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"Evaluation of Antioxidant properties of silk sericin on exposure to Ultra violet C "

By

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INTRODUCTION

- Silk is a natural fiber, derived from variety of species, including silk worms and spiders. Silk is called "Queen of textiles" amongst the natural fibers due to its natural luster, elegance and strength; silk holds a great prominence in culture and traditions in most parts of the world.
- Silk is a protein fiber that consists of sericin and fibroin. Silk consists of 70 to 80 % of crystalline, insoluble, fibrous protein called fibroin and 20 to 30 % of an amorphous matrix of water-soluble globular protein called sericin.
- The sericin protects the pupa inside the cocoon against UV radiation, wind, rain and low temperature (Cao and Zhang, 2016). The antioxidant potential of the sericin is related to its high content of amino acids with hydroxyl groups, which acts as chelators.
- *Bombyx mori* is called as **monophagous insect**, because it feeds only on mulberry leaves. *Bombyx mori* silkworms have been domesticated for several years and are the most important economic insect in textile applications. In addition to their textile applications, the proteins in silk also have been explored and used in several biomedical processes.

- Sericin is a globular protein that constitutes about 20 to 30 % of silk fiber. Its role is to coat and link the fibroin filaments together in the worm cocoons (Aghaz *et al.*, 2015). Sericin and fibroin exists as a highly concentrated gel with high viscosity.
- Sericin is synthesized and secreted in middle silk gland And sericin is well heeled in combination of serine (32%) and aspartic acids (16.8%).
- The sericin's antioxidant activity is one of the most significant properties because it could provide positive effects on people health and in the food industry as a natural food preserver (Puangphet *et al.*, 2015).
- Sericin is immunologically inert and has proven safely to use, the applications of sericin in biomedicine as well as food and cosmetic industry and can be used supplement in culture media.
- In many studies UV spectrum is used to evaluate the quality of proteins as they absorb near ultraviolet region due to the electron transfer of aromatic amino acid, tryptophan, tyrosine, and phenylalanine (Mahmoodi NM *et al.*, 2010; Cohn D 1979).

Hypothesis

- Silk is considered to be one of the valuable amongst the natural fibres due to its its natural luster, elegance and strength hence its preferred for increasing its physiological properties and anti-oxidant properties.The antioxidant potential of the sericin is related to its high content of amino acids with hydroxyl groups as well as Presence of phenol, alkenes, and aromatic compounds in sericin it is considered to have antimicrobial properties. On exposure to uv the protein changes its properties and structure; so exposing the sericin protein to uv the anti-oxidant properties may be increased which contribute to recycling of discarding sericin in sericulture industry which will increase the Economic value of sericulture market as well as it introduce new ecofriendly

OBJECTIVES

- Isolation of silk sericin from High temperature high pressure method.
- Drying of sericin through tray drying method or through Rota evaporator.
- Characterization of silk sericin (FTIR, TGA-DSC).

MATERIALS AND METHODS

Materials:

The *bombyx mori* cocoons were collected from silk rearing fields of Rayapur Hubli

Methods

- Sample collection: silk worm cocoons are collected and cut down in small pieces.
- Extraction of protein from *Bombyx mori* cacoons : sericin is accomplished by high temperature and high pressure method. The filtrate was subjected to Rota evaporator.
- Gravimetric methods: concentration of extracted sericin powder is obtained by

Characterization of silk sericin

- FTIR (Fourier-transform infrared spectrophotometer):sample was analysed in the range of 400 to 4000 per cm

- TGA-DSC (Thermogravimetric analysis and differential scanning calorimetry):sample was analysed in the temperature range of 20°C to 600°C

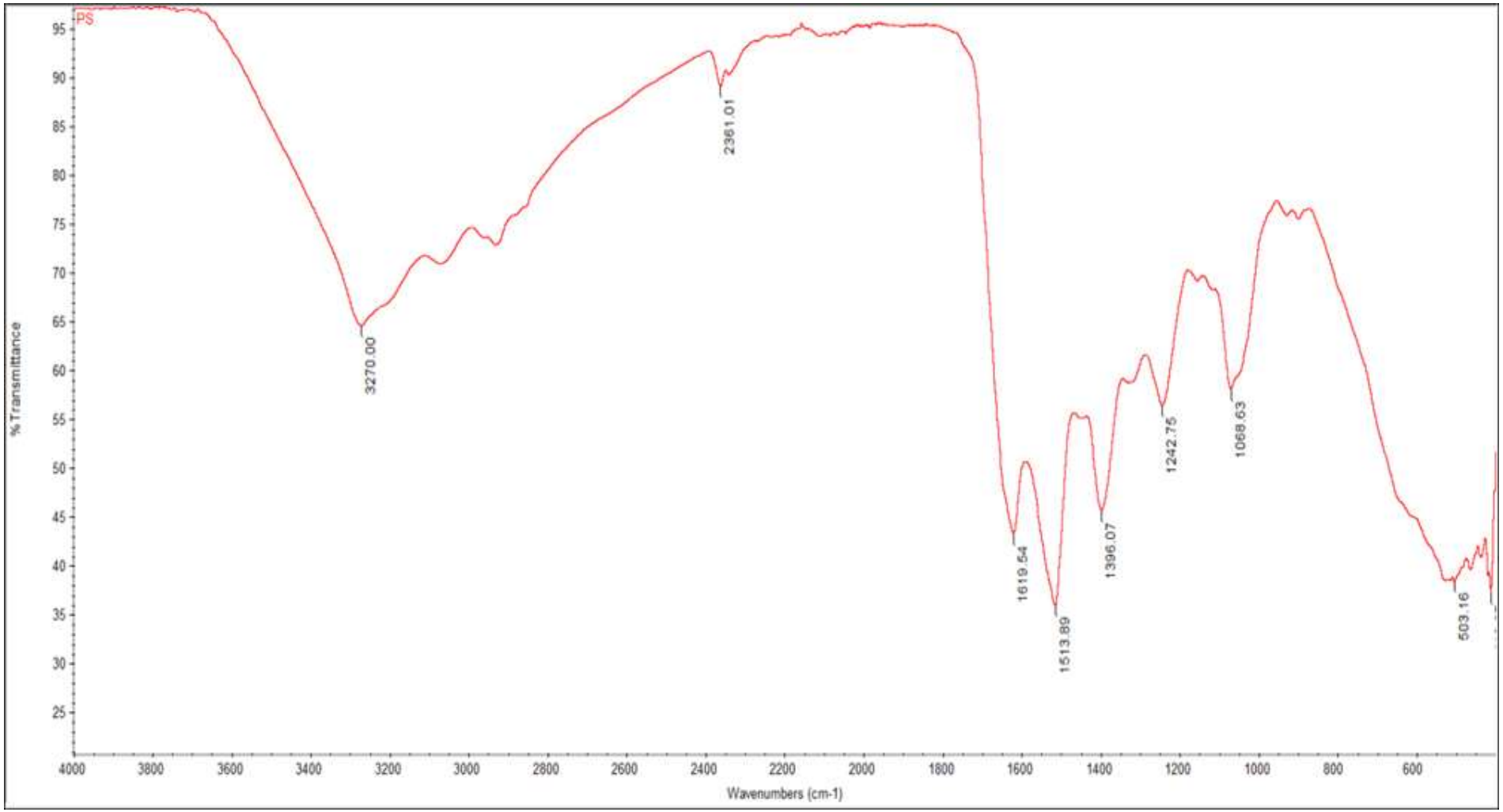
RESULTS

DRIED FIBERS

COCOONS PIECES

SERICIN EXTRACT

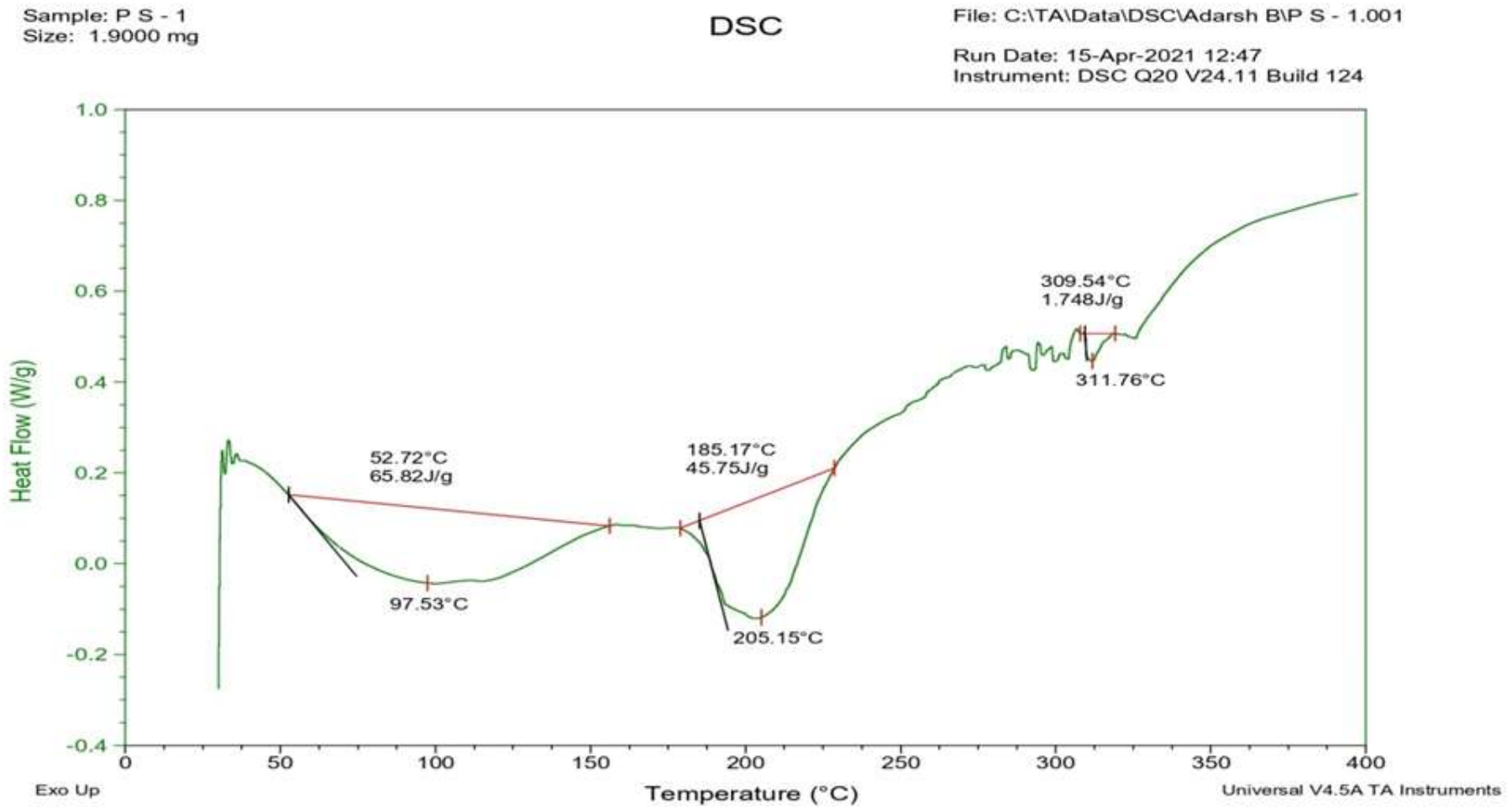
DEGUMMED SILK



Fourier-Trans form Infrared Spectra of sericin sample extracted from *Bombyx mori*

The Compounds with their functional group present in sericin extract

Wavenumbers cm^{-1}	Functional group	Compound
3270	-OH stretch	Normal Polymeric
2361	P-H	Phosphine
1619	C═C stretch	Olefic alkene
1513	-O-N═O	Aromatic Nitro compound
1396	C_6H_6 -OH bending	Phenol or Tertiary alcohol
1242	R-O-R' Stretching	Aromatic ethers, Aryl O
1068	C-F	Aliphatic fluro compounds
503	C-I	Halo compound



DSC curves of *Bombyx-mori* sericin sample

CONCLUSION

- The sample anlysed under FTIR at the peak 3270per cm may be associated with N-H stretching vibration O-H with 1700 to 1600 per cm indicating C=O stretching vibration
- DSC results shows endothermic peak near 52.72 °C, 185.17°C and another at 309.54°C
- As there are several reports on antioxidant properties of silk sericin and protective activity of sericin on UV-A and UV-B irradiation but there is no study on UV-C. Hence UV-C exposure needs to be studied to know the change in properties of sericin.

FUTURE PROSPECTIVE

- Silk sericin is kind of natural material originated from wide variety of and cacoons and behave excellent biocompatibility and unique biological properties.
- Sericin endow it with good water solubility, cellular adhesion, proliferation activity, Insitu flourescence, antioxidant and inhibitory effect on tyrosinase.
- Action of Cross linking agent ,chemical active group or uv light silk sericin can be designed into various structural biomaterials , including micro(nano) structural material, 2D films and hydrogel or even 3D porous scaffolds, denoting broad prospect in biomedical application. Such as wound healing, tissue regeneration, drug deliverity, medicine, material coating.
- Silk sericin as a active agent in cosmetics such as moisturizers, anti aging, anti-UV light(sun screen)
- The properties of fibrous filters can be enhanced by coating with sericin and can be coated onto nylon or polyester fibers to reduce the amount of toxic free radicals, and fungi, bacteria's in indoor air filters

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