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Artigo científico

Quality control, development and validation of HPLC analytical methodology for harpagoside content on dry extracts of *Harpagophytum procumbens* Burch DC

Controle de qualidade, desenvolvimento e validação de metodologia analítica por CLAE para doseamento de harpagosídeo em extratos secos de *Harpagophytum procumbens* Burch DC

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Abstract: *Harpagophytum procumbens* is found in Namibia, Botswana and Kalahari. It belongs to the Pedaliaceae family and is known as Devil's Claw. Its roots contain harpagoside and harpagid iridoids, triterpenes and flavonoids and are used as anti-inflammatory and analgesic. The objective was to evaluate the physicochemical and microbiological quality, to develop HPLC and TLC methodology of the dry extract of the plant. Two samples of the dry extract of *H. procumbens* from different suppliers were used, sample 15-18% (A) and 15% (B) of Harpagoside. Determination of aspect, loss by drying, heavy metals, apparent density, total ash and microbiological analyses were performed according to official compendia. The identification was performed by CCDA with mobile phase composed of ethyl acetate:methanol:water (77:15:8), revealed with sulfuric vanillin. The assay was performed by HPLC. The physicochemical analyses highlighted the appearance of yellowish to brown powder, loss by drying of 2.6-4.17%, apparent density of 0.347-0.635 g/mL and total ash of 1.05-3.79%. Growth within the limits, absence of pathogens and coliforms were observed. The samples under analysis presented violet band with the same retention factor (0.65), referring to harpagoside. The method was specific, precise, accurate (RSD <5%), linear (r=>0.9939) and robust, being suitable for the marker. The assay provided 15.94 ± 0.49 % (A) and 15.27 ± 1.34 % (B). The samples analyzed were in accordance with the specifications of each test performed. It was possible to affirm that the extracts of *Harpagophytum procumbens* used in the trials and marketed in Brazil presented results that prove their quality, safety and efficacy.

Keywords: Devil's claw. Herbal. Liquid chromatography.

Resumo: O *Harpagophytum procumbens* é encontrado na Namíbia, Botswana e Kalahari. Pertence à família Pedaliaceae e é conhecida como Garra do Diabo. Suas raízes contém iridóides harpagosídeo e harpagídeo, triterpenos e flavonoides e são utilizadas como anti-inflamatórias e analgésicas. O objetivo foi avaliar a qualidade físico-química e microbiológica, desenvolver metodologia por CLAE e CCD do extrato seco da planta. Foram utilizadas duas amostras do extrato seco do *H. procumbens* de fornecedores distintos, amostra 15-18% (A) e 15% (B) de Harpagosídeo. Foram realizados determinação de aspecto, perda por secagem, metais pesados, densidade aparente, cinzas totais e análises microbiológicas de acordo com compêndios oficiais. A identificação foi realizada por CCDA com fase móvel composta por acetato de etila:metanol:água (77:15:8), revelado com vanilina sulfúrica. O doseamento foi feito por HPLC. As análises físico-químicas destacaram o aspecto de pó amarelado à marrom, perda por secagem de 2,6-4,17%, densidade aparente de 0,347-0,635 g/mL e cinzas totais de 1,05-3,79%. Foram observados crescimento dentro dos limites, ausência de patógenos e coliformes. As amostras em análise apresentaram banda violeta com o mesmo fator de retenção (0,65), referente ao harpagosídeo. O método foi específico, preciso, exato (RSD <5%), linear (r>0,9939) e robusto, sendo adequado para o marcador. O doseamento forneceu 15,94 ± 0,49 % (A) and 15,27 ± 1,34 % (B). As amostras analisadas estavam de acordo com as especificações de cada teste realizado. Foi possível afirmar que os extratos de *Harpagophytum procumbens* utilizados nos ensaios e comercializados Brasil apresentaram resultados que comprovam a sua qualidade, segurança e eficácia.

Palavras-chave: Garra do diabo. Fitoterápicos. Cromatografia líquida.

1 INTRODUCTION

The use of medicinal plants in the art of curing dates from the most remote times and it is related to the beginnings of medicine and based on the accumulation of information by successive generations. Since the nineteenth century, the Brazilian potentialities have been

sought through the development of pharmaceutical specialties of plant origin, studies of botany and Brazilian medicinal plants, with those of Luiz José Godói Torres who published in 1814 "Medicinal plants native to Minas Gerais" (ROCHA et al., 2021).

Devil's claw, is known as *Harpagophytum procumbens* Burch DC, it is a plant species belonging to the family Padaliaceae that has a restricted distribution to the Kalahari Desert in the South Africa region and the steppes in Namibia (GXABA; MANGANYI, 2022), and it receives this unique name by the peculiar form of its fruits covered by small hooks.

Robust and perennial, its roots measure 6 cm in diameter and can reach up to 2 meters in length. It has an irregular network of secondary tubers, broad leaves, 3 to 5 lobes, covered by white mucilage. The flowers are trumpet-shaped and may be pink, red or purple, with a yellow or white center, mostly blooming in summer (KRIUKOVA et al., 2021).

This species has been used in folk medicine to combat fever, skin lesions, gout, rheumatoid arthritis, changes in gallbladder function, pancreas, stomach, kidneys (MENGHINI et al., 2019), dysmenorrhea, anorexia, osteoarthritis, seizures in children and complications of childbirth (BRENDLER, 2021).

The literature mentions that among the constituents of *H. procumbens* DC are the iridoid glycosides as harpagoside, harpagide and procumbin; the flavonoids luteolin and kaempferol; phenolic acids such as chlorogenic acid, cinnamic acid and caffeic acid. In this species, it was also identified a molecule from the group of quinones, the harpagoquinone, phytosterols, β-sitosterol and stigmasterol, triterpenes such as oleanolic acid, ursolic acid and various polysaccharides (KONDAMUDI; TURNER; MCDOUGAL, 2016; DIUZHEVA et al., 2018; RIBEIRO et al., 2020).

Several drugs are registered and marketed in Brazil containing the dry extract of this species. ANVISA (National Agency of Sanitary Vigilance) defines as herbal medicine any product obtained with the exclusive use of vegetal raw materials, whose efficacy and safety are validated through ethno-pharmacological surveys, use, technoscientific documentation or clinical evidence. Through Resolution - RDC nº 26/2014, ANVISA establishes norms for the registration of herbal medicines, classifying them as new, similar or traditional herbal medicine (BRASIL, 2014).

About the quality of the herbal medicine, it is necessary to prove, through quantitative analysis, the presence of the characteristic active compounds or even if there has been degradation as for example due to the seasonal variations that often drastically influence their levels (BALEKUNDRI; MANNUR, 2020).

To assist in the validation of analytical methods, ANVISA published RDC No. 166, dated July 24, 2017, which corresponds to the "Guide for validation of analytical and bioanalytical methods" (BRASIL, 2017), Q2B based on the ICH, which sets parameters to validate a methodology applicable to pharmaceutical products and is crucial for their quality control.

Due to the normative needs regarding the regularization of phytotherapics and to assure the reliability of the results obtained from an analytical method, this work aims to validate the analytical methodology by HPLC for the determination of the harpagoside in the dry extract of *Harpagophytum procumbens* Burch DC.

2 MATERIALS AND METHODS

2.1. Material and chemicals

For the quality control of dry extract, two samples of *Harpagophytum procumbens* dry extracts from two different providers were used, one sample with 15-18% of harpagoside (Sample A) and 15% of harpagoside (Sample B).

For the development and validation of high-performance liquid chromatography (HPLC) analytical methodology for harpagoside content, it was used the dry extract of *Harpagophytum procumbens* Burch DC supplied by Martin Bauer Group® (Vestenbergsgreuth, Germany) (15 mg harpagoside / 100mg of dry extract).

The solvents used were: HPLC grade methanol (Merck®), and purified water in Direct® Q system (Millipore®). Standard harpagoside (Purity ≥ 99,8% Phytolab®) was used.

The HPLC YOUNG LIN YL9100 (Allcrom®), column Polar Phenomenex Gemini® RP 150 x 4.6 mm, 5µm, ultrasonic bath (Odontobras® model 1440D), vacuum pump (Quimis® model Q-355B) and Direct® Q (Millipore®) were employed to validate the proposed method.

2.2. Quality control of the dry extract

The physicochemical analyses were performed to determine the appearance of the extract, loss on drying, bulk density, limit test for heavy metals and total ash, according to the test specifications of the official compendia (BRASIL, 2019).

For the microbiological analysis, total bacterial counts (1000 CFU/g), fungal/yeast counts (max. 100 CFU/g), *Pseudomonas* (Absent/g), *Escherichia coli* (Absent/g), *Staphylococcus aureus* (Absent/g) and *Salmonella* sp. (Absent/25g) (BRASIL, 2019).

Thin layer chromatographic analysis of the dry extracts were performed using a solvent system composed of ethyl acetate: water: methanol (77: 15: 8), revealed with sulfuric vanillin solution and the dry extracts were compared to the harpagoside standard (Phytolab®).

2.3 Development and validation of HPLC analytical methodology for harpagoside content

The diluent solution used in the method for the preparation of the solutions was Methanol.

The standard solution was prepared starting from a primary harpagoside standard to achieve a concentration of 0.06 mg/mL. 6 mg of standard harpagoside was weighed, 5 ml of diluent solution was added and stirred until complete solubilizing. The volume was completed to 10 mL with diluent solution and homogenized. Subsequently, 1 mL of the freshly prepared solution was pipetted and transferred to a 10 mL flask.

To prepare the sample, 100 mg of dry extract was weighed and transferred to a 25 mL flask. Methanol (15 mL) was added and the flask was brought to the ultrasound 15 minutes for complete solubilizing. The volume was then

filled with the diluent solution. As the extract had a concentration of 15%, a 0.6 mg / mL solution of harpagoside was prepared.

Analysis were performed on HPLC using the gradient method using C18 reverse phase column and, as the mobile phase, a gradient of Methanol (B) and water (A). The separation of the compounds was performed by elution (0–5 min (15% to 50% B); 5-15 min (isocratic 50% B); 15-16 min (50% to 15% B) and 16-20 min (isocratic 15% B). The system was coupled to a UV detector (278 nm), oven temperature of 25 °C, flow rate of 1.5 mL / min and injection volume of 20 µL. Parameters such as retention time (Rt), peak area (Pa), peak resolution (Rs >1.0), and tailing factor (t < 1.5) were observed at all experiments. Data
collection and statistical analysis were performed with the software YL-Clarity® (South Korea).

2.3.1 Method validation

According to the classification for the analytical tests, described in RDC 166 (BRASIL, 2017), the proposed method fits into Category I, whose parameters are: specificity, linearity, precision, accuracy and robustness.

Specificity was evaluated by analyzing the chromatograms of four sample types: positive control type 1 (standard solution); positive control type 2 (sample solution); diluent solution and mobile phase analysis to evaluate the existence of some interfering peak coeluting with the present active peak.

The linearity was evaluated by analyzing 5 standard preparations at the following concentrations: 0.048 mg / mL, 0.054 mg / mL, 0.06 mg / mL, 0.066 mg / mL and 0.072 mg / mL, corresponding to 80%, 90%, 100%, 110% and 120% of the theoretical test concentration, respectively. These concentrations were obtained by dilutions in triplicate from a stock solution with concentration of 0.6 mg harpagoside / mL, resulting in 15 standard solutions for analysis. The least squares method was used to establish the calibration curve, which was prepared with a mean of 3 determinations per concentration level and the regression analysis of variance led to the determination of the coefficient.

The precision of the method was evaluated taking into account the repeatability and intermediate precision. The repeatability of the method was verified by 6 determinations at 100% of the test concentration with the same analyst and the same instrumentation. The determination of intermediate accuracy was performed on 2 different days with different analysts. Each analyst performed 6 determinations at 100% test concentration, resulting in 6 samples per day.

To prepare the sample, 100 mg of dry extract was weighed and transferred to a 100 mL flask. 50 mL of methanol was added and the flask was brought to the ultrasound 15 minutes for complete solubilizing. The volume was then filled with the diluent solution.

To prepare the injection solution, 2 mL of the 100% solution was pipetted and transferred to a 5 mL volumetric flask. The flask volume was filled with diluent solution and homogenized.

Repeatability and intermediate precision were expressed as DP and DPR, and the method was considered accurate when it presented a relative standard deviation of less than 5%, in accordance with ANVISA criteria (BRASIL, 2017).

Accuracy was analyzed by the method of adding known amounts of standard to the solution of the dry devil's claw extract. In this way, 3 samples were prepared in triplicate at concentrations of 80%, 100% and 120% of the theoretical concentration of the test, resulting in a total of 9 samples. The method was declared accurate when the theoretical recovery of the concentrations analyzed was found to be within the 95% to 105% confidence interval.

And Robustness was evaluated with three test preparations at the concentration of 100% of the theoretical concentration of the test, as described in solution preparations. The results were evaluated by means of the analysis of variance (Table 1).

For the statistical analysis, the software Excel® was used, and were analyzed when the mean, standard deviation, relative standard deviation and variance.

Table 1 - Parameters evaluated in the robustness test with their respective variations.

Parameters	**Variations**		
Different columns batches	Phenomenex 00F-4225-E0		Phenomenex 00F-1671-E0
Oven temperature	23 °C	25 °C	28 °C
Mobile phase flow	1,3mL/min	1,5mL/min	1,7mL/min

Source: (Araújo, 2023).

3 RESULTS AND DISCUSSION

3.1 Quality control of the dry extract

The results for the physicochemical analyses are presented in Table 2. Regarding the aspect of the extracts analyzed, a difference in coloration was observed. Sample A was yellow to brown in color and sample B was beige. Despite this difference, no visual signs of degradation or contamination of the analyzed extracts were found.

The determination of loss on drying is an important assay for the quality control of dry extracts. With the possibility of deterioration of the chemical components, moisture content can enable the development of microorganisms, hydrolysis and enzymatic activities (BARNI; CECHINEL- FILHO; COUTO, 2009; DAO et al., 2018). The values found for the extracts analyzed are within the specified limits in the Brazilian Pharmacopoeia (BRASIL, 2019).

The heavy metal limit test consists on the formation of solid particles of heavy metal sulfides in suspension and subsequent visual comparison of the color intensity in the sample and standard preparations. The assay is semiquantitative, representing the sum of the concentration of contaminants in the sample (ARJOMANDI; SHIRKHANLOO, 2019). These metals can come from soil, irrigation water or the atmosphere and

increase with environmental pollution. The proximity of roads can favor the contamination of the soil by the drag of pollutants promoted by the rains (SINGH et al., 2022).

Bulk density is an important parameter and can be used as a basis for predictions of filling and compacting properties and important information about the drying process of vegetal extracts, and is a parameter used by the manufacturer for the quality control of the extract produced (STRANZINGER et al., 2019). Thus, the values obtained with samples analyzed have values within the specified reports by the suppliers.

The percentage of total ashes can determine the content of inorganic impurities and constituents contained in organic substances (MUKHERJEE, 2019). The results for the samples analyzed are within the specified in the compendium (8 - 14%) (BRASIL, 2019).

Table 2 - Physicochemical analyses for the quality control of dry extracts of *H. procumbens*.

Assay	Sample A	Sample B
Aspects	Thin and hygroscopic powder; yellow to brown color; characteristic odor	Thin and hygroscopic powder; beige color; characteristic odor
Loss on drying (105 °C)	2,6%	4,17%
Limit test for heavy metals	<10 ppm	<10 ppm
Bulk density	0,635 g/mL	0,347 g/mL
Total ashes	3,79%	1,05%

Source: (Araújo, 2023).

Additionally, the microbiological quality control of the samples is presented in Table 3. The results show that the samples analyzed did not present contamination by pathogenic microorganisms and within the specifications for the total bacterial and fungal/yeast count (BRASIL, 2019). In general, raw materials of natural origin are more likely to present contamination problems. Factors such as pollution in irrigation water, atmosphere, soil, conditions of collection, handling, drying, storage and natural microbiota are important and should be considered, as they allow high levels of microbial contamination, sometimes pathogenic, which can compromise not only the material, but also the end user (ALEGBELEYE; SINGLETON; SANT'ANA, 2018).

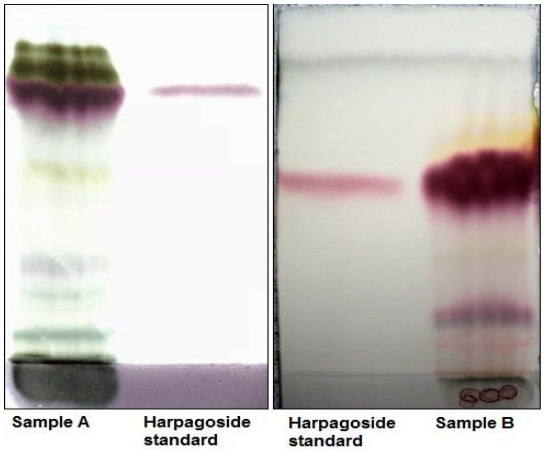
Table 3 - Microbiological analyses for the quality control of dry extracts of *H. procumbens.*

Assay	Sample A	Sample B
Total bacterial count	< 1000 CFU/g	< 1000 CFU/g
Total fungal/yeast count	< 100 CFU/g	< 100 CFU/g
Pseudomonas aeruginosa, *Escherichia coli*, *Staphylococcus aureus*, *Salmonella* sp.	Absent	Absent

Source: (Araújo, 2023).

The quality control for herbal medicines involves sensory and analytical inspection, and instrumental techniques can be used, such as thin layer chromatography, a technique recommended in various pharmacopoeias to provide the fingerprints of herbs (BALEKUNDRI; MANNUR, 2020; LI et al., 2020). To identify the harpagoside marker in the extracts, the fingerprints obtained by TLC showed a retention factor (Rf) of 0.65, referring to the harpagoside standard, resulting in positive identification for the two samples analyzed (Figure 1).

Figura 1. TLC of the samples of dry extracts of *H. procumbens.*



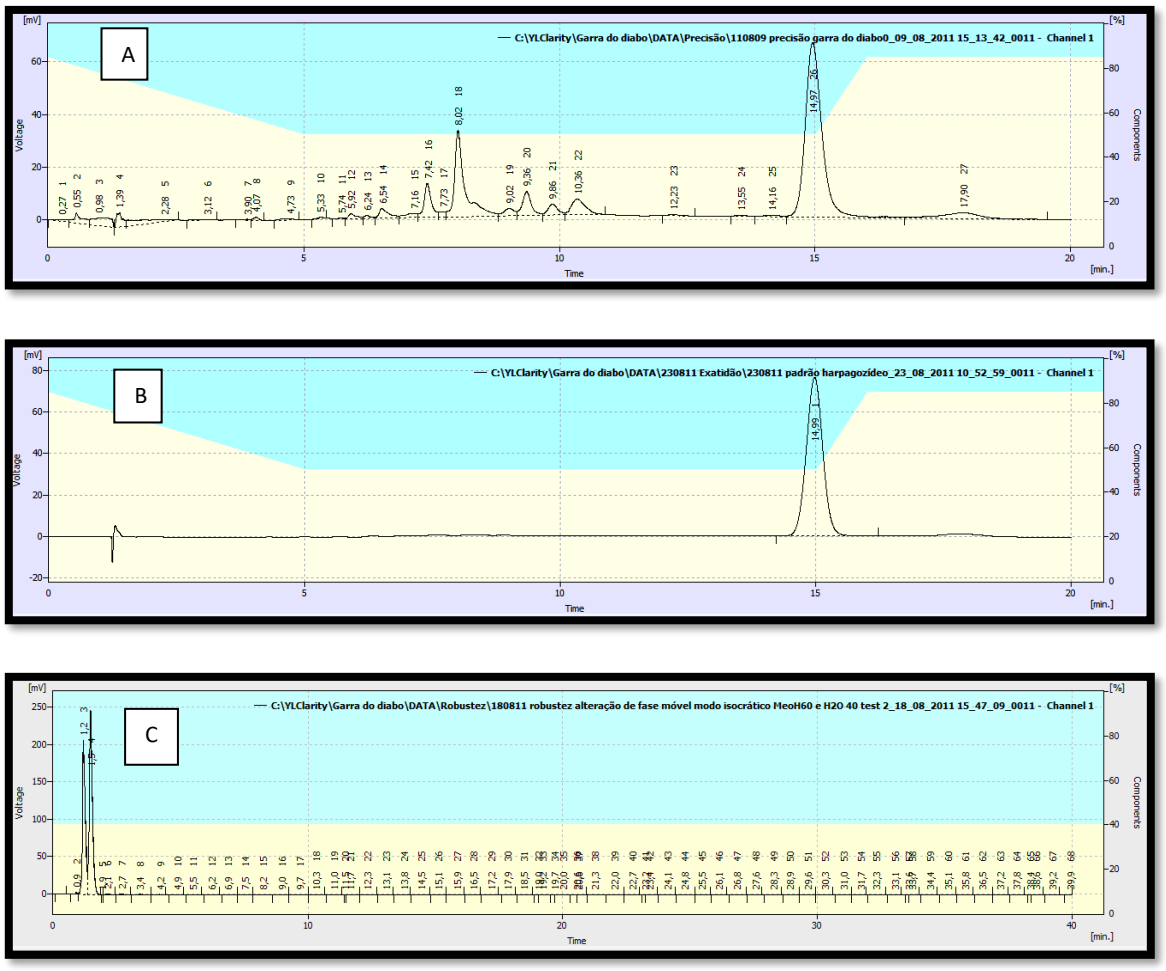
Source: (Araújo, 2023).

3.2. Method validation

3.2.1 Specificity

The chromatograms obtained from the solution of 100% dry extract, the standard, diluent solution and the mobile phase may show the absence of peaks eluting in the same region as the harpagoside standard. There was no interference in the retention time of the analyte (15 minutes), and the total time of the race for the analyzes of 20 minutes. Thus, the proposed method is considered specific for the harpagoside (Figure 2).

Fig. 2. Specificity chromatograms: (a) 100% solution, (b) standard harpagoside solution and (c) diluent solution.



Source: (Araújo, 2023).

3.2.2 Linearity

The proposed method for the determination of harpagoside in the dry extract of Devil's claw was linear for the studied concentrations (0.048 - 0.072 mg / mL), presenting the results expressed in Table 4.

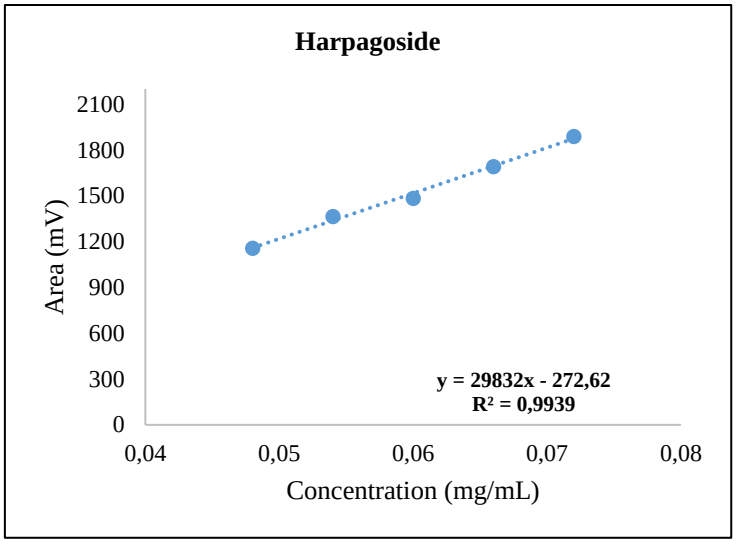
Table 4 - Data obtained for linearity.

Theoretical concentration (mg/mL)	Samples	Analyte area	Mean area	R.S.D. (%)
0,048	1	1120,016	1157,07	3,36
	2	1153,577		
	3	1197,622		
0,054	1	1349,566	1364,71	2,09
	2	1397,658		
	3	1346,893		
0,060	1	1530,25	1484,42	2,68
	2	1463,874		
	3	1459,148		
0,066	1	1686,918	1691,95	0,42
	2	1688,848		
	3	1700,081		
0,072	1	1890,844	1888,41	0,19
	2	1890,121		
	3	1884,278		

Source: (Araújo, 2023).

The calibration curve obtained by the least squares method can be expressed by the equation y = 29832x - 272,62, where y is the peak area of the harpagoside and x is the harpagoside concentration in mg / mL. The correlation coefficient was 0.9940, above the minimum limit (0.99), which guarantees the linearity of the method, since it obeys a linear correlation in the concentration ranges evaluated (Figure 3) (BRASIL, 2017).

Fig. 3. Calibration curve with harpagoside standard.



Source: (Araújo, 2023).

3.2.3 Precision

The results of repeatability and intermediate accuracy are found in Table 5, as S.D e R.S.D.

Table 5 - Repeatability and Intermediate precision of chromatographic method for assay of harpagoside in the dry extract of *H. procumbens*.

Analist	Repetition	Analyte area	Concentration obtained (mg/mL)	Content (%)	Mean (%)	S.D.	R.S.D. (%)
1	1	1437,804	0,0592	98,54	99,69	1,16	1,16
	2	1481,295	0,0609	101,51			
	3	1445,743	0,0594	99,08			
	4	1469,531	0,0604	100,71			
	5	1449,346	0,0596	99,33			
	6	1444,135	0,0594	98,97			
2	1	1427,144	0,0587	97,81	98,33	1,53	1,55

2	1475,031	0,0607	101,16
3	1412,405	0,0581	96,80
4	1420,342	0,0584	97,34
5	1438,521	0,0592	98,59
6	1434,154	0,0590	98,29

Source: (Araújo, 2023).

These results indicate that the method is accurate, since it presented R.S.D. of less than 5%, thus complying with the current legislation (BRASIL, 2017).

3.2.4 Accuracy

The method accuracy data are shown in Table 6.

Table 6: Accuracy of the chromatographic method for harpagoside content in the dry extract of *H. procumbens*.

Percentage	Replica	Analyte area	Concentration obtained (mg/100mL)	Content (%)	Recovery mean (%)	S.D.	R.S.D.
80%	1	1101,179	11,19	76,08	95,18	0,37	0,39
	2	1098,468	11,06	75,89			
	3	1106,954	10,77	76,48			
100%	1	1420,338	14,71	98,13	97,79	0,32	0,32
	2	1411,214	14,62	97,50			
	3	1414,812	14,66	97,74			
120%	1	1722,410	17,85	119,00	98,48	0,79	0,80
	2	1695,611	17,57	117,14			
	3	1713,632	17,76	118,39			

Source: (Araújo, 2023).

Considering that ANVISA regulates that the accuracy results should not be less than 95% [16], the proposed method is in compliance with recovering between 95 - 105% for the three levels of concentration tested.

3.2.5 Robustness

Table 7 show the robustness evaluation results for the parameters analyzed in this test.

Table 7 - Robustness results for variation of the chromatographic column batch, oven temperature and flow variation.

Parameter	Variation	Sample	Analyte area	Concentration obtained (mg/mL)	R.S.D. (%)	F	$F_{critical}$	P-value
Chromatographic column batch	Standard	1	1475,295	0,0606	0,33	2,44	5,14	0,16
		2	1468,384	0,0603				
		3	1465,778	0,0602				
	00F-4225-E0	1	1468,214	0,0603	0,30			
		2	1463,305	0,0601				
		3	1459,208	0,0600				
	00F-1671-E0	1	1466,567	0,0603	0,24			
		2	1459,770	0,0600				
		3	1461,221	0,0601				
Oven temperature	Standard	1	1469,244	0,0604	0,40	0,36	5,14	0,70
		2	1471,350	0,0605				
		3	1460,170	0,0600				
	28 °C	1	1462,149	0,0601	0,37			
		2	1458,323	0,0599				
		3	1469,111	0,0604				
	23 °C	1	1459,214	0,0600	0,32			
		2	1468,312	0,0603				
		3	1466,221	0,0602				
Flow variation	Standard	1	1459,457	0,0600	0,14	0,02	5,14	0,98
		2	1462,331	0,0601				
		3	1463,444	0,0601				
	1,3 mL/min	1	1458,212	0,0599	0,22			
		2	1461,320	0,0600				
		3	1464,779	0,0602				
	1,7 mL/min	1	1466,543	0,0603	0,31			
		2	1458,309	0,0599				
		3	1458,999	0,0599				

Source: (Araújo, 2023).

It was verified by ANOVA (analysis of variance) that there was no statistically significant difference between the results for the variation of the batch of chromatographic column and the oven temperature, since for these parameters the calculated F was lower than the critical F, and the P value was greater than 0.05. It was also observed a difference in harpagoside retention time and variations in peak areas, but did not interfere in the quantification capacity of the method, maintaining its accuracy.

Thus, the proposed method for harpagoside assay in the dry extract of *H. procumbens* seems to be robust, not varying with changes in the chromatographic column batch and the oven temperature.

The method developed and validated according to the legislation was used to identify and quantify harpagoside in the two commercial dry extracts. The analyses to certify the usability of the analytical method proposed for harpagoside content in both extracts dried samples showed 15,94 ± 0,49 % (A) and 15,27 ± 1,34 % (B).

The two samples analyzed were in accordance within the specifications of each test performed for quality control, and the results for harpagoside content were acceptable, using the method proposed. After all the tests, it is possible to state that the extracts of *Harpagophytum procumbens* supplied in Brazil present results that prove their quality.

In a study conducted by Nalluri and Sujithkumar (2019), analyzing 3 different dry extracts of *H. procumbens*, it was possible to verify contents of 98.7%, 98.3% and 99.5% in the products studied, demonstrating quality for their use in the production of medicines. However, Ribeiro et al (2020), when analyzing 3 different products containing standardized extracts of the species, verified significant variations between the results obtained with samples containing -42.0% of harpagoside, compared to the others that presented +27.5 and +28.0% of the active. These results suggest a serious health risk due to therapeutic failure or toxicity and reinforces the need for quality control studies to ensure the safety and efficacy of medicines of natural origin.

4 CONCLUSIONS

The HPLC analytical methodology proposed for the determination of the harpagoside in the dry extract of *Harpagophytum procumbens* Burch DC has high specificity which confers safety in the results, is linear in the range of 0.048 to 0.072 mg/mL and robust to the factors required by current requirements. The obtained precision and accuracy of results meet the specifications established by ANVISA, attesting reliability. According to the set of results obtained, it can be concluded that the proposed analytical method is validated and, therefore, suitable for use in the routine of quality control laboratories. Tests for quality control of samples of dry extracts of *H. procumbens* show that the extracts marketed in Brazil have acceptable quality.

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