Analysis of nutritional components of *Taraxacum mongolicum* and its antibacterial activity

**Demin GAO**

**INTRODUCTION**

*Taraxacum mongolicum* Hand-Mazz. is a herbaceous perennial plant of the family Asteraceae, which is widely distributed in Asia and Europe. As a traditional Chinese medicine, it has been widely used in clinic for treating abscesses, reducing eye inflammation, viral infectious diseases and provoking diuresis.[1–5] Furthermore, *T. mongolicum*, especially its leaves and flowers, has been used as edible vegetables by local people in Northern China. Moreover, nutritional components of *T. mongolicum* are slightly different in different areas. At present, it is mainly obtained from the market as a cultivated vegetable, which replaced a wild dandelion. However, the main nutritional components in China and its antibacterial activity have not yet been reported. Thus, in this study, we measured the nutritional components and evaluated its antibacterial activity.

**MATERIALS AND METHODS**

*Plant materials*

The plants of *Taraxacum mongolicum* Hand. –Mazz. were obtained from the suburb of Jinan, China, in April 2010. The biological identification of the plant

**ABSTRACT:** *Taraxacum mongolicum* Hand-Mazz. has been used as a Chinese traditional medicine for a long history. In this study, its nutritional components were analyzed, including main nutritional components and micronutrients. At the same time, antibacterial test was evaluated. The results showed that nutritional components and mineral elements were very rich. Among of which, moisture, carbohydrate and protein are the major part of nutrients and the content of calcium, potassium, magnesium and phosphorus accounted for over 6.0% of the total minerals. The activity test indicated that only ethanol extracts of *T. mongolicum* exhibited antibacterial activity against some bacteria, such as *Staphylococcus aureus* and its isolated strain from air, *Escherichia coli* and *Pseudomonas aeruginosa*. The results support the clinical use of the plant in the treatment of inflammation in north China.

**Keywords:** *Taraxacum mongolicum*, nutritional components, antibacterial activity.

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was done by author, where the voucher specimen is conserved in the herbarium of Shandong University of TCM, China.

**Nutritional components**

The crude proteins were determined using Kjeldahl technique.[6] Determination of vitamin and physiochemical parameters like moisture, total ash, total fat and fiber contents were performed using the method reported by the Association of Official Analytical Chemists.[7] The mineral elements such as phosphorus (P), potassium (K), calcium (Ca), sodium (Na), magnesium (Mg), iron (Fe), zinc (Zn), copper (Cu) and manganese (Mn) were determined with atomic absorption spectrometry.

**Preparation of the aqueous and ethanol extraction**

The plants of *T. mongolicum* were air-dried, powdered, and macerated in water for 2h. The aqueous solution was boiled twice, each 1.5 h and then concentrated to final concentration of 1g/ml. In the same, the powder (5.0 kg) was macerated in ethanol (70%, v/v) and mixed well, in water bath for 3 h at 50°C. The solvent was filtered and concentrated to final concentration of 1g/ml.

**Antibacterial assay**

Selected test microorganisms were *Escherichia coli*, *Staphylococcus aureus* and its isolated strain from air, *Shigella flexneri*, *Proteus vulgaris* and *Pseudomonas aeruginosa*. Antibacterial tests were carried out by the disc diffusion method.[8] Sterile paper discs (6 mm in diameter) prepared from Whatman were impregnated with aqueous and ethanol solution placed on the inoculated agar. Negative control and positive control was prepared with ethanol and erythromycin respectively. The inoculated plates were incubated at appropriate temperature for 24 h. The antibacterial activity was evaluated by measuring the zone of inhibition against the test organisms. Each assay in this experiment was repeated twice.

**MIC assay**

The minimum inhibitory concentration was studied for the microorganisms that were determined as sensitive in the disc diffusion method. The aqueous extract and ethanol extract were first diluted to 500 μg/ml, and then serial two-fold dilutions were made with nutrient broth in the concentration rang from 10 to 500 μg/ml. The last tube containing 5 ml of nutrient broth without extract and 1 ml of the inocula was used as a negative control.

**RESULTS**

**Nutritional components**

The content of main nutritional components in the *Taraxacum mongolicum* were shown in Table 1, which indicated that moisture, carbohydrate and protein are the major part of nutrients in the dandelion and its high protein (4.15 ± 0.672%) showed its better nutritional value in the leaf vegetables.

**TABLE 1:** The content of main nutritional components in *Taraxacum mongolicum* (g/100 g).

<table>
<thead>
<tr>
<th>NUTRITIONAL COMPONENTS</th>
<th>CONCENTRATION</th>
<th>NUTRITIONAL COMPONENTS</th>
<th>CONCENTRATION</th>
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<tbody>
<tr>
<td>Protein</td>
<td>4.15 ± 0.672</td>
<td>Fat</td>
<td>1.08 ± 0.073</td>
</tr>
<tr>
<td>Moisture</td>
<td>84.02 ± 6.965</td>
<td>Crude fibre</td>
<td>2.01 ± 0.367</td>
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<tr>
<td>Carbohydrate</td>
<td>5.03 ± 0.834</td>
<td>Crude ash</td>
<td>3.22 ± 0.483</td>
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</tbody>
</table>

**TABLE 2:** The content of main micronutrients in *Taraxacum mongolicum* (mg/g).

<table>
<thead>
<tr>
<th>MICRONUTRIENT</th>
<th>CONCENTRATION</th>
<th>MICRONUTRIENT</th>
<th>CONCENTRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>3.87 ± 0.517</td>
<td>Zn</td>
<td>0.04 ± 0.006</td>
</tr>
<tr>
<td>K</td>
<td>40.03 ± 3.859</td>
<td>Cu</td>
<td>0.01 ± 0.006</td>
</tr>
<tr>
<td>Ca</td>
<td>12.15 ± 7.611</td>
<td>Mn</td>
<td>0.04 ± 0.008</td>
</tr>
<tr>
<td>Na</td>
<td>0.29 ± 0.017</td>
<td>V&lt;sub&gt;B1&lt;/sub&gt;</td>
<td>0.03 ± 0.005</td>
</tr>
<tr>
<td>Mg</td>
<td>4.24 ± 0.521</td>
<td>V&lt;sub&gt;B2&lt;/sub&gt;</td>
<td>0.38 ± 0.006</td>
</tr>
<tr>
<td>Fe</td>
<td>0.23 ± 0.076</td>
<td>V&lt;sub&gt;C&lt;/sub&gt;</td>
<td>0.05 ± 0.004</td>
</tr>
</tbody>
</table>

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Mineral and vitamin

Taraxacum mongolicum contains minerals like Ca, Mg, K and Na, etc (Table 2). All of micronutrients, the content of calcium, potassium, magnesium and phosphorus accounted for over 6.0% of the total minerals, especially its calcium and potassium, which was considered one of the most abundant mineral elements in the vegetables. The experiment also displayed that dandelion is naturally rich in vitamins and V₉ is the highest content.

Antibacterial activity

The antibacterial activity of aqueous and ethanol extract of Taraxacum mongolicum against six bacterial species was summarized in Table 3. The zone of inhibition above 7 mm in diameter was taken as positive result. The results revealed that only ethanol extract showed antibacterial activity with varying magnitudes only in four strains, while aqueous extract did not. The MIC were 50 μg/ml for Staphylococcus aureus, Staphylococcus aureus (isolated) and Escherichia coli and 100 μg/ml for Pseudomonas aeruginosa.

DISCUSSION

T. mongolicum has a long history for green leafy vegetable for more than 1000 years. Our study indicated that the minerals, especially the calcium, potassium, phosphorus and magnesium are very rich. Of all the minerals, potassium and calcium (5.218%) were carefully matched with regular vegetables, such as legumes, potato and spinach etc. This means that, by dry weight, up to 5% of dandelion is potassium and calcium. So T. mongolicum is called as an ideal source of potassium and calcium. This may suggest that many Chinese people go to the fields or suburbs for dandelion in spring.

It was reported that ethanol extracts of the dried aerial parts of T. mongolicum have been shown to have anti-inflammatory and anticancer effects, which was agreed with the antibacterial effects in this experiment. It was further inferred that phenylpropanoids and sesquiterpene lactones in dandelion might be key to this activity. As the above compounds are insoluble in water, so no antibacterial activity of aqueous extract was shown.

In summary, our study showed that T. mongolicum has a higher nutritional value, better antimicrobial effects and edible plant.

REFERENCES

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