The dry matter of the raspberries accessions were 0.03% (PC1); 0.36% (PC2) and 0.16% (PC3).

iii. Carotenoid:

Carotenoid content from five wild edible fruits showed more amount in mature fruits than ripened fruits. Mature fruits of Elaeagnus conferta (8.4mg/100gFW) and ripened fruits of Schleicher oleosa (3.4mg/100gFW) showed highest carotenoid content.
Table 1: Continued…

<table>
<thead>
<tr>
<th>Name of the plants</th>
<th>Phytic acid</th>
<th>Oxalate</th>
<th>Catalase</th>
<th>Peroxidase</th>
<th>Superoxide dismutase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M R M R M R</td>
<td>M R M R</td>
<td>M R M R</td>
<td>M R M R</td>
<td>M R M R M R M R</td>
</tr>
<tr>
<td>Grewia tiliifolia</td>
<td>0.82 0.62 1.22 1.1</td>
<td>0.0086 0.005</td>
<td>0.0037 0.0046</td>
<td>0.001467 0.0011</td>
<td></td>
</tr>
<tr>
<td></td>
<td>±0.07 ±0.09 ±0.3 ±0.25</td>
<td>±0.005 0.0002</td>
<td>0.0002 0.0002</td>
<td>0.00013 ±0.0001</td>
<td></td>
</tr>
<tr>
<td>Ficus racemosa</td>
<td>0.93 0.7 1.4 1.1</td>
<td>0.02 0.0044</td>
<td>0.003733 0.008533</td>
<td>0.004667 0.002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>±0.05 ±0.2 ±0.15 ±0.15</td>
<td>0.0002 0.0002</td>
<td>0.000153 0.0002</td>
<td>0.0005 ±0</td>
<td></td>
</tr>
<tr>
<td>Elaeagnus conferta</td>
<td>0.51 0.31 1.23 0.93</td>
<td>0.0037 0.000667</td>
<td>0.0025 0.0055</td>
<td>0.003567 0.00262</td>
<td></td>
</tr>
<tr>
<td></td>
<td>±0.09 ±0.02 ±0.10 ±0.11</td>
<td>±0.00015 0.0002</td>
<td>0.0002 0.004</td>
<td>0.00028 ±0 0.327</td>
<td></td>
</tr>
<tr>
<td>Antidesma ghasembilla</td>
<td>0.75 0.67 0.87 0.73</td>
<td>0.0045 0.0003533</td>
<td>0.000467 0.0006333</td>
<td>0.0008 0.0006</td>
<td></td>
</tr>
<tr>
<td></td>
<td>±0.07 ±0.04 ±0.04 ±0.05</td>
<td>0.0002 0.0003</td>
<td>0.000208 0.0003</td>
<td>±0.0001 0.0001</td>
<td></td>
</tr>
<tr>
<td>Schleichera oleosa</td>
<td>0.7 0.46 1.36 1.1</td>
<td>0.0053 0.0045</td>
<td>0.001167 0.001433</td>
<td>0.0012 0.000833</td>
<td></td>
</tr>
<tr>
<td></td>
<td>±0.079 ±0.04 ±0.30 ±0.1</td>
<td>0.0003 0.0056</td>
<td>0.000115 0.00011</td>
<td>±0 ±0.0002 0.0001</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1: Phytochemical assessment of five wild edible fruits
Phytochemical assessment of five wild edible fruits

Gouado et al. (2007) studied carotenoid content of some locally consumed fruits and observed that mango fruits are the richest source of provitamin A carotenoids (2854 ug/100 g FW) followed by red pumpkin (1204 ug/100 g FW) and the lowest in guava (29.84 ug/100 g FW). As we compared these values with present study carotenoid content is lower in present study.

Carbohydrates:

Reducing sugar and total sugar is higher in ripened fruits and starch content is higher in mature fruits. From five edible fruits, reducing sugar (10.07) and total sugar (29.43g/100gDW) is higher in Ficus racemosa fruits. Starch content is higher in mature fruits of Antidesma ghasembilla (17.7g/100gDW).

The increase in reducing sugars in the pulp and peel of Guava fruits up to the climacteric peak and subsequently decreases have been reported by Hind et al. (2003). Subramanyam and Acharya (1957) also found that reducing sugars increased during guava fruit ripening and then decreased. Similar results were also reported in mango fruits (Abu-Goukh and Abu-Sarra, 1993 and Subramanyam et al., 1976). The starch content in Artocarpus heterophyllus was approximately 330 g/kg DW (Rahman et al. 1995) and Cordia dichotoma have 5.86 g/100g DW (Aberoumand, 2009). The amount of total soluble sugars changes with fruit maturity showing amaximum score at ripening (Cho et al.,1993). Sugar content varies with plant nutrition, climate, soil and storage conditions (Whiting, 1970).

Enzymatic Antioxidants:

Enzymatic activities of catalase (CAT) and superoxide dismutase (SOD) were higher in mature fruits while peroxidase higher in ripened fruits. Ficus racemosa mature fruits showed higher catalase (0.0247 ΔOD /min/mg protein) and SOD (0.0046ΔOD,min/mg protein) while ripened fruits showed higher POX activity (0.0085 ΔOD /min/mg protein).

Huang, et al., (2007) studied the activity of enzyme catalase in orange pulp during fruit ripening and maturation of three cultivars ('Red Flesh' navel orange, 'Newhall' navel orange and 'Sanguine' orange,) and noticed the progressive decrease in catalase activity with ripening and the most substantial decrease in catalase occurred between young fruit stage and green fruit stage. Niranjana, et al. (2009) studied the effect of pre cooling and heat treatment on antioxidant enzymes profile of Mango and Banana. The highest activity of SOD in mango (T5) was 119.4 units / min/g FW. and least in (T4) was 86 units /min/g FW. Incase of banana (T6) highest SOD activity was (2.84 units / min/g FW) and least in T4 (0.4 units / min/g FW). In present study, all enzymatic antioxidants were lower than studied by these authors.

Antinutritional factors:

Although the wild fruits are delicious and nutritious, more consumption of such fruits are hazards to our body, so before eating it must be checked weather it contain proper amount of antinutritional factors. The antinutritional factors such as phytic acid and oxalic acid, have adverse effect on health through inhibition of protein digestion, growth, iron and zinc absorption (Liener et al 1980, Larsson et al 1996.). Therefore we analyzed following two antinutritional factors.

Phytic acid: Among five fruits, Ficus racemosa showed higher phytate content (0.7±0.2%) while Elaeagnus conferta (0.31±0.03%) showed less.
Aberoumand and Deokule (2009) carried out the nutritional values of some wild edible plants from Iran and India. The Cordia myxa Roxb is one of them. They analysed nutrients such as carbohydrates (free sugars and starch), oil, proteins, minerals, ascorbic acid and antioxidant phenols and phytic acid. They obtained 2.5 mg/100g phytic acid in this fruit.

Oxalate: Oxalate content is higher in mature fruit of Schleicheria oleosa (1.49±0.03%) and lower in ripened fruits of Ficus racemosa (1.13±0.02%).

The seeds of the fruits of some wild plants, Cassipourea congoensis (Tunti), Nuclea latifolia (Luzii), Deterium microcarpum (Tallow), Balanites aegyptiaca (Betu), and Gemlin arborea (Melina) were analysed to establish their proximate compositions and the physico chemical characteristics of the oils by Nkafamiya et al. (2007). The oxalate content in these seeds were 10.21 ± 1.11% in Cassipourea congoensis; 9.5 ± 0.16% in Deterium microcarpum; 10.15 ± 0.13 Nuclea latifolia; 10.01 ± 0.12% in Balanites aegyptiaca, 9.16 ± 0.13% in Gemlinia arborea.

CONCLUSION:

All Five wild edible plants are rich in carbohydrates and in antioxidant enzymes. Out of them, Ficus racemosa were rich in antioxidant enzymes; Grewia tilifolia, Elaeagnus conferta, Ficus racemosa and Schleicheria oleosa are rich in all non enzymatic antioxidants. The nutritional and phytochemical composition of five wild edible fruits indicates that, these neglected fruits can be a valuable source of phytochemical and nutrients under famine conditions and can be used to prevent diseases.

REFERENCES


