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Bioassay Guided Screening of Cryptolepis Extracts for Onward Synthesis of Nano Ferrites

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Abstract

In this study, various leaves and stem organic extracts were prepared using the solvents viz., n-hexane, ethyl acetate, ethanol and water, separately. Different phytochemical test for alkaloids, carbohydrates, oils, amino acids and others were performed to determine their presence in the extracts. These plant extracts were used for screening of sample via UV and HPLC techniques to compare the wavelength and absorbance, and retention time on chromatogram by extracts, respectively. The surface properties and size of nickel-zinc nano ferrites were evaluated by Energy-dispersive X-ray spectroscopy (EDX) and Scanning Electron Microscopy (SEM). The former, showed the presence of nickel (Ni) and zinc (Zn) weighing 4.27% of N ,6.89% of C and 35.5% of O in the sample which confirmed the presence of nano ferrites in leaves and stem of C. buchanani.

Introduction

The *Cryptolepis buchanani*, commonly known as Kareballi (Dahotre & Singh, 2011), is being cultivated in palaeotropic and its Components *like* sarverogenin and isosarverogenin (Kumar et al., 2014; Ghosh et al., 2008; Hanprasertpong et al., 2017). have powerful cytotoxic action and are anti-inflammatory as well as show immunopotent characteristics (Maravajhala et al., 2012). Major components of *C. buchanani's* leaves are alkaloids (Jang et al., 2013), amyrin, carbohydrates, saponins, steroids and triterpenes (Mehri et al., 2012; Mohanpuria et al., 2008). while stem contains alkaloids and triterpenes (Sivakumar et al., 2011; Raghavender & Jadhav, 2009).

A potential impact of *Cryptolepis buchanani* is synthesis of nanoferrites using *C. buchanani* leaves extracts with ethylacetate nanoferrites (Sharma & Pallavi, 2012). The nano ferrites can be characterized by using various techniques like scanning electron microscopy (SEM).The structural, electronic, magnetic, optical characteristics (Sharma et al., 2012) of nano ferrites are proved to be far better than their large surface and quantum confinement relative to their ferrites in bulk (Pande et al., 2006). The study was designed to analyze the presence of nano ferrites in *Cryptolepis buchanani* leaves and stem extracts through different methods.

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Methods

The solvents used for experimental purpose were standard. Some solvents were purchased from Delta Lab Lahore, while others were available in chemistry lab University of Lahore, Sargodha campus.

Experimental design

At first, the plant sample of *Cryptolepis buchanani* were collected from the farm, washed to remove dust and other impurities, and separated from the whole and dried, afterwards. Then, various parts of the selected plant were ground to obtain fine samples and kept in different vials after labelling. The extracts of *Cyptolepis buchanani* leaves and stems prepared by Soxhelt apparatus using organic solvents such as n-hexane, ethanol and water. Finally, different biochemical tests were performed to check the presence of various phytoconstituents in these extracts and confirmed by SEM and EDX analysis.

Figure 1. Preparation of leaf extract of Cryptolepis buchanani

Cryptolepis buchanani extracts were labelled as

- *Cryptolepis buchanani* leaves extracts with n-hexane (CBEL-H)
- *Cryptolepis buchanani* leaves extracts with ethylacetate (CBEL-Ea)
- *Cryptolepis buchanani* leaves extracts with ethanol (CBEL-E)
- *Cryptolepis buchanani* leaves extracts with water (CBEL-W)
- *Cryptolepis buchanani* stem extracts with n-hexane (CBEL-H)
- *Cryptolepis buchanani* stem extract with ethylacetate (CBEL-Ea)
- *Cryptolepis buchanani* stem extract with ethanol (CEBL-E)
- *Cryptolepis buchanani* stem extract with water (CBEL-W)

Synthesis of Nix Zn1-x Fe_2O_4 nanoferrites

In this study, Nix Zn1-x Fe_2O_4 altered sol-gel technique was used to synthesize nanoferrites. *Cryptolepis buchanani* plant extract was typically combined with distilled water under strong agitation to ensure the production of homogenous solution, while maintaining pH. Then, heating on the hot plate at 100℃ under strong mixing, mixture was allowed to evaporate for a couple of hours until a dehydrated originator was attained. This dehydrated mass was crumpled into powder by mortar and pestle

Results and Discussion

Phytochemistry of *Cryptolepis buchanani* extracts

All extracts of *Cryptolepis buchanani* were subjected for further qualitative analysis to detect the presence of various compounds. Different phytochemical tests were performed, and results obtained from experiments.

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Table 1. Phytochemical analysis tests of *Cryptolepis buchanani* leaves and stem extracts

"+" sign is for illustration of functional groups presence.
"-" sign is for illustration of functional groups absence.

Phytochemical Detection	Tests	Measurments (Leaves)				Measurements (Stem)			
		CBELH	**CBELEa**	**CBELE**	**CBEL-W**	**CBESH**	**CBESEa**	**CBESE**	**CBESW**
Test For Alkaloids	Mayer's Test	++	_	++	++	++	_	++	_
	Wagner's Test	++	++	++	++	++	++	++	++
Amino Acids	Ninhydrin test	_	_	++	++	_	_	++	++
Carbohydrates	Molish's test	++	++	++	++	++	++	++	++
	Benedict's test	+ +	+ +	++	++	++	++	+	++
Oils and Fat	Spot test	-	++	++	++	-	++	++	-
	Saponification	_	++	++	+	_	++	++	-
Phenolic Compounds	$FeCl_3$ Test	++	-	++	++		_	++	++
	Lead acetate test	++	_	+	_	++	_	++	_
	Alkaline reagents	++	++	_	++	++	++	_	++
Glycosides	Borntrager's test	++	_	_	_	++	++	_	_
Protiens	Biuret test	++	++	++	++	++	++	++	++
Saponins	Foam test	_	_	++	++	_	_	++	++
Volatile oil	Oil test	++	++	++	-	++	++	++	-

UV spectroscopic analysis

The UV visible spectroscopy has examined the catalytic activities of samples. Extracts of *C.buchanani* was subjected to UV analysis and maximum absorbance for each sample was observed. It was evident that extracts of *C.buchanani* from ethyl acetate extracts were the most active in all samples and *CBEL* showed peak absorption and wavelength.

Table 2. Comparsion of UV analysis between *C.Buchanani* extracts.

Samples	Wavelength(nm)	Absorbance
C.Buchanani leaves extract with ethylacetate	576.80	0.234
	486.40	2.266
	312.00	2.035
C.Buchanani leaves extract with ethanol	483.00	0.366
	398.60	0.273
	443.20	0.045
C.Buchanani stem extract with ethanol	417.80	0.264
	410.60	0.284
C.Buchanani leave with water	364.20	0.480

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Estimation of chemical compounds of *Cryptolepis buchanani* leaves extracts by using HPLC

HPLC chromatogram ethanolic leaves extract of *Cryptolepis buchanani* with ethylacetate showed a variety of peaks showing that nine compounds were present. The chemical compounds found in ethanolic extract of *Cryptolepis buchanani*.

Table 3. HPLC analysis of *Cryptolepis Buchanani* leaves extract in ethylacetate

Peak no.	Retention time	Name of compounds	Molecular Formula
1	7.870		
2	8.320		
3	9.132	D-Galactose,6deoxy-[DFucose]	C6H12O5
4	9.434		
5	10.942	Dodecanoic Acid	C12H24O2
6	11.132	Phosphonoflu oridic acid, (1methyl ethyl) cyclohexyl ester	C9H18FO2P
7	14.602		
8	16.822	n-Hexadecanoic Acid	C16H32O2
9	17.289	Unknown	
10	18.742	9,12octadecadieno ic acid	C18H32O2
11	18.856	Oleic acid	C18H34O2
12	19.255	Octadecanoic acid	
13	19.398		
14	21.023	4,8,12,16tetramethyl heptadecan-4olide	C21H40O2
15	22.068		

Fourier Transform Infrared (FT-IR) analysis of *Cryptolepis buchanani*

FT-IR analysis has been performed for *Cryptolepis buchanani* extracts and was used to classify diverse functional groups and compounds present.

Table 4. Comparison for FT-IR analysis of *C.buchanani* extracts

"+" sign is for illustration of functional groups presence.
"-" sign is for illustration of functional groups absence.

Sr. NO	Functional Groups	CBEL-H	CBEL-Ea	CBEL-E
1	Alkane	++	++	++
2	Alkene	++	-	++
3	Alkyne	++	-	-
4	Ketone	++	+ +	-
5	Ester	++	+ +	-
6	Alcohol	++	-	++
7	Phenol	++	-	-
8	Ethers	++	-	-
9	Cyanide	-	-	-
10	Amide	-	++	
11	Azo	++	++	++

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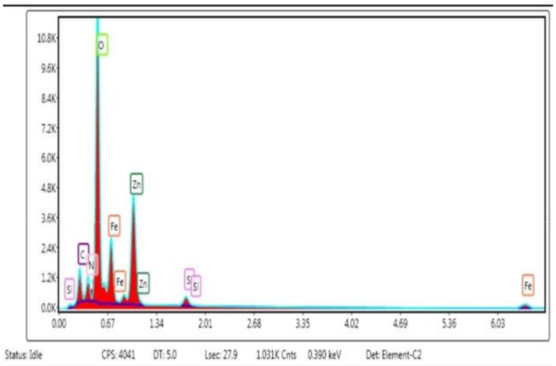
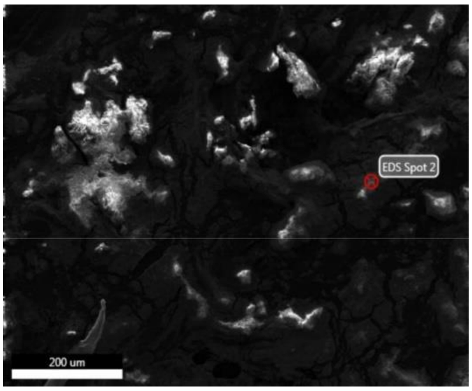
12	Amine	-	++	++

Nickel zinc nano ferrites detection

Nickel zinc nano ferrites based on the extract of *Cryptolepis* (SEM) were viewed in scanning electron microscopy for analysis of surface morphology. The forms of nan ferrites are evident as the SEM images show that the particles are spherical in form of Nickel-zinc. Similarly, the EDAX method was used to analyse nickel-zinc nano ferrites and the chromatogram showed that nickel (Ni) and zinc (Zn) were presents in pure form.



(a)



(b)

Figure 1. (a) EDAX. (b) SEM view

Conclusion

The synthesis of nickel-zinc nano ferrites with *Csryptolepis buchanani* extracts would be free of toxic contaminants and would open the way for cheaper chemicals. The plant extract-based synthesis can provide nano ferrites of a controlled size and morphology. In conclusion, nickel-zinc nano ferrites synthesized from the *Cryptolepis buchanani* leaf extracts confirmed that leave extract prepared using ethyl acetate was the most active of all solutions.

References

Dahotre, S. G., & Singh, L. N. (2011). Study of magnetic properties of nano structured Mn-Zn ferrite. *Archives of Physics Research*, *2*(1), 81-89.

Ghosh, N. N., Pant, P., & Bhuvaneswari, S. (2008). Chemical methodologies for preparation of micron and nanometer scale ferrites-a mini review of patents. *Recent patents on nanotechnology*, *2*(1), 8-18.

Hanprasertpong, N., Pantong, A., Sangdee, C., Kunanusorn, P., Kasitanon, N., Lhieochaiphant, S., & Teekachunhatean, S. (2017). Cryptolepis buchanani oil formulation versus indomethacin solution in topical therapy for osteoarthritis of the knee: a randomized controlled trial. *Journal of Herbal Medicine*, *7*, 18-26.

Jang, D. H., Lee, Y. I., Kim, K. S., Park, E. S., Kang, S. C., Yoon, T. J., & Choa, Y. H. (2013). Induced heat property of polyethyleneglycol-coated iron oxide nanoparticles with dispersion stability for hyperthermia. *Journal of nanoscience and nanotechnology*, *13*(9), 6098-6102.

Kumar, G., Shah, J., Kotnala, R. K., Dhiman, P., Rani, R., Singh, V. P., ... & Singh, M. (2014). Self-ignited synthesis of Mg–Gd–Mn nanoferrites and impact of cation distribution on the dielectric properties. *Ceramics International*, *40*(9), 14509-14516.

Maravajhala, V., Papishetty, S., & Bandlapalli, S. (2012). Nanotechnology in development of drug delivery system. *International Journal of Pharmaceutical Sciences and Research*, *3*(1), 84.

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Mehri, A., Ebrahimi, S. S., Abdizadeh, H., & Khanmohammadi, H. (2012). Optimized sol–gel chemical route using vacuum suction for fabrication of densely packed NiFe 2 O 4 nanowires. *Journal of superconductivity and novel magnetism*, *25*(8), 2743-2748.

Mohanpuria, P., Rana, N. K., & Yadav, S. K. (2008). Biosynthesis of nanoparticles: technological concepts and future applications. *Journal of nanoparticle research*, *10*(3), 507-517.

Pande, M., Dubey, V. K., Yadav, S. C., & Jagannadham, M. V. (2006). A novel serine protease cryptolepain from Cryptolepis buchanani: purification and biochemical characterization. *Journal of agricultural and food chemistry*, *54*(26), 10141-10150.

Raghavender, A. T., & Jadhav, K. M. (2009). Dielectric properties of Al-substituted Co ferrite nanoparticles. *Bulletin of Materials Science*, *32*(6), 575-578.

Sharma, A., & Pallavi, K. S. (2012). Sonia,"Synthesis and Characterization of CeO-CuO Nanocomposites". *Archives of Applied Science Research*, *4*(6), 2557-2563.

Sharma, D. E. E. P. A. K., Sahu, A. N., Mujeeb, M. O. H. D., Bharti, A. B. I. N. A. S. H., Sharma, A. N. U. B. H. A. V., Tripathi, R. K., & Ashraf, K. A. M. R. A. N. (2012). Development of pharmacognostical profile of Cryptolepis buchanani Roem & Schult. *Int J Pharm Pharm Sci*, *4*(2), 615-618.

Sivakumar, P., Ramesh, R., Ramanand, A., Ponnusamy, S., & Muthamizhchelvan, C. (2011). Preparation and properties of nickel ferrite (NiFe2O4) nanoparticles via sol–gel auto-combustion method. *Materials Research Bulletin*, *46*(12), 2204-2207.

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