Short Communications

Biochemical Characterization of Defatted Meal of Different Accessions of Simmondsia chinensis (Link) C. K. Schneid. (Jojoba)

Swati Agarwal, Khushboo Chaudhary, Suphiya Khan*

Department of Bioscience and Biotechnology, Banasthali University, P.O. Banasthali Vidyapith, Rajasthan, 304022, India

*Corresponding Author: E-mail: suphiyakhan@gmail.com; Tel: +91 1438 228302; Fax: +91 1438 228365

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Abstract. Jojoba (Simmondsia chinensis, family Simmondsiaceae) seeds of six different accessions were used for extraction of oil and defatted meal. Seed samples were analyzed for oil, protein, carbohydrate, total free amino acids and polyphenolic contents. Significant differences among the accessions were found for oil, protein and carbohydrate contents. The highest oil content (51.53%) was obtained in Accession 82-18 and the lowest oil content (49.24%) in accession CMSCRI. Protein content of defatted seed meal ranged from 27.25% (MS) to 30.56% (47) and the lowest carbohydrate content (51.53%) was obtained in Accession 82-18 and the lowest carbohydrate content (51.53%) was obtained in Accession 82-18 and the lowest carbohydrate content (51.53%) was obtained in Accession 82-18 and the lowest carbohydrate content (51.53%) was obtained in Accession 82-18 and the lowest carbohydrate content (51.53%) was obtained in Accession 82-18 and the lowest carbohydrate content (51.53%) was obtained in Accession 82-18 and the lowest carbohydrate content (51.53%) was obtained in Accession 82-18. Chemoprofiling studies showed 47-21 accession will be used for commercial applications.

Keywords: Jojoba, polyphenolic contents, Simmondsia chinensis and soxhlet apparatus.

1. INTRODUCTION

Jojoba (Simmondsia chinensis (Link) Schneider) is an oil yielding desert shrub (family Simmondsiaceae) of arid and semi-arid areas (Kumar et al., 2009) and is promoted by central and state governments for plantation for its renewable source of high quality oil. Over 300 products containing jojoba have already appeared in markets which will further expand in future (Ince et al., 2010). International demand for jojoba oil is increasing continuously. Jojoba oil is a potential source of biodiesel also (Bouaid et al., 2007). The seeds storing about 50% of a light yellow, odorless liquid wax ester commonly referred to as jojoba oil. Commercially jojoba is grown for its oil which having lubricating properties. Besides being known for its lubrication, jojoba has attracted interest towards, cosmetics, pharmaceuticals, animal feeding, and landscape as soil conservation (Shani, 1995). Jojoba seeds have also been used in cleaning of aquatic system mainly for the removal of access ferric ions (Al-Anber et al., 2014).

Jojoba oil mainly composed of straight chain monoesters in the C20–C42 range. This oil can be used for different commercial purposes like lubrication, cosmetics and pharmaceuticals (Cappillino et al., 2003). After oil extraction its defatted meal, represent a potential supplement for animal feeds. Once defatted, the major constituents of it are proteins (31%) and carbohydrates (55%) (Kolodziejczyk et al., 2000).

Jojoba industry faces the challenge of finding ways to improve productivity and quality of the products. There are number of different jojoba accessions which are grown in jojoba farms. This is mandatory to comparably evaluate them for its commercially important chemical properties. These properties include seed oil, protein, total carbohydrate polyphenols and total free amino acid contents. The objectives of the present study is to screen the best accession having high oil yield content as well as good amount of biochemical constituents of its defatted meal.

2. MATERIALS AND METHODS

Six different accessions of Jojoba seeds were obtained from Association of Rajasthan Jojoba Plantation and Research Project (AJORP) Jaipur, (Rajasthan) India. Seeds were cleaned properly and dried in oven at 60°C for 1 hr. Seeds were ground in grinder and then placed in Soxhlet apparatus for 24 hr for oil extraction with petroleum ether (1:6 w/v). After oil extraction the resulting defatted product is called “defatted jojoba meal”. Extracted oil was air dried at room temperature for 24-48 hr for solvent removal. After solvent removal oil quantity was measured by using measuring cylinder.
2.1. Protein and Carbohydrate Fractions

The isolation of protein and carbohydrate fractions according to solubility was carried out by suspending defatted flour in 70% isopropanol (1:30, w/v) at 20°C with agitation during 24 hr. Protein and carbohydrate content in suspension were determined by Lowry’s method (Lowry et al., 1951) and Anthrone method (Trevelyan et al., 1952), respectively.

Table 1: Oil percentage and biochemical composition of six different accessions of Jojoba (Simmondsia chinensis)

<table>
<thead>
<tr>
<th>Accessions</th>
<th>Jojoba Oil (in %)</th>
<th>Crude Protein (in %)</th>
<th>Carbohydrate (in %)</th>
<th>Polyphenol (in %)</th>
<th>Total free amino acid (in µg/gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>47-21</td>
<td>51.41</td>
<td>30.56±3.55</td>
<td>56.43±2.52</td>
<td>0.158±0.02</td>
<td>0.013±3.36</td>
</tr>
<tr>
<td>40</td>
<td>49.37</td>
<td>28.97±3.87</td>
<td>49.80±2.64</td>
<td>0.189±0.02</td>
<td>0.011±3.15</td>
</tr>
<tr>
<td>CMSCRI</td>
<td>49.24</td>
<td>27.69±5.83</td>
<td>51.40±2.93</td>
<td>0.191±0.01</td>
<td>0.013±6.21</td>
</tr>
<tr>
<td>48-25</td>
<td>49.50</td>
<td>28.55±4.44</td>
<td>54.10±2.64</td>
<td>0.179±0.01</td>
<td>0.014±7.51</td>
</tr>
<tr>
<td>MS</td>
<td>51.43</td>
<td>27.25±3.20</td>
<td>56.53±2.52</td>
<td>0.177±0.01</td>
<td>0.009±8.09</td>
</tr>
<tr>
<td>82-18</td>
<td>48.53</td>
<td>30.41±3.42</td>
<td>54.10±2.54</td>
<td>0.196±0.02</td>
<td>0.010±5.24</td>
</tr>
</tbody>
</table>

2.2. Polyphenolic compound analysis

Polyphenols were quantified (Price and Butler, 1977) by using 20 mg samples in 3 ml of methanol and 1 ml of each 0.1 M ferric chloride in 0.1 N HCL and 0.008 M potassium ferricyanate. After 10 min of incubation absorbance at 720 nm was read using double beam spectrophotometer. Standard curve were prepared using 10-1000 µg of gallotannic acid.

2.3. Total free amino acid content

Total free amino acid will be determined by using ninhydrin as a powerful oxidizing agent (Moore and James, 1968).

2.4. Statistical analysis

The experimental values calculate by Standard deviation (SD) and mean to examine difference between each treatment, significance difference at \( P \leq 0.05 \).

3. RESULTS AND DISCUSSIONS

Jojoba is mainly considered a bi-purpose material one is for its oil purpose and second as face scrub in cosmetic industry. Seeds of six accessions (47-21, 40, CMSCRI, 48-25, MS and 82-18) were subjected to chemoprofiling studies. All biochemical parameters (Oil, protein, carbohydrate, polyphenol and total free amino acid contents) showed significant variation.
among different accessions (Table 1). Oil content ranged from 49.24 to 51.53% Accession 82-18 had the highest seed oil content, while CMSCRI had the lowest one. In this study the oil percentage is similar to the previous studies (Soqeer et al., 2012). Protein content of defatted jojoba seed meal varied from 27.25% to 30.56%. Accession 47-21 showed highest protein content while MS had the lowest concentration of protein in their seed meal. Remaining three accessions showed almost equal concentration of protein. Accession MS showed highest (56.53%) while 40 showed the lowest (49.8%) carbohydrate concentration.

Our results corroborated previous suggestions (Medina and Trejo-Gonzalez, 1990) that in case of carbohydrate concentration all the six accessions showed significant difference among them.

Total free amino acid concentration ranged from 0.009 to 0.014 µg/gm. 47-21 and CMSCRI showed equal concentration of total free amino acid. Accession 48-25 showed highest (0.014 µg/gm) and MS showed lowest (0.009 µg/gm) concentration. Medina and Trejo-Gonzalez (1990) reported same as polyphenol content varied from highest (0.196%) for 82-18 and lowest (0.158%) for 47-21.

Based on results and other related studies (Purcell et al., 2000; Soqeer et al., 2012) oil yield and protein concentration appear to be the two major criteria for selecting jojoba clones. High oil yielding plants with higher protein concentration appeal to jojoba plant selectors because higher protein content seeds are commercially more valuable as an animal feed. According to biochemical parameter values presented in (Table 1 and Fig. 1) accession MS showed highest oil yield, but accession 47-21 having appropriate range of all biochemical contents and oil yield. Accession 47-21 offer good production prospects and may be recommended for commercial production.

4. CONCLUSION

Chemoprofiling studies showed great diversity in their contents of oil, protein, and other biochemical constituents in different jojoba accessions. Moreover, the results clearly demonstrate that biochemical parameters present a good selection criterion for selection of the best jojoba accession, Accession 47-21 offer good production prospects and may be used as a raw material in jojoba industry.

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Dr. Suphiya Khan, working as Associate Professor in the Department of Bioscience and Biotechnology, Banasthali University, Rajasthan, India. She has 12 years of teaching and research experience in DNA Fingerprinting and Plant Biotechnology. She is currently supervising ten Ph. D. students in different aspects of Plant Biotechnology. She has several research publications in prestigious International and National Journals. She handled projects from different grant agencies viz. U.G.C., M.H.R.D. etc.

Ms. Swati Agarwal has done her graduation with Gold Medal in Biotechnology from Allahabad Agriculture University, Allahabad, India and Post-graduation in Biotechnology from Banasthali Vidyapith, Rajasthan, India. She is presently working as a Junior Research Fellow (J.R.F.) and Research Scholar in the Department of Bioscience and Biotechnology and specialized in the area of Plant Biotechnology.

Ms. Khushboo chaudhary has done her M.Sc. Degree in Biotechnology from Dr. Bhim Rao Ambedkar University, Agra, India. She has also teaching experience and has over good publications. She is presently working as a research scholar in the Department of Bioscience and Biotechnology and specializes in the area of plant stress biotechnology with some minor molecular and microbiology application.