Arctium lappa L.: Chemical composition, antioxidants, phytochemical compounds and use for healing activity

DOI: 10.46932/sfjdv2n2-073

Received in: March 1st, 2021
Accepted in: May 30th, 2021

Fernando Luquis
Bachelor, Scientific Initiation, Pharmacy, Uninove.
Full address: 815 Main Lane, apto 4219, Orlando, Florida, Zip Code: 32801
E-mail: fernandoluquis@gmail.com

Andréia Aparecida Oliveira Silva
Professor Biomedical Sciences, Healthy Directory, Uninove.
Full address: Rua Antonio Gomes, 135, apto 92, torre BE, Vila Santo Antonio, Guarulhos, SP, Brasil.
Zip Code: 07093-090
E-mail: aulasandreia@gmail.com

Nilsa Sumie Yamashita Wadt
Professor Pharmacy, UNIP.
Full address: Av. Marquês de São Vicente, 3001 - Água Branca, São Paulo, SP, Brazil, Zip Code 05037-040
E-mail: nilwadt@gmail.com

Edgar Matias Bach Hi
Professor Experimental Biochemistry Academic Nucleum (NABEX), UNILUS.
Full address: Rua Batista Pereira, 265 - Macuco, Santos, SP, Brazil, Zip Code 11015-101
E-mail: edgarbach@gmail.com

Ana Maria Cristina CRPF Martins
Scientific Research Instituto Biológico
Full address: Av. Conselheiro Rodrigues Alves, 1252, São Paulo, SP, Brazil, Zip Code 04014-002
Email: crisfm@biologico.sp.gov.br

Erna Elisabeth Bach
Scientific Research -Retired Instituto Biológico
Full address: Av. Conselheiro Rodrigues Alves, 1252, São Paulo, SP, Brazil, Zip Code 04014-002
E-mail: ernabach@gmail.com

ABSTRACT
Arctium lappa L., popularly known as burdock, is a medicinal plant with wide application in Chinese folk medicine. The objective of the present work was to proceed hydroethanolic extraction of the leaves, to analyze the chemical compounds as proteins, phenols, antioxidants, phytochemical and its skin healing potential in exposed cutaneous lesions in rats treated with gel containing the extract. For preparation the extract, fresh leaves of the burdock plant were obtained from Sítio Wadt located in Valinhos, SP and dried. 50g of dry leaves was subjected to percolation. Extract was tested to quantify proteins, phenols, and antioxidant capability. For skin healing of wound in rats, it was used male Wistar rats, divided in three groups (treated, control and fibrinase). Was performed daily application over the wound and healing evaluated macroscopically and measured by digital planimetry. Results demonstrated that hydroethanolic
extract of leaves presented proteins, phenols, phenolic compounds and antioxidants. In animals, fibrinase was not as efficient as burdock extract and when compared to control group. It is possible to conclude that the gel with burdock extract is effective at skin healing in rats, being used as a phytoterapic, besides possessing antioxidant activity.

**Key words:** Burdock, skin healing, hydroethanolic extract

1 INTRODUCTION

*Arctium lappa* L. (Asteraceae), popularly known as “burdock” or “bardana” is considered a medicinal plant, brought from Asia and acclimated worldwide, including Brazil (CARLOTTO et al., 2015; CUNHA et al., 2003).

Greater burdock is a biennial plant, rather tall, reaching as much as 1 to 2 m. It has large, alternating, cordiform leaves that have a long *petiole* and are *pubescent* on the underside. The flowers are purple and grouped in globular *capitula*, united in clusters (CORRÊA, 1984; SILVA JUNIOR, 2001).

According to BOJOR (2003) and CHEVALIER (1996), this plant is important for liver treatment, which is widely used by the Chinese, and is also used internally (liver diseases, diuretic or hyperglycemic) or externally (to treat eczema and skin infections).

LIN et al. (1996, 2000, 2002) described that all therapeutic applications differ from the extracted parts, which may be roots, leaves, seeds and fruits. The roots and seeds are indicated as diuretics and blood cleansing (JAINSVAL & KUHNERT, 2011; LIU & LIN, 2012; LIU et al. 2005, 2010) while the leaves are indicated for the treatment of burns and ulcers (LOU et al, 2010).

Roots from *A. lappa* are popular in the Asian cuisine being widely consumed but leaves are rich in phenolic compounds (terpenoids) and used in infusion and also can be used for skin infections (JEELANI & KHUROO, 2012). Few reports exist in relation to the aqueous leaf extract where only CARLOTTO et al. (2015) described that in the leaves was found a compound like caffeyle-quinic acid responsible for gastric protector.

The objective of the present work was to proceed hydroethanolic extraction of the leaves of burdock, to analyze the chemical compounds present as proteins, phenols, antioxidants, phytochemical and evaluate its skin healing potential in exposed cutaneous lesions in rats treated with gel containing the extract.
2 MATERIAL AND METHODS

Leaves from burdock plants were collected from Sítio Wadt, in Valinhos, SP, and transported to the Uninove laboratory in Styrofoam boxes for drying, grinding and extraction. 50 g of leaf powder were extracted using 70% of ethanol in one week by percolation. The gel was prepared adding 10% of extract. Tests were run for quantification of proteins (LOWRY et al., 1951), phenols (SWAIN & HILLIS, 1959), flavonoids (WOISKY & SALATINO, 1998), antioxidants (RUFINO et al, 2007) and evaluated by HPLC as polyphenols.

Phenolic compounds were separated in the HPLC equipment (Young Lin YL 9300) equipped with a quaternary pump, UV-vis detector and column oven (YL9330). The column used was Kinetex C18 (4.6mm × 250mm i.d., 5μm) and the wavelength was 254nm. Elution was carried out at 1.0mL / min at 35°C. Phase A consists of methanol and phase B was 0.1% acetic acid in water. The injected volume was 20μL. The compounds used as standard were purchased from Sigma (coumaric, ferulic, caffeic, rutin, quercetin, canferol acids) and dissolved in an HPLC grade solvent (methanol). For identification, the retention time and peak areas correlated with concentration were used by the Clarity software.

Male 4-week-old Wistar rats weighing between 200-250g were obtained from UNINOVE (Ethics Committee AN 37/2014). The animals were kept in polypropylene cages (three animals per cage) covered with metallic grids in a room maintained at 23°C, 55±10% humidity, 12h light and 12h dark cycles and fed ad libitum for two weeks before the start of the study.

The rats were then randomly divided into three different groups (N=5). Animals in group 1 were treated with 1mL of gel containing burdock 10% hydroethanolic extract; group 2 with 1mL of gel-10% ethanol (equivalent to 70%) and group 3 with fibrinase. Daily application was performed over the wound, 4cm² of total area in dorsal region of each animal. The wound evaluation was made macroscopically in time of 0, 3, 5, 7, 14 and 21 days, and skin healing retraction measures evaluated by digital planimetry.

Statistical analysis was performed using Assistat-2012 program (Anova, T student- test).

3 RESULTS

The hydroethanolic extract of burdock leaves showed 2.23mg of protein and 1.04mg of phenol but in gel have 0.223mg of protein and 0.104g of phenol. The antioxidant activity was 1366μmol trolox correspondent in gel to 136.6μmol trolox (Table 1).
Table 1: Quantity of protein, phenol, antioxidant and flavonoids present in gel with 10% of hidroethanolic extract from leaves of burdock.

<table>
<thead>
<tr>
<th>Extract</th>
<th>mg protein</th>
<th>mg phenol</th>
<th>IC50 uM trolox</th>
<th>mg of quercetin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burdock hidroethanolic</td>
<td>0.223</td>
<td>0.104</td>
<td>136.6</td>
<td>0.771</td>
</tr>
</tbody>
</table>

Protein= mg soro albumin bovin; phenol= mg of clorogenic acid

The extract when analysed by HPLC observed unknown bands and presence of chlorogenic acid, cafeic acid and p-coumaric acid (Table 2).

Table 2: HPLC results (254nm) from burdock hydroethanolic extract compared with phenolics standart by retention time and concentration.

<table>
<thead>
<tr>
<th>Extract</th>
<th>Retention time (min)</th>
<th>Concentration (ug)</th>
<th>Standard Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burdock hidroethanolic</td>
<td>4.3</td>
<td>x</td>
<td>unknown</td>
</tr>
<tr>
<td></td>
<td>4.35</td>
<td>x</td>
<td>unknown</td>
</tr>
<tr>
<td></td>
<td>4.99</td>
<td>x</td>
<td>unknown</td>
</tr>
<tr>
<td></td>
<td>5.66</td>
<td>150.00</td>
<td>Chlorogenic acid</td>
</tr>
<tr>
<td></td>
<td>5.9</td>
<td>1500.00</td>
<td>Cafeic acid</td>
</tr>
<tr>
<td></td>
<td>6.6</td>
<td>13.14</td>
<td>P-coumaric acid</td>
</tr>
<tr>
<td></td>
<td>7.08</td>
<td>x</td>
<td>unknown</td>
</tr>
</tbody>
</table>

In animals after 21 days in the group treated with gel+extract was observed the wound healed about 96.4% compared to control group, while with fibrinase corresponded to 59.5% compared to control group (Figure 1). Fibrinase is the positive control, that is, it has proven healing action, but when compared to gel + extract from bardana leaves the healing was 36.9% more effective with the gel.
Rats submitted to burdock gel, in addition to healing, presented a microbiological decrease in the injured area during the healing process, they did not obtain allergic reactions and the wound remained clean during healing until the end of the 21-day study.

Figure 1: Graphic involved time of wound healing of rats treated with burdock hydroethanolic extract-gel, gel-ethanol and fibrinase. Points were media from N=5 rats. Percentage of healing wound included on same graphic.

4 DISCUSSION

Arctium lappa, popularly known as burdock or bardana, is a medicinal plant with wide application in folk medicine. According to LOU et al. (2010), the leaves are rich in phenolic compounds and there are few reports on the use of leaves, but rather, studies related to the roots and seeds. Phenolic compounds bring many benefits to human health associated with an antioxidant effect (SUN et al., 2011; SILVA et al., 2013), antitumor (TAMAYO et al., 2000), anti-HIV (SLANINA et al., 2001), gastric antiulcer (SANTOS et al., 2009; SILVA et al., 2013), antimicrobial and antifungal (CHAN et al 2011).

For the evaluation of chemical compounds present in the hydroethanolic extract of bardana leaves, the presence of protein, phenol and antioxidant metabolic was observed. In addition to these, it was verified on HPLC, presence of unknown compounds, chlorogenic acid, caffeic acid and para-coumaric acid. The results are in line with D’ARCHIVIO et al. (2007) who cited the presence of flavonoids, phenolic acids and lignans. In the case of chlorogenic acid, in hydroethanolic extract, it was also described by LIN et al (2008). A study by FERRACANE et al. (2009) demonstrated the existence of chlorogenic acid and caffeic acid in the roots, seeds and leaves of burdock with hydroethanolic extract.

The polyphenols can assist in the healing because they can form a thin layer of protein complex and polyphenols and protect against external agents that may damage the tissue.
5 CONCLUSION
It is possible to conclude that the gel with burdock hidroethanolic extract is effective in rats skin healing.

ACKNOWLEDGEMENTS
Financially Supported by CNPq (Process number: 474681/2013) for reagents and HPLC. And for UNINOVE for use the laboratory.
REFERENCES


