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Physiochemical properties of rice based herbal biscuit incorporated with the decoction of *Syzygium cumini* bark

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Diabetes mellitus is a widespread debilitating disease in the modern-day world which leads to many health complications affecting the quality of life. Intake of less refined food, herbal decoctions etc. play a vital role in managing diabetes. Scientific experiments have proven the efficacy of some medicinal plants for their therapeutic potential in the management of diabetes mellitus. *Syzygium cumini* (madan) is one of the widely used medicinal plants in the treatment of diabetes mellitus. Traditional rice variety, pachchaperumal is widely known to have many health benefits.

The present study was designed to develop a nutritionally rich diabetic friendly herbal snack incorporating *Syzygium cumini* decoction and pachchaperumal rice flour as the major ingredients. The biscuit was developed so that a portion of 6 biscuits (44 g) will contribute the daily intake of decoction dose as prescribed in Ayurveda (20 mL).

Physiochemical properties as diameter, thickness, volume, density, weight, texture and colour of the herbal biscuit was determined according to standard AOAC

methods and other standard methods. Presence of anti-diabetic compounds in the biscuit was confirmed by HPLC analysis.

The moisture, fat, protein, fiber, carbohydrate and ash contents of the biscuit were 9.86%, 4.74%, and 12.07%, Crude fiber 1.27%, 70.8% and 1.19%, respectively. Physical parameters were within the standard accepted ranges of a biscuit. DPPH antioxidant potential (IC₅₀) of the herbal biscuit was 1.60 mg/L and showed a high antioxidant potential compared with the control sample as 5.66 mg/mL and the standard BHT (Butylated Hydroxy Toluene) as 18.5 mg/mL. The total starch content was 40.4%. The biscuit showed the presence of several important fatty acids as lauric acid, palmitic acid and myristic acid in the fatty acid profile of GC-MS analysis. Presence of gallic acid and ellagic acid which are known antioxidants and hypoglycemic agents was confirmed by HPLC analysis. It can be concluded that the herbal rice biscuit prepared using pachchaperumal rice and the decoction of *Syzygium cumini* can be considered as a diabetic friendly snack.

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Technical Sessions : A - 24

## Synthesis, characterization and biological studies of a novel naphthalene-derivatized tridentate ligand and its *fac*-[Re(CO)<sub>3</sub>L] complex as potential therapeutic agents for lung cancer

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Re(I) compounds, among other organometallic compounds, have recently gained attention as potential anticancer agents. In this study, a novel tridentate ligand (N(SO<sub>2</sub>)(1-nap)dien) derived from diethylenetriamine (dien) attached to a sulfonamide group, was synthesized in good yield (63% yield) and its net neutral Re(I)

complex ([Re(CO)<sub>3</sub>(N(SO<sub>2</sub>)(1-nap)dien)]) synthesized by treating *fac*-[Re(CO)<sub>3</sub>(H<sub>2</sub>O)<sub>3</sub>]<sup>+</sup> with the synthesized ligand. The compounds were characterized by X-ray diffraction studies, <sup>1</sup>H NMR, FT-IR, UV-Vis and fluorescence spectroscopies.

The  $[\text{Re}(\text{CO})_3(\text{N}(\text{SO}_2)(1\text{-nap})\text{dien})]$  compound crystallizes in monoclinic system with space group  $P21/n$  [ $a = 8.0675(4)$ ,  $b = 22.9977(12)$ ,  $c = 9.9692(5)$  Å,  $V = 1793.27(16)$  Å<sup>3</sup>,  $Z = 4$ ]. The complex has a distorted octahedral structure where the Re(I) metal is coordinated by three nitrogen atoms of the dien backbone and three CO ligands. The two chelate rings of the  $[\text{Re}(\text{CO})_3(\text{N}(\text{SO}_2)(1\text{-nap})\text{dien})]$  complex have the same pucker chirality. Crystal structure of the complex and NMR analysis confirm that, upon complexation, the sulfonamide nitrogen deprotonates and binds with metal in a tridentate fashion giving a net neutral coordination sphere. The metal complex exhibits an upfield (*exo*-NH) and a relatively downfield NMR signal (*endo*-NH) in DMSO- $d_6$ . In an FTIR spectrum of the ligand, the peak at  $870\text{ cm}^{-1}$  due to S-N stretching vibrations, has shifted to  $860\text{ cm}^{-1}$  in the spectrum of the metal complex. The high energy bands between 200-300 nm in the absorption spectrum of the free ligand have shifted to shorter wavelength in the spectrum of the complex. Emission

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spectra were recorded in methanol and enhanced fluorescence intensity was observed at 440 nm for the $\text{N}(\text{SO}_2)(1\text{-nap})\text{dienH}$ ligand while its Re complex showed quenched fluorescence intensity. The *in vitro* cytotoxic activity of the synthesized compounds was examined using NCI-H292 (non-small cell lung cancer cells) and MRC-5 (human normal lung fibroblast cell line). Both the ligand and the complex show acute cytotoxicity for MRC-5 cells at 24 hours. Highest cytotoxic activity was observed for $[\text{Re}(\text{CO})_3(\text{N}(\text{SO}_2)(1\text{-nap})\text{dien})]$ complex for NCI-H292 cells with an IC_{50} value of $9.91\text{ }\mu\text{M}$ at 48 hours.

The promising cytotoxic activity of the novel synthesized ligand and its metal complex indicate that these compounds may be good candidates to be utilized as anticancer drug agents.

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Technical Sessions : A - 25

Development of natural rubber based materials having enhanced mechanical properties

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Advances in polymer science have led to the development of several novel mechanical strengthened high performance polymers from natural rubber (NR). The properties of natural rubber itself restrict it to be used for many applications. Modifications of NR acquire a vast range of desired properties to use in so called areas. Those shortcomings were overcome by chemical and physical alteration of natural rubber. The mechanical strength of a polymer mainly depends on its physical parameters and cross-links density.

Double network (DN) systems were synthesized using NR (network I) and isodecyl acrylate (IDA) (network II) to acquire a higher mechanically strengthened material following a general synthesis procedure reported elsewhere. The long chains of isodecyl acrylate can favor chain entanglements which could increase the strength of the material.

Different concentrations of natural rubber (NR), different percentages of cross-linker of NR; dicumyl peroxide (DCP), monomer -isodecyl acrylate (IDA), initiator-

benzoyl peroxide (BPO) and the cross-linker for the second network-divinyl benzene (DVB) were used to synthesize a series of DN systems. As a reference set, a series of single network (SN) samples were prepared by using the conventional method. Swelling test, hardness test and compression test were carried out for property analysis.

Swelling data of the DN samples in toluene have shown higher swelling ratio than the conventionally prepared SN samples confirming that DNs contain higher free volume than the SN. Hardness test was carried out using an IRHD hardness tester and it showed that DNs have better hardness over the SN. The sample NR-2.5M-30-5/IDA-2.5M-1-2.5 which contains 2.5M NR concentration and 5% (w/w) of DCP along with 2.5M of IDA with 1% (w/w) and 2.5% (w/w) has shown the highest IRHD (International rubber hardness degrees) value of 68.33 out of the DNs. This sample contains the highest initiator to cross-linker ratio in network II among the rest of the samples.