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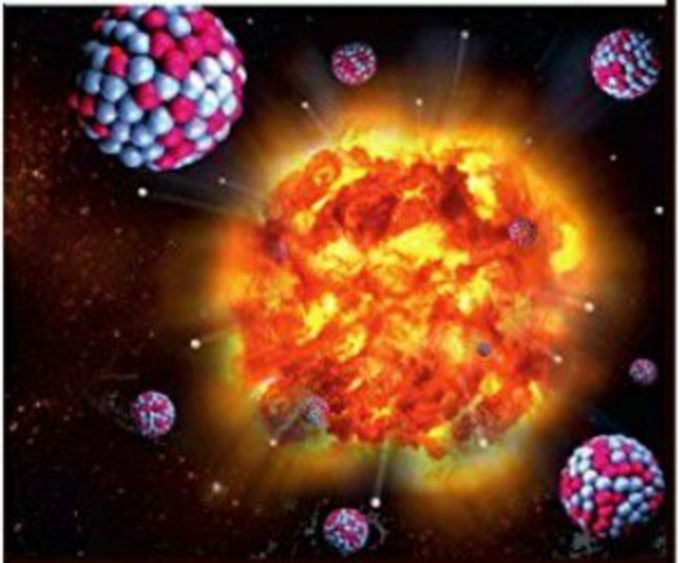

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CONTENT

PREFACE

This book is a result of extensive literature survey done by students of pharmacy, and other science fraternity from different colleges all over India. The information in this book is not intended to be a substitute for professional medical advice. Do not use this information to diagnose any disease of bacterial/viral/fungal origin also the book should not be used for ayurvedic treatment of any disease of bacterial/viral/fungal origin. However, the book is published to serve as a guide for people wishing to do research on our indigenous plants which can be used in the treatment of diseases of bacterial/viral/fungal origin.

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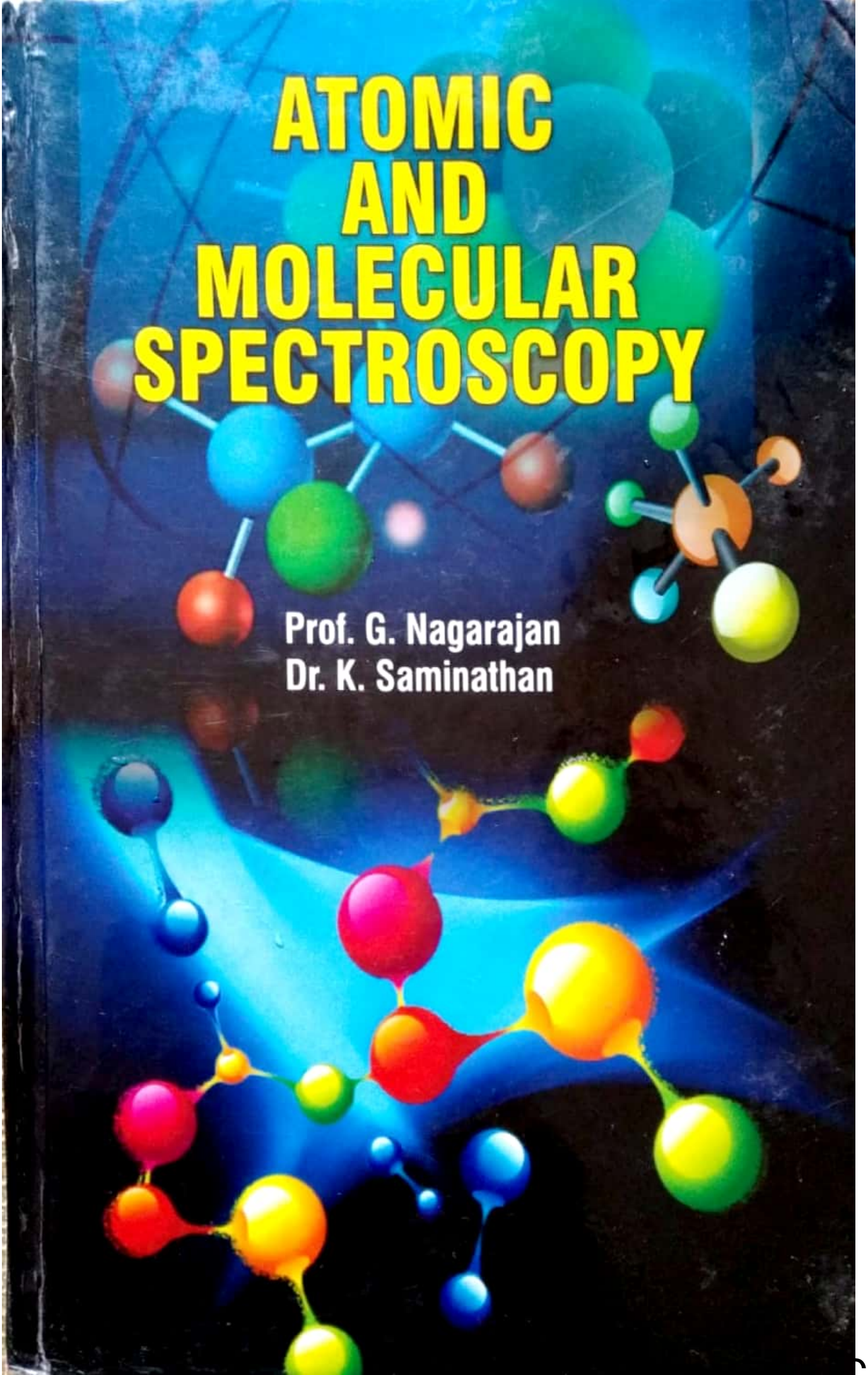

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ATOMIC AND MOLECULAR SPECTROSCOPY

Atomic Spectroscopy is the determination of elemental composition by its electromagnetic or mass spectrum. Atomic Spectroscopy is closely related to other forms of Spectroscopy. It can be divided by atomization source or by the type of spectroscopy used. In the latter case, the main division is between optical and mass spectrometry. Mass spectrometry generally gives significantly better analytical performance, but is also significantly more complex. Molecular spectroscopy sans facts, as present in other books is like a page of music with no instrument to play it on. One can appreciate the sound of music without knowing anything of musical theory although of course one's appreciation is enhanced by knowing some theory. However, a book of musical theory, even if it is illustrated by audible snatches of themes and a few chord progressions, is quite unlike the hearing of a real composition in its entirety. Raman spectroscopy provides information about molecular vibrations that can be used for sample identification and quantitation. The technique involves shining a monochromatic light source (i.e. laser) on a sample and detecting the scattered light. The majority of the scattered light is of the same frequency as the excitation source; this is known as Rayleigh or elastic scattering. This book delineates practical, tested, general methods for ultraviolet, visible and infrared spectrometry in clear language for novice users and serves as a reference resource for advanced spectroscopists.

Contents

About the Author

Prof. G. Nagarajan completed his B.Pharmacy and M.Pharmacy fromThe Tamilnadu Dr MGR Medical University, Chennai and obtained Ph.D degree from PRIST University, Tanjore, Tamilnadu. He is involved in teaching and researching in pharmaceutical chemistry for a period of 17 years. He is a member of the editorial board of various reputed journals. He guided more than 30 M.Pharm students and guiding 2 Ph.D students at present. He published more than 40 research articles in various reputed National and International journals. He is life member of many professional bodies like APTI, IPA & IPGA. Presently he is a professor and Dean in School of Pharmacy, PRIST University, Chennai, Tamil Nadu.

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DEVELOPMENT, CHARACTERIZATION AND PRE CLINICAL EVALUATION OF POLYHERBAL SYRUP FOR ANTIOXIDANT AND HEP ATOPROTECTIVE ACTIVITY

A SRINIVASA RAO[1], S SHOBHA RANI[2], M SRI RAMACHANDRA*[3,]

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[2] Institute of Science and Technology, JNTUH, Hyderabad - 500072, Telanagana, India.

ABSTRACT

The liver problems are on rise which necessitates development of better remedies to contain them. Hence the present study was intended to develop, characterize and evaluate polyherbal syrup containing *Cicer arietinum, Tabebuia argentea, Acacia leucophloea, Biophytum sensitivum* for its hepatoprotective and antioxidant activity. Polyherbal syrup was prepared by taking equal proportions of methanolic extracts of selected plants and simple syrup in 1:5 proportions. The formulation was then characterized for its organoleptic parameters, physicochemical parameters, stability testing and refractive index. It was later evaluated for hepatoprotective and antioxidant activity in CCl_4 induced hepatotoxicity model. The formulation showed significant hepatoprotective and antioxidant activity by restoring altered biochemical and antioxidant enzyme levels in both the models which proved its efficacy in alleviating liver disorders. The study provides a better remedy for liver disorders which needs further substantiation in clinical studies.

KEY WORDS: ***Hepatotoxicity, Polyherbal formulation, Oxidative stress.***

1. INTRODUCTION

Liver diseases have turned into a global concern worldwide[1]. The exposure to various organic compounds (drugs, chemicals, etc.) and environmental pollutants, to form highly reactive substances like reactive oxygen species (ROS) directly or through metabolic activation, which results change in anatomy or functions of liver[2]. The management of liver disorders is a big challenge to the modern medicine. The modern allopathic drugs are unsatisfactory in alleviation of hepatic ailments and some of these drugs adversely affect the liver function. The traditional system of medicine like ayurveda and siddha system of medicine have a crucial role in curing of liver aliments[3].Owing to good safety profile, use of herbal medicine for various diseases have received much attention in worldwide and in India[4]. The herbal formulations that have attained widespread acceptability as therapeutic agents include antidiabetics, hepatoprotective agents, and lipid-reducing agents[5]. However, there are many limitations such as collection, storage, doses, and duration regarding the safety and efficacy of these preparations. A research has been carried out to evaluate hepatoprotective and antioxidant activity of herbal agents as formulation[6]. The formulation contains methanolic extracts of aerial parts except seeds and seed coat of *Cicer arietinum* (Fabaceae), leaves of *Tabebuia argentea* (Bignoniaceae), *Biophytum sensitivum* (Oxalidaceae) and bark of *Acacia leucophloea* (Mimosaceae).

2. MATERIALS AND METHODS

2.1. Preparation of formulation

All the plant materials were collected and authentication was done by Dr. K. Madhava Chetty, Assistant professor, Department of Botany, Sri Venkateshwara University, Tirupati, Andhra Pradesh. Methanolic extracts of each plant prepared by using continuous hot percolation method. These extracts of each plant in equal proportions were mixed with simple syrup in 1:5 v/v ratio. The final liquid dosage form was then subjected to evaluation of quality and Pharmacological activity of the formulation as per official standards.

2.2. Chemicals

Carboxy methyl cellulose, Carbon tetrachloride, Silymarin was purchased from Sri Sai Krishna Enterprises, Hyderabad. Chem. Kit for SGOT, SGPT, SALP, and Total Protein and formalin were purchased from SD Fine chemicals, Chennai.

2.3. Evaluation of polyherbal syrup

The poly herbal formulation was evaluated for organoleptic parameters (color, odour, taste, appearance), physicochemical parameters (pH, specific gravity and viscosity, turbidity, homogeneity). [7] The syrup was subjected for stability testing at temperatures 4°C and 47°C. All the physicochemical parameters were evaluated at intervals of 24 hours, 48 hours and 72 hours to observe any change[7]. Refractive index was measured by Abbe's refractometer. [8]

2.3. Experimental animals

Wistaralbino rats weighing 150-200g were acclimatized forone week in experimental room. The animals were selected for final allotment of the study. Feed and water were given *ad libitum* throughout the study. All the animal experiments were conducted according to the ethical norms approved by the Institutional ethical committee of CPCSEA, New Delhi (Reg.No: 1722/Ro/Ere/S/13CPCSEA).

2.4. Carbon tetrachloride induced hepatotoxic model

Hepatoprotective activity was evaluated using CCl_4 induced hepatotoxicity. In each models 5 groups (n=6) i.e group-I (normal control), group-II (disease control), group-III (standard control), group-IV & group-V received PHF 200 and 400mg/kg b.w/day. Treatment duration in CCl_4 model was 21days. Normal control received 1ml of CMC; standard control received silymarin 50mg/kg/day; disease control groups received CCl_4 – 1ml/kg/day. Blood was collected by retro orbital plexus and transferred to sterilized non-heaparinized syringes to separate serum for biochemical analysis and animals were scarified and liver was isolated and preserved for histopathological examinations. The serum was stored at -10 ºC until biochemical analysis which was carried out within 24 hrs.

2.5. Assessment of hepatoprotective activity

The biochemical parameters includes serum enzymes Serum glutamic pyruvic transaminase (SGPT), Serum glutamic oxaloacetic transaminase (SGOT) by (uv kinetic method)[9], Alkaline phosphatase (SALP) by p-NPP method[10] bySchlebusch *et al.*, 1974., Total Bilurubin by taylor RLS *et al*, 1996[11] and Total Protein by Lowry's method by Dunn *et al*, 1992[12] were estimated.

2.6. Determination of anti oxidant parameters from liver homogenate

Anti oxidant parameters includes superoxide dismutase (SOD) by method ofpyrogallol[13], catalase (CAT) by the method of Aebi (1974)[14], reduced glutathione (GSH) by the method of Ellman, (1959)[15]and malondialdehyde (MDA) by ohkawa *et al,* 1979 by using liver homogenate.

3. STATISTICAL ANALYSIS

The statistical significance was analyzed by using one way analysis of variance (ANOVA) followed by Dunnett multiple comparisons test using Graph Pad Instat 3.

4. RESULTS AND DISCUSSION

4.1. Evaluation of Physicochemical properties and Stability studies:

4.1.1. Evaluation of Physicochemical properties

The density of the polyherbal syrup was found to be 1.103 g/cm^3, specific gravity - 1.106 g/mL, Viscosity - 4.53 cps, pH- 6.7, Refractive index - 1.341. All the physicochemical parameters were found to be in permissible range

4.1.2. Accelerated stability studies

The stability of polyherbal syrup was studied at 4^{0}C, room temperature, and 47^{0}C. There was no change in colour, odour and turbidity. It proved stability of polyherbal syrup at various temperatures.

4.2. Carbon tetrachloride induced Toxicity

Table: 1 Effect of Polyherbal formulation on various biochemical parameters in CCl_4 induced hepatotoxicity model in rats.

Parameters	Treatment groups				
	Group-I	Group-II	Group-III	Group-IV	Group-V
AST (U/L)	52.625±0.78	203.49±5.82$^{\#\#}$	72.95±1.92**	81.77±1.61**	77.47±0.92**
ALT (U/L)	53.26±4.23	233.38±12.1$^{\#\#}$	101.52±0.92**	87.85±2.91**	77.92±2.44**
ALP U/L	114.18±2.88	316.08±4.19$^{\#\#}$	128.58±1.57**	137.36±1.77**	123.69±1.70**
TBL (mg/dl)	0.57±0.04	6.25±0.12$^{\#\#}$	1.15±0.06**	1.44±0.10**	1.12±0.12**
TP U/L	9.255±0.59	2.98±0.14$^{\#\#}$	7.23±0.09**	6.44±0.10**	7.01±0.16**
Liv.wt (g/100g)	3.56±0.10	6.21±0.16$^{\#\#}$	4.13±0.04**	4.57±0.05**	4.28±0.08**
liv.vol (ml/100g)	4.34±0.12	6.82±0.11$^{\#\#}$	5.03±0.15**	5.49±0.09**	5.23±0.11**

Values were expressed as Mean±SEM (n=6), the statistical significance was analyzed by using one way analysis of variance (ANOVA) followed by Dunnett multiple comparisons test using GraphPadInstat3. P values: $^{\#}$P< 0.05 or *P< 0.05 (Significant), $^{\#\#}$P< 0.01 or **P< 0.01 (Highly significant), $^{\#\#\#}$P< 0.001 (Very highly significant) and compared to normal control group. **Values were highly significant at P< 0.01when compared to control group. ^{ns}Values were Not significant at P> 0.05 when compared to toxic control group. (#-Vs Normal control; * - Vs disease control)

Table: 2 Effect of Polyherbal formulation on antioxidant parameters in CCl_4 induced hepatotoxicity model in rats.

Treatment	Treatment Groups				
	Group-I	Group-II	Group-III	Group-VI	Group-V
SOD(u /mg of protein)	182.32±1.11	71.12±0.12$^{\#\#}$	161.2±1.13**	143.21±1.21**	**156.21±1.14****
CAT (u M/min/ mg of protein)	28.92±0.31	7.32±2.12$^{\#\#}$	21.10±0.98**	19.23±0.78**	**22.12±0.98****
GSH (µ mol / 100 mg of protein)	88.12±1.49	30.24±2.1$^{\#\#}$	71.32±1.12**	65.12±1.14**	**74.31±0.98****
MDA (n moles /100 mg of tissue)	0.39±0.12	5.42±1.12$^{\#\#}$	1.1±0.43**	1.56±1.14**	**1.21±0.09****

Values were expressed as Mean±SEM (n=6), the statistical significance was analyzed by using one way analysis of variance (ANOVA) followed by Dunnett multiple comparisons test using GraphPadInstat3. P values: $^{\#}$P< 0.05 or *P< 0.05 (Significant), $^{\#\#}$P< 0.01 or **P< 0.01 (Highly significant), $^{\#\#\#}$P< 0.001 (Very highly significant) and compared to normal control group. **Values were highly significant at P< 0.01when compared to control group. ^{ns}Values were Not significant at P> 0.05 when compared to toxic control group. (#-Vs Normal control; * - Vs disease control).

A strong exposure to CCl_4 leads to severe liver damage which is stimulated by cytochrome P-450 dependent mixed oxidases and produce free radical trichloromethyl (CCl_3 and Cl_3COO), which acts on the membrane of the endoplasmic reticulum and other cellular membranes resulting in an increase in calcium ion permeability through the plasma membrane causing severe instabilities of calcium homeostasis leading to necrotic cell death. These changes cause marked disruption of cell integrity, followed by excessive leakage of transaminases into the blood, leading to substantial rise of its enzymes (AST, ALT, and ALP) and total bilirubin. These elevations were observed in disease control group which indicated that the hepatotoxicity was developed by CCl_4. Higher and lower doses of polyherbal formulation 400 mg/kg, 200 mg/kg showed significant decrease in liver enzymes (AST, ALT and ALP) and total bilirubin and increase in total protein levels (Table: 1). Chronic exposure of CCl_4 cause excess production of free radicals leading to depletion of natural antioxidant enzymes like superoxide dismutase, catalase and reduced glutathione.[16] As a result of reduction of these antioxidant enzymes the free radicals cause the oxidation of lipids or thiol moiety of biomembranes of hepatocytes leading to lipid peroxidation and release of thiobarbituric acid reactive substances (TBARS).[17] Significant reduction in the levels of antioxidants like SOD, CAT, GSH and increase

in lipid peroxidation in CCl_4 treated group indicates the induction of hepatotoxicity. This herbal syrup exhibited dose dependant protective effect on hepatic parameters. High doses of the formulation (400mg/kg) significantly normalized the altered the biochemical and antioxidant parameters (Table: 2).

5. CONCLUSION

Our investigations confirmed the hepatoprotective effect of the herbal formulation and revealed its effect in alleviating oxidative stress induced by CCl_4 in a dose-dependent manner. Herbal formulation significantly reduced the levels of AST, ALT, ALP, TB, and increase the level of TP, SOD, CAT and GSH. These findings are also confirmed by histopathological observation. Traditionally these plants were reported with hepatoprotective activity. The hepatoprotective and antioxidant activity of polyhedral formulation could be attributed to synergistic interaction of phytochemicals present in it. Further studies are warranted to confirm its effect clinically.

6. ACKNOWLEDGEMENTS

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SP-05

HEPATOPROTECTIVE ACTIVITY OF TABEBUIA ARGENTEA LEAF EXTRACTS AGAINST PARACETAMOL INDUCED LIVER DAMAGE INALBINO WISTAR RATS.

A SRINIVASA RAO[1], S SHOBHA RANI[2], M SRI RAMACHANDRA*[3,]

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[2] Institute of Science & Technology, JNTUH, Hyderabad, India.

ABSTRACT
The study was designed to evaluate *in vitro* antioxidant and hepatoprotective activity of *Tabebuia argentea* leaf extracts against Paracetamol induced liver damage in albino Wistar rats.The *in vitro* antioxidant activity was evaluated by measuring superoxide radical, hydrogen peroxide radical, hydroxyl radical, nitric oxide radical reducing power and estimation of phenolic content of petroleum ether, methanolic and aqueous extracts of *Tabebuia argentea*. Hepatoprotective activity of the extracts was screened against Paracetamol (3gm/kg b.w) at doses of 200 and 400 mg/kg by estimating biochemical parameters (SGPT, SGOT, SALP, TB and TP), physical parameters (liver weight, liver volume) and histopathological changes in liver with silymarin (50mg/kg, b.w.) as standard.Methanolic, aqueous and Pet.ether extracts of plant showed good antioxidant activity. Administration of plant extracts resulted in significant reduction in SGPT, SGOT, SALP and TB and increase in TP as compared to disease control group. They also reduced the liver weight and liver volume. In plant extract treated groups histological aberrations were reduced as compared to disease control. Among all the extracts the META showed a significant effect at high dose (400 mg/kg) ($p< 0.001$) compared to lower dose. This evidence showed that the plant has antioxidant and hepatoprotective activity. From the results it can be concluded thatthe*Tabebuia argentea* possesses antioxidant and hepatoprotective effect against Paracetamolinduced liver damage in rats.

Key words: ***Tabebuia argentea*, Paracetamol, Silymarin and Hepatotoxicity**

1. INTRODUCTION:

Liver is a vital organ which maintains homeostasis by performing various activities like production of bilirubin, plasma proteins, metabolism of carbohydrates, lipids, proteins and detoxification of chemicals and drugs etc[1]. *Tabebuia argentea* (*Bignoniaceae)* is a flowering trees and commonly called as 'silver trumpet tree with Silvery gray leaves, bark is corky, Leaves are palmate, opposite, 11 inches long and 4 inches wide.[3] They are rich source of many organic compounds, especially, of phenolic and polyphenolic substances. It was intended to investigate the hepatoprotective activity of *T.argentea* using paracetamol model.

2. MATERIALS AND METHODS:

2.1 Preparation of plant extracts: The leaves of *Tabebuia argentea* were collected and authenticated by Dr.*Madhava Setty, d*epartment of Botany, S.V University, tirupati. The leaves were shade dried and powdered. The powder was subjected to successive solvent extraction by using petroleum ether, methanol and water. Then the dried extract was obtained by evaporation of the solvent using a rotatory vacuum evaporator at 50 ºC and kept in dessicator and studied for phytochemical, *in vitro* antioxidant activity and examined for their hepatoprotective activity in rats.

2.2 *In Vitro* antioxidant studies: Petroleum ether, methanol and aqueous extracts were subjected for *in vitro* antioxidant studies namely viz., superoxide[4], hydrogen peroxide[5] , nitric oxide [6] hydroxyl radical scavenging activity [5] and reducing power[7]. Its total phenol content [8]were also studied.

2.3. Experimental animals:

Healthy Wistar albino rats weighing 170-180g were acclimatized for7 days and selected for study. Feed and

water were given *ad libitum* throughout the study. All the animal experiments were conducted according to the ethical norms approved by the Institutional ethical committee of CPCSEA, New Delhi (Reg.No: 1722/Ro/Ere/S/13CPCSEA).

2.4. Paracetamol induced hepatotoxic model: To evaluate the hepatoprotective potential of *T.argentea*in Paracetamol (PCM) - induced hepatic damage, rats were randomly divided into nine groups. Group I served as a control, Group-II is served as disease control(3gm/kg)[9], Group III received daily oral dose of Silymarin (50mg/kg b.w.), Group IV and V received once daily oral dose of 200, 400mg/kg b.w. of PETA respectively along, Group VI and VII received once daily oral dose of 200, 400mg/kg b.w. of META, Group VIII and IX received once daily oral dose of 200, 400mg/kg b.w. of AQTA respectively for 7 days. Except group I all were treated with single dose administration of PCM 3gr/kg oral route. Liver parameters were estimated by colleting the blood from retro orbital plexus. They includes serum enzymes SGPT, SGOT by (uv kinetic method), ALP by by p-NPP method by Schlebusch *et al.*, 1974.[10] Total Bilurubin by taylor RLS *et al*, 1996[11] and Total Protein by Lowry's method by Dunn *et al*, 1992 were estimated. Physical parameters like liver weight and liver volume were determined.

3. STATISTICAL ANALYSIS:

The data was represented as mean ± SEM. The statistical significance was analyzed by using one way analysis of variance (ANOVA) followed by Dunnett multiple comparisons test using Graph Pad Instat 3.

4. RESULTS AND DISCUSSION:

4.1. Phytochemical investigations of *T. argentea*:

Phytochemical investigations of *Tabebuia argentea* showed the presence of carbohydrates glycosides, saponins, alkaloids, phytosterols, proteins, phenolics, tannins and flavonoids in its methanolic extract whereas aqueous extract of the plant showed similar constituents except phytosterols. Petroleum ether extract showed presence of fats and fixed oils.

4.2 Estimation of total phenolic content:

The methanolic extract contains more Phenolic content (69.23 mg GAE/ g of extract) compared to petroleum ether (53.21 mg GAE/ g of extract) and aqueous extract (10.32 mg GAE/ g of extract).

4.3*In vitro* antioxidant studies:

Table: 1 Effect of T. argentea leaves extracts against superoxide, hydrogen peroxide, nitric oxide and hydroxyl radicals and its reducing power.

Free radical scavenging activity (% Inhibition)						
Compound	Conc µg/ml	superoxide	hydrogen peroxide	nitric oxide	hydroxyl	reducing power
ascorbic acid	100	45.14	44.13	34.23	41.41	41.77
	200	48.14	50.35	50.47	49.59	43.98
	300	50.06	54.57	55.07	53.93	47.99
	400	52.67	59.5	59.67	59.22	55.32
	500	55.5	62.32	64.14	61.31	60.3
Pet ether Extract	100	32.92	37.37	22.19	28.08	19.64
	200	37.31	41.46	25.3	32.1	26.69
	300	41.7	44.47	27.6	34.34	29.46
	400	43.8	48.07	32.2	39.64	32.36
	500	48.55	50.48	33.69	43.49	34.3
Methanol	100	37.99	41.78	38.29	25.04	32.78

	200	43.43	45.77	42.76	32.42	40.24
	300	46.63	49.29	44.51	37.39	41.77
	400	49.38	52.11	47.63	42.21	45.78
	500	53.08	54.81	50.6	47.51	51.31
Aqueous Extract	100	41.01	40.14	37.07	24.71	31.12
	200	44.85	45.3	41.54	29.21	34.16
	300	47.73	50.96	44.24	34.18	40.24
	400	48.97	53.48	47.63	40.44	41.77
	500	51.44	55.28	51.15	46.7	46.47

Oxidative stress is the root cause of many aliments results in production of free radicals. They are highly unstable in nature and they attack on various cellular components leads to lipid peroxidation and subsequence damage. Antioxidants are the substances which quench these free radicals and protect the tissues and organs from their invasion. The free radical scavenging activity of petroleum ether, methanolic and aqueous extracts of *T. argentea* was carried out. Three extracts of *T. argentea* showed dose dependent inhibition of hydroxyl, hydrogen peroxide, superoxide, nitric oxide and their reducing ability. The superoxide and hydroxyl radical scavenging activity of methanolic extracts were found to be relatively better than that of aqueous and petroleum ether extracts. Whereas hydrogen peroxide and nitric oxide scavenging activity and inhibition of reducing power of the free radicals of methanolic extracts was found to be prominently better than that of aqueous and petroleum ether extracts. The total phenolic content of methanolic extract of *T. argentea* which might be the reason for its better activity compared to petroleum ether and aqueous extracts.

4.3 Paracetamol induced hepatotoxicity:

Table: 2 Effect of on T.argentea various biochemical parameters in PCM Induced hepatotoxicity model in rats.

Groups	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII	Group X
AST	62.84±2.18	237.89±4.27$^{\#\#}$	78.12±2.10**	210.9±4.08**	175.7±3.31**	169.50±2.77**	**119.6±4.40****	171.8±3.38**	135.89±2.82**
ALT	86.23±1.99	290.45±4.16$^{\#\#}$	119.85±3.03**	251.3±3.90**	231..82±3.92**	201.40±2.40**	**145.8±3.51****	211.99±3.20**	161.02±5.71**
ALP	131.03±3.76	334.17±6.46$^{\#\#}$	138.02±1.27**	311.69±3.91**	281.53±4.67**	243.65±4.51**	**199.1±3.32****	249.1±7.11**	215.61±3.70**
TBL	0.525±0.05	6.23±0.12$^{\#\#}$	0.95±0.04**	5.19±0.05**	4.87±0.08**	3.78±0.14**	**2.21±0.06****	3.81±0.11**	2.56±0.09**
TP	8.07±0.21	2.96±0.06$^{\#\#}$	6.87±0.07**	3.6±0.10**	3.87±0.04**	3.89±0.07**	**4.24±0.06****	3.78±0.13**	3.98±0.14**
Liv.Wt	3.51±0.10	6.11±0.11$^{\#\#}$	4.23±0.08**	5.89±0.04^{ns}	5.97±0.05^{ns}	5.13±0.05**	**4.98±0.05****	5.33±0.05**	5.1±0.04**
liv.Vol	4.54±0.11	6.72±0.16$^{\#\#}$	5.01±0.04**	6.51±0.17^{ns}	6.3±0.05*	6.12±0.06**	**5.9±0.04****	6.22±0.07**	6.09±0.06**

Values were expressed as Mean±SEM (n=6), the statistical significance was analyzed by using one way analysis of variance (ANOVA) followed by Dunnett multiple comparisons test using GraphPadInstat3. P values: $^{\#}$P< 0.05 or *P< 0.05 (Significant), $^{\#\#}$P< 0.01 or **P< 0.01 (Highly significant) and compared to normal control group. **Values were highly significant at P< 0.01when compared to control group.^{ns}Values were Not significant at P> 0.05 when compared to toxic control group. (#-Vs Normal control; * - Vs disease control)

At higher doses, paracetamol has the potential to damage hepatocytes and cause hepatotoxicity. It undergoes metabolism/ bioactivation to release a reactive metabolite known as N-acetyl paraquinone imine (NAPQI).The levels of these three enzymes were found to increase in disease control group indicating the induction of hepatotoxicity by paracetamol. Amelioration of the levels of these enzymes after treatment with petroleum ether, methanolic and aqueous extracts of *T. argentea* indicate their protective effect against paracetamol induced hepatotoxicity. During haptopathy there will be increase in bilirubin levels due to the damage of hepatocytes. Prior treatment with various extracts of *T.argentea* significantly reduced total bilirubin level. During the hepatotoxicity the proteins of the liver tissue undergo denaturation under the catalytic influence of NAPQI. Elevation of the total protein content in treatment groups indicates antidenaturation effect of the plant. Inflammatory changes in hepatocytes leads to increase in liver weight and volume which indicate hepatotoxicity as observed in group II. Reduction in these parameters after treatment with extracts indicate their hepatoprotective activity. (Table: 2).

5. CONCLUSION:

Our investigations established that *T.argentea* showed *in vitro* antioxidant and hepatoprotective activity in PCM model in a dose-dependent manner. It should be further evaluated clinically to substantiate its use for liver related disorders.

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Effect of Aqueous Extract of *Colocasia esculenta* against High Fat Diet Induced Non Alcoholic Fatty Liver Disease in Rats

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Background: Nonalcoholic fatty liver disease (NAFLD) is becoming a major public health problem due to the increasing incidence of obesity and diabetes in India for the last two decades. The present work is aimed to investigate the effect of aqueous extract of *Colocasia esculenta* against (AECE) high fat diet induced nonalcoholic fatty liver disease in wistar albino rats. **Methods:** Rats were randomly divided into four groups (*n*=6 per group) as follows: Normal control (standard laboratory diet); HFD control (High fat diet); HFD+AECE (200mg/kg); HFD + AECE (400mg/kg) for 60 days. After treatment the rats fasted for 12-14hrs and were then euthanized; all of their blood as well as their livers were collected for estimation of biochemical parameters and histopathological studies. **Results:** Treatment with aqueous extract of *Colocasia esculenta* (200mg/kg, 400mg/kg b.w) significantly reduced the body weight and body weight gain. In addition, significantly reduced the serum triglycerides, total cholesterol, LDL cholesterol, VLDL cholesterol and showed significant increase in HDL cholesterol. High fat diet fed control rats treated with AECE at doses 200,400 mg/kg body weight produced significant decrease in liver cholesterol content and triglyceride content. High fat diet fed control rats treated with AECE at doses 200, 400 mg/kg body weight produced significant decrease liver enzyme markers. Treatment with AECE at dose 200 mg/kg body weight produced significant increase in liver anti-oxidant system also reversed the Histopathological changes. **Conclusion:** Aqueous extract of *Colocasia esculenta* may be beneficial in the non-alcoholic induced fatty live in rats in dose dependent manner.

Keywords: *Colocasia esculenta,* HFD, Histopathological, NAFLD.

Neuroprotective Effect of Pentoxifylline on Chronic Ethanol Induced Cognitive Impairment in Male Albino Mice

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Background: Alcoholism is a chronic disease characterized by unrestrained drinking. Several studies revealed that chronic alcoholism affects the prefrontal cortex and hippocampus of the brain, resulting in cognitive impairment. Pentoxifylline (Ptx) is a methyl xanthine derivative having potent antioxidant activity, where it acts as a competitive nonselective phosphodiesterase inhibitor. Recent studies revealed that it also has neuroprotective action. **Objectives:** To investigate the neuroprotective effect of Pentoxifylline (Ptx) on chronic Ethanol (EtOH)-induced cognitive impairment in male albino mice. **Methods:** Adult male albino mice (weighing 25-30 g) were allocated into four groups (*n*=5) and Group 1 given with 10% EtOH; Group 2 given with 10% EtOH+ Ptx (100mg/kg, i.p); Group 3 given with 20% EtOH; Group 4 given with 20% EtOH+ Ptx (100mg/kg, i.p) up to 60 days, At the end of the study behavioral, biochemical parameters and also histopathological studies were performed. **Results:** EtOH treated groups showed a substantial decrease in inflexion ratio in the elevated plus maze, time spent in target quadrant region in Morris water maze and retention latency in passive avoidance test. Furthermore, EtOH treated groups exhibited a considerable decrease in catalase, superoxide dismutase, GABA levels and increased glutamate, acetylcholinesterase levels when contrasted to Ptx-treated groups ($P< 0.05$), which indicated antioxidant and neuromodulatory effects of Pentoxifylline. **Conclusion:** From the study, EtOH treated groups exhibited alteration in spatial memory and reinstated to normal in Ptx treated groups. Further research is essential to explore its precise molecular mechanism on cognition in chronic alcoholism.

Keywords: Acetylcholinesterase, Alcoholism, Cognitive impairment, GABA, Glutamate, Hippocampus, Pentoxifylline.

Evaluation of Cardioprotective Effect of Indol-3-Carbinol in High Salt Induced Myocardial Stress and Hypertrophy in Male Sprague dawley rats

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Objectives: The present research is aimed at to explore the cardio-protective activity of Indole 3 Carbinol against high salt induced myocardial stress and hypertrophy in male Sprague Dawley rat. **Methods:** In this study male Sprague dawley rates were divided into five groups. Each group consists of 6 rats (N=6). Group-I treated with normal water and feed, Group-II subjected with high salt diet (8% NaCl), Group-III treated with high salt diet (8% NaCl) + Losartan (20mg/kg, p.o), Group-IV treated with high salt diet (8% NaCl), + I3C (10mg/kg, p.o) and Group-V treated with high salt diet (8% NaCl), + I3C (40mg/kg, p.o). The animals were treated for 63 days periods. After completion of treatment period, the biochemical and histopathological analysis were carried out on collected serum as well as heart samples. **Results:** Finally, I3C treated rats observed with significant reduction of CK-MB, LDH (serum) myeloperoxidase, Malondialdehyde (cardiac tissue) levels and significant improvement of catalase, SOD, GSH (cardiac tissue) compared with high salt diet (8% NaCl) group animals and also observed normal histoarchitecture of cardiac tissue in I3C treated rats animals. **Conclusion:** Indole-3-Carbinol at 40mg/kg may be considered with this preliminary examination (biochemical and histopathology) as potential source of cardio-protective agents.

Keywords: Indole-3- carbinol, High salt diet, myocardial stress, Hypertrophy.

Effect of *Annona squamosa* Linn against Aluminium Chloride Induced Alzheimers in Rats

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Objectives: The present study is aimed to investigate the polyphenolic fraction of *Annona squamosa* Linn (PFAS) against aluminium chloride induced Alzheim-

ers disease in rats. **Methods:** Wistar rats were divided into Group I normal control: received distilled water, Group II: received Aluminum chloride (100mg/kg, oral). Group III and IV received PFAS (200mg/kg, 400mg/kg, oral respectively) and inducing agent (Aluminium chloride-$AlCl_3$ 100mg/kg, oral). Group V received Donepezil (1mg/kg, oral) and inducing agent ($AlCl_3$ 100mg/kg, oral). The rats were given respective treatment for 28 days and behavioural parameters were determined on 1st day, 15th and 28th day. After 28th day rats were sacrificed and anti-oxidant parameters, brain Acetylcholinesterase content were determined along with histopathological studies. **Results:** The polyphenolic fraction of *Annona squamosa* Linn showed dose dependent protective effect against Alzheimer's disease by significant improvement in locomotor activity, motor coordination, spatial memory and conditioned avoidance response, significant decrease in Lipid Peroxidation (LPO), acetyl cholinesterase (AchE) and increase in anti-oxidants compared to aluminium chloride treated rats. PFAS mitigated the $AlCl_3$ induced histological changes by dose dependently. **Conclusion:** PFAS showed potent neuroprotective effect against $AlCl_3$ induced oxidative stress in rats. Hence it would be promising compound to treat AD. This work was funded by University Grants Commission-SERO, Hyderabad.

Keywords: *Annona squamosa* Linn, Alzheimer's disease, Neuroprotective effect.

Phytochemical Investigation, Evaluation of Cytotoxic Potential and Morphological Behaviour of *Croton scabiosus* Bedd against Lung and Breast Cancer Cell Lines

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Background: *Croton scabiosus bedd* is an endemic plant belongs to the family *Euphorbiaceae* found in eastern and Western Ghats of Andhra Pradesh. According to the folklore information available in the literature this bark extract is generally used to treat tumors and in snake bite poisoning. **Objectives:** In the present study GC-MS and HPTLC spectral analysis were performed for acetone (M1), chloroform (M2) and ethyl acetate (M3) bark extracts. Terpenes, Saponins, Flavonoids and Steroids were identified as chief constituents. **Methods:** Since terpenes and saponins show potent anticancer activity, cytotoxic activity and morphological behaviour study were performed against Lung adenocarcinoma (A-549) and Breast adenocarcinoma (MCF-7) cell lines by MTT assay. **Results:** The results are given as IC_{50} values and stated that Chloroform extract had shown better retardation of cellular growth against both A-549 and MCF-7 cells. **Conclusion:** Ethyl acetate extract had shown retardation of cellular growth against A-549 only but not againstMCF-7.

Keywords: Breast adenocarcinoma cell lines, *Croton scabiosus bedd*, GC-MS, HPTLC, Lung adenocarcinoma, MTT assay, Morphological behavior.

Nephroprotective Activity of Acetone Extract of *Macrotyloma uniflorum* Seed Extract against Cisplatin Induced Renal Failure

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Objectives: The present study was undertaken to evaluate the Nephroprotective activity of *Macrotyloma uniflorum* seeds extract using Cisplatin induced nephrotoxicity in rats. **Methods:** A total of 30 male wistar rats were randomly divided in to 5 groups with 6 rats in each group. Group I- received vehicle, Group II- received cisplatin (7mg/kg, i.p) only on 7th day, Group-III and IV - received acetone extract at the dose of 250mg/kg and 500 mg/kg respectively for 10 days along with cisplatin on 7th day of treatment protocol. Biochemical marker of renal failure was estimated in collected urine as well as in the serum. Kidney tissue was used for antioxidant parameters and histopathological examination. **Results:** Acetone extract of *Macrotyloma uniflorum* seed powder treated animals observed with restoration of renal function markers in dose dependent manner and is indicated by significant increase in of 24 hr urine volume ($P< 0.01$, $P< 0.001$), urine creatinine ($P< 0.01$), creatinine clearance ($P< 0.05$, $P< 0.001$) and significant decrease in serum parameters such as blood urea nitrogen ($P< 0.05$ $P< 0.01$), serum creatinine ($P< 0.01$, $P< 0.001$), albumin ($P< 0.05$) and urea ($P< 0.001$) compared to cisplatin treated animals. Seed extract significantly increased endogenous antioxidant enzymes such as SOD ($P< 0.05$ $P< 0.01$), CAT ($P< 0.001$) and GSH ($P< 0.01$ $P< 0.001$) and significantly decreased MDA ($P< 0.001$) content compared to cisplatin treated group. Pathological alterations in kidney tissue architecture such as sever tubular necrosis; tubular vacuolization and dilation were significantly improved by *Macrotyloma uniflorum* seed extract treatment. **Conclusion:** From the observations of phytochemical investigations, renal function markers, antioxidant marker and histopathological changes conclude that *Macrotyloma uniflorum* seed extract may afford renoprotective effect against Cisplatin chemotherapy induced renal failure.

Keywords: Antioxidant markers, Histopathological changes, *Macrotyloma uniflorum* seed extract, Renal function markers, Total flavonoid content.

Pre-clinical Drug Interaction study of Trazadone with Pioglitazone

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Background: Management of hyperglycaemia requires continuous treatment and the risk of depression is double in diabetic patients. Therefore, treatment of depression in diabetic patients is liable to increase multiple drugs usage. Pioglitazone and trazadone are most generally used drugs in diabetes and depression respectively. Both of these drugs are metabolised by CYP 3A4 enzymes. Simultaneous usage of these drugs may leads to drug interaction. Therefore, this study aimed to evaluate the potential drug interaction between trazadone and pioglitazone. **Methods:** Blood glucose levels were estimated by GOD/POD method and pioglitazone serum levels by HPLC method for pharmacokinetic data. **Results:** Trazadone enhances the hyperglycaemic effect of pioglitazone by altering metabolism of pioglitazone. **Conclusion:** Care should take while treating depression in diabetic patients with trazadone and pioglitazone and dose modification is necessary. This work was funded by University Grants Commission-SERO, Hyderabad.

Keywords: CYP 3A4, Drug interaction, Pioglitazone, Trazadone.

Evaluation of Cardioprotective Effect Activity of *Rumex vesicarius* Leaf Extract in Doxorubicin Induced Cardiotoxicity in Wistar Male Albino Rats

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Background: Myocardial infarction is one of the leading causes of death for both men and women all over the world. **Objectives:** The present study was to investigate the protective effect of hydro alcoholic extract of *Rumex vesicarius* (HAERV) leaves in doxorubicin induced cardio toxicity. **Methods:** Doxorubicin (DOX) 10 mg/ kg *i.p.* single dose was given to cause cardiac damage

and the levels of cardiac biomarker enzyme such as LDH, CK-MB, Calcium, AST, ALT and antioxidants catalase (CAT), glutathione (GSH) and lipid peroxidation (LPO) were observed and in the end of experiment histopathology was carried out for heart. Standard Amlodipine (5 mg/kg b. wt, *p.o*) and HAERV (200 and 400mg/kg b. wt, *p.o*) were given in combination with DOX 10 mg/kg *i.p*. single dose to rats at the 30th day of experiment and as a pretreatment for 29 days. **Results:** Pretreatment with standard Amlodipine and HAERV significantly (P<0.001) reduced the elevated cardiac toxicity biomarker enzyme level and raised the level of antioxidants such as CAT, GSH and decrease LPO in the extract treated groups as compared to the disease control group. In the histopathological studies, standard Amlodipine and HAERV showed protection against myocardial toxicity induced by doxorubicin. **Conclusion:** The present study indicates that the pretreatment of HAERV significantly reduce the (DOX) induced cardio toxicity.

Key words: Myocardial infarction, *Rumex vesicarius*, CK-MB, LDH, Lipid peroxidation.

Effect of *Terminalia catappa* Leaf Extract Oncafeteria Induced Obesity in Rats

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Objectives: To investigate the anti-obesity effect of *Terminalia catappa* leaf extract on cafeteria induced obesity in rats. **Methods:** The animals were divided into five groups of six animals each and individually housed in cages. The normal control group continued to be fed laboratory pellet chow *ad libitum*. The cafeteria diet-control group received the cafeteria diet in addition to the normal pellet diet (NPD). The remaining three groups were fed with the cafeteria diet and NPD along with *Terminalia catappa* leaf extract (200 mg/kg, p.o, 400 mg/kg, p.o.) and orlistat (45 mg/kg, p.o.), respectively, for 4 weeks. Body weight and daily food intake were measured regularly during the experimental period. The various adipose pads were weighed and serum total cholesterol (TC), triglyceride (TG), LDL, VLDL and high-density lipoprotein cholesterol (HDL-C) were measured. **Results:** The *Terminalia catappa* leaf extract -treated groups showed a significant decrease in body weight and various adipose pad weight and serum, TC, TG, LDL,VLDL and increase in HDL levels after 4 weeks treatment. Also decrease the adipose tissue size and adipocyte number. **Conclusion:** At present study, *Terminalia catappa* leaf extract can inhibit the development of obesity and hyperlipidemia on cafeteria induced obesity in rat. The effects appear to be partly because of various phytoconstituents of *Terminalia catappa* leaf extract. But further studies are still wait for establishing mechanism and isolation of phytoconstituents. And by observing above results *Terminalia catappa* leaf extract can act as adjuvant in obesity treatment.

Keywords: Antiobesity, Cafeteria diet, *Terminalia catappa*.

Growth Inhibitory Effect and Photo Stability of Anthocyanin Fractions of three Hybrids of *Rosa* Species against Ciprofloxacin Resistant Pathogenic Bacteria

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Objectives: This study was aimed to investigate the antimicrobial potential petals of *Rosa* species. **Methods:** The petals of three flowers were subjected to cold maceration by hydro-methanolic mixture for a period of 48 hr at room temperature. The % yield of extracted values for Red rose, Yellow rose and Orange rose for 2.5%, 2.2% and 2.9% respectively. All the extracts were resinous in nature and were dried in petri plate and were positive for anthocyanins. The pigment film was very thin and uniform with high colour intensity. **Results:** These coloured pigments were tested for the colour stability using photo-oxidation, the result was significant reduction in OD value that means instability. Among all flowers, Red rose was found more intense in the colour and also relative more stable. Anti-bacterial activity was performed against ciprofloxacin resistant species including *S. Aureus, B. Subtilis, E. coli, K. Pneumonia* and *P. Vulgaris* at 50 and 100µg/ml by micro dilution method. Among all the red rose and yellow rose fractions showed % inhibition of 69.5 and 69.0 % respectively on *klebsiella pneumoniae*. **Conclusion:** All three fractions were effective on both *E. Coli* and *B. Subtilis* with more than 60% inhibition. The % inhibition of other bacteria was below 50%.

Keywords: Anthocyanins, B. Subtilis, *E. coli, K. Pneumonia*, Micro dilution method, *P. Vulgaris*.

The Anticancer and Antitubercular Activity of Bio Guided Fractions of *Tinospora cordifolia* and their Immunomodulatory Activity

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Background: Natural products with immunomodulatory activity are widely used in treatment of many diseases including autoimmune diseases, *Tinospora coridifolia* is a well-known medicinal plant and is widely used in folk medicine/Ayurveda system of medicine. **Methods:** The leaves of the plant *Tinospora cordifolia* were extracted by cold maceration using ethanol, ethyl acetate and n-hexane. All the extracts were screened for their antitubercular, anticancer activities and IL-10 expression (in HCT-116 cells) using luciferase reporter phage (LPS), MTT and flow cytometry assay methods, respectively. **Results:** The antitubercular and anticancer screening data revealed that ethyl acetate and n-hexane extracts demonstrated promising (p<0.05) antitubercular activity with respective inhibition (%) of 92 % and 86 %, at 100µg/ml whilst their corresponding IC_{50} values for anticancer activity was 63.99 and 113.7 µg/ml respectively on HeLa and HCT-166 cells. Overall, ethanol extract was relatively less active. The flow cytometric assay for n-hexane extract demonstrated the significant (p<0.05) IL-10 expression (44.12 MFU) in HCT-116 cells against the control cells (8.48 MFU). The GC-MS analyses of n-hexane extract showed presence of tembatarine, berberine, cordifoliside E and magnoflorine as major constituents. NHTR was fractionated into 11 fractions (T1- T11) and were screened against HCT-116 cancer cell lines. **Conclusion:** T11 showed potent activity against HCT-116 cancer cell lines with IC_{50} value of 40.8µg/ml, it inhibits the cell cycle 's' phase and morphology changes of cells observed.

Keywords: Anticancer, Antitubercular, HCT-116, HeLa, IL-10, Immunomodulatory, MCF-7, *Tinospora cordifolia*.

Design and Development of Cefotaxime Mucoadhesive Films from Natural Mucilage of Sago Pearls

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Objectives: The present research work aims to prepare and evaluate the Mucoadhesive films containing Cefotaxime an antibiotic drug using different ratios of polymers and sago beads mucilage. **Methods:** The film was prepared by solvent casting technique using glycerin, chitosan, acetic acid and sago beads mucilage. Prepared films were evaluated for their appearance, weight variation, thickness, folding endurance, moisture uptake, tensile strength and

percent elongation, content uniformity, surface P^H. **Results:** The thickness of the unloaded films for formulations F1 to F5 showed in the range of 132-245 µm and all the formulations exhibiting almost uniform thickness but the films loaded with different concentrations of drug showed the varying thickness. The formulations F1-F5 containing 10% drug showed thickness in the range of 198-399 µm. Films were found to be stable at accelerated stability conditions. The percentage drug content of all films was found to be between 98.24% - 102.42% of c. The stability study of the formulated films was carried out under different environmental conditions. The film was packed in the aluminum foil and stored in stability chamber for stability studies at 2-8°C (45% RH) 25-30°C (60% RH) and 45-50°C (75% RH) for a period of 45days. **Conclusion:** Amongst all formulae, the formulation F4 showed the highest dissolution rate.
Keywords: Cefotaxime, Mucoadhesive films, Natural mucilage, Sago pearls.

Mucoadhesive Properties of *Datura stramonium* Leaves Mucilage: Design and Characterization

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Objectives: The objective of the present study is to extract mucilage from *Datura stramonium* leaves and scrutinize the numerous possessions of the dried mucilage to measure its functionality as an excipient. The petition for matrix-forming matrices, both synthetic and natural, is clearly established by scrutiny of the numbers applied the large number of developing industrialists and research. **Methods:** Different mucoadhesion properties were performed for natural and synthetic polymer viz., shear stress, tensilestrength and viscosity. The matrix films were prepared by molding method. The films were evaluated for physical properties, drug uniformity, bio adhesive strength and *in-vitro* drug release. **Results:** It was obvious from this work that the formulation F-5with *DSLM* (dried) showed maximum bio adhesive strength *in vitro* drug release was found to be good end of 10 h with non-fickian diffusion mechanism. The stability studies of F-5 revealed that there was no change in bio adhesive strength and *in-vitro* release when stored at stressed storage conditions. **Conclusion:** It was concluded that *Datura stramonium* leaves mucilage shows better bio adhesive strength.
Keywords: Bio adhesion, *Datura stramonium*, Films, Release.

Development and Characterization of Granisetron HCl Mouth Melt Films by 32 Factorial Design

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Objectives: The purpose of the present study was to develop and characterize Granisetron HCl mouth melt films for the effective treatment of emesis by the application of 3^2 factorial design. **Methods:** The formulation development was carried out by experimental design using Design-Expert software (version 11). FT-IR studies confirmed the compatibility between the Granisetron drug and the excipients used. In the present study, the experimentation was performed at three levels using Dehydrated Banana powder and Orange peel pectin powder as factors, Disintegration time and *In vitro* drug release were selected as responses by setting the targets to not more than 30 sec disintegration and drug release in 5 min. The formulated films were evaluated for various evaluation tests and were found within the acceptable limits. **Results:** From contour plots and residual plot analysis data, it was observed that both ingredients at higher levels exhibited faster disintegration time and 99.67% drug released at 5 min and with significant, $p<0.05$ which might be due to gel formation by rapid capillary action and pronounced hydration of natural super disintegrants. **Conclusion:** It can be concluded that natural super disintegrants in formulation development served as an alternate source to synthetic agents in achieving faster and quicker onset of action and drug release. Further applying these experimental designs reduced the number of trials and cost of the final product. Design space created would help in regulatory submissions and for any changes required as per the FDA. *In vivo* studies should be performed to prove its efficacy in the treatment of emesis.
Keywords: Emesis, 3^2 factorial design, Natural super disintegrants.

Design of Experiments (DoE) in Extended Drug Delivery for Antiviral Drug- Valacyclovir

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Background: Recent scientific and patent literature shows increased interest in academics and industrial research groups regarding novel dosage forms that can be retained in the stomach for prolonged and predictable period of time and the most feasible approach for this is to control the gastric residence time using gastro-retentive dosage forms which will provide new and important therapeutic option. **Methodology:** Valacyclovir was used with various ingredients like HPMC K15, HPMC K4M, Eudragit, MCC 102 and Aerosil. The tablets were prepared by wet granulation method. Fourier-transform infrared (FTIR) studies of the prepared tablets and the drug and the excipients showed compatibility. **Results:** Results of *in vitro* release profile indicated that formulation (F7) was the most promising formulation as the extent of drug release from this formulation was high as compared to other formulations. DoE is implemented by applying 2 level 3 factor full factorial design by using Design Expert software version 7. From DoE studies it was showed that as increase in concentration of Eudragit, MCC 102 and HPMC the drug release also increased and by maintaining the concentrations in required range the extended release is shown. **Conclusion:** It was concluded that the formulation F7 is the best formulations as the extent of drug release was found to be around 96.22 % at the desired time 24 hrs and NMT 60% at 12 hrs and followed Higuchi model release.
Keywords: Extended release, DoE, Gastro-retentive.

Formulation and Evaluation of Taste Masking Oral Disintegrating Tablets of Zolmitriptan

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Background: Zolmitriptan is a new serotonergic agonist of the 5-HT1D/1B receptor with anti-migraine property and belongs to the class of the triptans. It is extremely bitter in taste. The purpose of this research was to develop a bitter less orally disintegrating tablet of poorly soluble drug like zolmitriptan. **Methods:** Taste masking was done by complexing Kyron T-134 in different ratios. Three super disintegrants like Sodium starch glycolate, Crospovidone, Low substituted hydroxyl propyl cellulose were used. Prepared tablets were evaluated for different properties like Drug content, hardness, friability, wetting time, water absorption ratio, disintegration time and In-vitro dissolution studies. **Results:** The different formulations showed disintegration time between 39 to 52 Sec. Drug release showed between the ranges of 5 to 30 min. Among all the formulations, F9 with Low substituted hydroxyl propyl cellulose at a concentration of 4% showed 98.09% drug release within 30 min. **Conclusion:** F9 was considered as best among the other formulations. The tablets showed enhanced dissolution hence better patient compliance. Kinetic analysis (r2) of release data based on best curve-fitting method for selected ODT of Zolmitriptan showed first order kinetics indicating that the drug release depends upon its concentration.
Keywords: Zolmitriptan, Kyron T-134, Super disintegrants, Oral disintegrating tablets and Disintegrating time.

Formulation and Evaluation of Nicotine Transdermal Patches by using Hydrophilic and Hydrophobic Polymers

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Objectives: The present investigation is to formulate matrix type Transdermal drug delivery system of Nicotine using different polymers such as Ethylcellulose, Eudragit RL 100 by solvent evaporation technique. **Methods:** The prepared patches using different polymers were evaluated by Compatibility study, Physical appearance, Thickness uniformity, Weight uniformity, Tensile strength, Folding endurance, Percentage Moisture content, Percentage Moisture uptake, Water vapour transmission rate, Drug content uniformity, *in vitro* drug release studies. **Results:** From the results of the drug content determination, it was assured that there was uniform distribution of drug in the patches and the deviations were within the acceptable limits. Release study of Nicotine patches indicated that the drug release from the formulation varies with the different compositions of polymers. Among all the prepared formulations, formulation containing PVA and EC (1:1) showed better drug release of 76.76 ± 1.83 after 24 hr. By reviewing the results obtained, on the basis of the *in vitro* characterization it was concluded that Nicotine can be administered transdermally through matrix type TDDS developed in our laboratory. Transdermal patches consisting of the polymers PVA and EC along with PEG 400 as plasticizer and Tween 80 as permeation enhancer demonstrated sustained release of the drug for 24 hrs.
Keywords: Transdermal Patches, Nicotine, Plasticizer, Solvent evaporation method.

Dissolution Rate Enhancement by *in- situ* Micronization Technique for Fenofibrate

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Background: *In-situ* micronization is an emerging simple technique to augment the solubility of the poorly aqueous soluble drugs by size reduction without involvement of drug mechanical size reduction process i.e., high energy input, loss of drug, broad size distribution etc. can be overcome by this technique. Fenofibrate is a hypolipidemic drug belongs to BCS class II exhibit very low aqueous solubility which leads to poor oral bioavailability (40%) **Methods:** In order to improve the solubility to dissolution rate, fenofibrate was prepared into micro crystals by using PEG 6000, PVPK 30 and HPMC K 15 as stability which inhibits the particle growth there by reducing the particle size. Total twelve formulations were prepared through solvent change method which leads to precipitation of micro crystal. All formulations were evaluated for drug content; crystals yield SEM analysis *in vitro* drug release studies. **Results and Conclusion:** Among all the formulations, FLO (PEG-0.2g) and F4 (PVP-0.8g) showed promising results and exhibited drug release of 98±0.12 and 96±0.136 respectively when compared to pure drug (60±0.02) at the end of 60 min.
Keywords: Fenofibrate, *in-situ* micronisation, Micro crystals, Solubility, Solvent change, Dissolution, Stabilizer.

Influence of Extraction Solvent, Diluent, Disintegrants on Processability and Performance of Tablets Formulated with *Costus igneus* Leaf Extract

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Background: The use of herbs to treat disease is almost universal and is more affordable than purchasing experience modern pharmaceutics. Synthetic oral hypoglycemic drugs have undesirable side effects and hence natural products may be a better option. *Costus igneus* claimed to help insulin build in the human body and is referred as insulin plant. **Methods:** The plant leaves have been collected from ABS botanical garden, Salem, Tamilnadu. The dried leaf powder was subjected to solvent extraction with petroleum ether, methanol, chloroform, ethyl acetate, n-butanol and water separately. The % yield, phytochemical analysis was carried out for each extract. The extracts were screened for their anti-hyperglycemic activity in glucose overloaded hyperglycemic rats (protocol IAEC/IV/22/BCOP). **Results:** Chloroform extract exhibited higher activity and its dose was optimized by treating 50,100and200 mg/kg body weight. Diluents such as lactose, mannitol and microcrystalline cellulose were used to convent the extract as free flowing powder. **Conclusion:** Among the diluents, lactose was found to be better based on quantity required to form granulatable mass. The micrometric properties of the granules are excellent. These granules were comprising by using three super disintegrates SSG, croscarmellose sodium and crospovidone. The tablets were now subjected to various quality control tests according to I.P. Low disintegration time observed from the tablets containing crospovidone.
Keywords: *Costus igneus* Leaf Extract, Croscarmellose sodium, Crospovidone.

Formulation and Evaluation of Metoprolol Sustained Release Tablets by Melt Granulation (Extrusion Spheronization) Technique

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Objectives: The objective of the present study is to develop sustained release matrix tablets of metoprolol tartrate using melt granulation technique. Metoprolol is a beta selective adrenergic receptor blocking agent used in the management of hypertension. The half-life of the drugs is 4-6 hr. Thus sustained release formulations are desired for prolong action and improve patient compliance. **Methods:** In melt granulation process, binder which melts or softens at relatively low temperature is used. Extrusions pheronization process is one of the most promising techniques to produce granules of uniform size, good flow ability and low friability. In this study, binders such as beeswax, paraffin wax, stearic acid and PEG 8000 were used. The selected binders were melted in china dish kept on water bath. The required amount of the drugs was transferred into molten mass and mixed well. Molten mass was passed from 0.8mm die screen of extruder maintained at a speed of 30 rpm. Extrudes were transferred immediately into spheronizer filled with 1mm groove plate and spheronizer speed was set at 500 rpm. The granules were collected and subjected to drying at 45°C. The spheroides were evaluated for flow properties. **Results and Conclusion:** The flow properties were found to be good and hence subjected to compression. The formulations were evaluated as per pharmacopoeial standards and found to satisfy the quality requirements. The formulations release profiles were analyzed with different mathematical equations. The drug release followed first order kinetics and controlled by diffusion mechanism. The formulations prepared with stearic acid satisfied the USP specifications.
Keywords: Metoprolol, Melt granulation, Extrusion spheronization, Sustained release tablets.

Preparation and Evaluation of Diclofenac Transdermal Films using Modified Chitosan

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Objectives: In the present investigation, transdermal films of diclofenac sodium were prepared with modified chitosan. **Methods:** Chitosan has been chemically modified by treating with different aldehydes like acetaldehyde, Benzaldehyde, salicylaldehyde and cinnamaldehyde to form Schiff's bases. Ma-

trix diffusion type transdermal drug delivery systems were prepared by solvent casting method. Diclofenac sodium is a non-steroidal anti-inflammatory drug and having a biological half-life of 2 hr. To reduce gastric irritation and frequency of administration of diclofenac sodium, transdermal formulations are desired. Glycerol was employed as plasticizer. The drug loaded films were formulated with chitosan and modified chitosan and the evaluated for various physico-chemical characters like thickness, weight variation, water vapor permeability, % elongation, % drug content and in-vitro drug diffusion studies. **Results:** All chitosans are able to form good films with desirable mechanical properties. The drug release from the formulations followed first order kinetics and controlled by diffusion mechanism. **Conclusion:** Modified films formulated with the chitosan with salicylaldehyde offered relatively slow release of diclofenac compared with the other chitosan employed in this investigation.
Keywords: Diclofenac, Transdermal Films, Modified Chitosan.

Formulation and Evaluation of Sustained Release Matrix Tablets of Itopride

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Objectives: In the present investigation an attempt was made to formulate the oral controlled release Itopride matrix tablets by using carbopol 934 and natural gums like locust bean gum and Tamarind seed polysaccharide gum as rate controlling polymer and to evaluate drug release parameters as per various release kinetic models. **Methods:** Release rate profiles were evaluated through different kinetic equations: zero-order, first-order, Higuchi and Peppas models. The tablets were prepared by wet granulation method. Compressed tablets were evaluated for uniformity of weight, content of active ingredient, friability, hardness and *in vitro* release studies. The FT-IR study has shown compatibility between Itopride hydrochloride and tamarind gum with the formulation excipients used in the study. The *in vitro* dissolution study was carried out for 12 hr using paddle (USP type II) method in phosphate buffer (pH 1.2 and 7.4) as dissolution media. **Results and Conclusion:** 18 formulations were prepared among that F1, F2, F6, F7, F11 and F12 failed to controlled release beyond 12 hr. The formulation, F-18 shows 97.93% of drug release at the end of 12 hr. Selected formulation (F-18) was subjected to stability studies for 3 months, which showed stability with respect to release pattern. The drug release follows zero order kinetics and the mechanism was found to be anomalous (non-Fickian) diffusion. All the formulations showed compliance with Pharmacopoeial standards.
Keywords: Itopride hydrochloride, Controlled Release, Matrix tablets, Carbopol 934, Tamarind gum, Locust bean gum.

A Retrospective Study on Antibiotic Microbial Sensitivity in Type II Diabetes Mellitus Patients with Urinary Tract Infections in Tertiary Care Hospital

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Background: Diabetes mellitus is a chronic metabolic disorder characterized by insulin deficiency or insulin resistance. Patients with DM are increased risk of Urinary Tract Infections (UTI). The present study was aimed to explore the antibiotic microbial sensitivity in type II DM with UTI patients. **Methods:** In the current study the parameters was analyzed such as demographic details (Age, gender, weight, height etc.,), Patient complaints, Laboratory data and Macroscopically Examination data. The statistics were assessed by using Student t Test, Mann Whitney U Test and Chi Square Test. **Results:** *E. coli* was the major isolated micro-organism followed by *Enterococcus* and *Klebsiella*. It also observed that Gram negative organism showed more sensitivity to Cefperazone-Sulbactum followed by Piperacillin-Tazobactum and Gram positive organism showed more sensitivity to Amoxycillin-Clavulanic acid. Conclusion: Further studies were carried out to know the exact reason at molecular level.
Keywords: Diabetes mellitus, Urinary tract infections, *E. coli*, *Klebsiella sps*, Antibiotic microbial sensitivity.

A Survey on Concomitant use of Complementary and Alternative Medicine in Addition to Allopathy for Treatment of Diabetes Mellitus

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Background: Diabetes is a chronic debilitating medical condition in India with which more than 62 million populations are suffering with. The use of alternative therapies in addition to conventional allopathic medication is seen in the chronic diabetics. WHO estimates that ~80% world uses alternative medicine for primary health care which includes use of Ayurveda, Homeopathy, Unani and others. In this context, the current study is planned to explore diabetic population undergoing multiple therapies. **Methods:** A cross-sectional survey was conducted on the type II diabetic patients using both CAM and allopathic medicine concomitantly. Out of 400 people surveyed, 61.3% used dietary supplements, herbal medicines and external preparations along with Physician's prescription. Out of this only half of them informed to their consultant practitioner about their CAM usage. 2/3rd of people preferred concomitant usage rather than monotherapy. **Results:** Based on this survey it is known that people are incurred a major part of expenditure on allopathic than alternative therapies. The patients believe that the use of CAM is effective, but many are unaware of herb-drug interaction on a parallel therapy. It is evident that usage of CAM alone is better to cure diabetes. We concluded that females of 50-61 age groups are more prone to diabetes related side effects on concomitant usage of CAM and allopathic medicine. **Conclusion:** Therefore, the patients undergoing multiple therapies shall be properly counselled.
Key words: Alternative Medicine, Alternative therapies, Diabetes Mellitus.

Patient Satisfaction towards Pharmacist Delivered Counselling Services in Chronic Disorders: A Cross-sectional Study

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Background: The success of healthcare service is majorly depends on patient satisfaction. Evidence shows that, pharmacist delivered counselling services had shown a great impact over economical, clinical and humanistic outcomes. The study aims to assess the patient satisfaction towards counselling services provided by pharmacist in chronic disorders. **Methods:** This is a cross-sectional study, conducted in out-patient pharmacy department of the secondary care referral hospital. Patient satisfaction regarding counselling services was assessed by using a feedback form. The feedback form comprises ten statements regarding, introduction before counselling session, information provided regarding disease, voice and tone of counsellor, information regarding drug and non-pharmacological measures, doubts clarification, language, use of counselling aids, time spent, ending counselling and overall satisfaction. **Results:** Majority of the patients were shown overall satisfaction with patient counselling services delivered by the pharmacist. More than half of the

patients were satisfied with counselling content, language, doubts clarification and time spent by the pharmacist. Some of the patients were shown dissatisfaction towards counselling services. The major reasons for dissatisfaction of the patient are busy schedule, critically illness and fatigue and tiredness. Some of the patients are even ready to pay consultation fee for pharmacist provided services. **Conclusion:** The study concludes that, Majority of the patients shown a positive towards counselling services provided by the pharmacist. This study helps in making pharmacist mediated counselling services in disease management policies. Feedback of the patient regarding counselling services will provide insights for improvement in the service.

Keywords: Patient-satisfaction, Counselling, Pharmacist, Long-term therapy, Feed-back.

Impact of Pharmaceutical Care in Hypertensive Patients in Secondary Care Referral Hospital

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Background: Pharmaceutical care program may be an option to improve control of blood pressure (BP) in hypertensive patients. The aim of current study was to assess the pharmaceutical care services by pharmacist for hypertensive patients in a rural secondary care hospital. The identify drug related problems in a patients, to assess the significance of the pharmaceutical care plan, to estimate medical adherence in subjects before and after pharmaceutical care. **Methods:** This is a prospective study, 350 hypertensive patients were enrolled in the study. This patients are divided into two groups i.e., test and control group. We provide Pharmaceutical Care (PC) to test group and care not given to control group. The primary outcome was changes in Blood Pressure (BP) in patients between baseline and final visit after 6 months later. The secondary outcomes were determination of drug related problems (DRPs) and adherence towards hypertensive drugs. Descriptive statistics were used to describe the adherence characteristics of the patients. **Results:** Based on the results 60-69 age group were having more patients 105(30%) than other age group, female were 191(54.57%) members and males are 159 members i.e., 45.42%. females were number than male in total 350 members. Among the study population DM with HTN shows more patients (64.28%) in population than other co morbid conditions, the clinical outcome has been improved in tests were 29.67% where as it was for control 20.27%, medication adherence has been improved in test were 35%, control 20%, 170 drug related problems were identified. **Conclusion:** We conclude that test shows improvement than control by providing care. We concluded that pharmaceutical care program help in better management of hypertensive patients by improving health outcomes.

Keywords: Pharmaceutical care, Blood pressure, Drug related problems.

Assessment of Risk Factors and Development of Preventive Strategies of Surgical Site Infections

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Background: Surgical site infections (SSIs) are associated with substantial morbidity and mortality, prolonged hospital stay and increased cost. The precise identification of risk factors is important to develop strategies to prevent these infections. **Objectives:** To assess the risk factors and development of preventive strategies of surgical site infection. **Methods:** It was a prospective observational study for 6 month of the time period which performed in the YSR Memorial Hospital Anantapur. During the study period, data were collected prospectively for 200 patients undergoing major surgery. **Results and Discussion:** A total of 200 patients were included in the study. Out of these 200 patients, males were 68.5% and females were 31.5%. The patient in alcoholic and smoker group was having high risk (0.022) of SSIs and impact of age group (30-60 years) on male having high risk (0.02) of SSIs as compared to female (0.017). Various risk factors assessed to calculate SSI Risk Index Score includes - Skin preparation, Social habits, ASA class, Antibiotic Prophylaxis, WBC count, Catheters used, Blood transfusion and Duration of operation. **Conclusion:** The study shows that some factors had proven the positive impact on the risk of SSIs. Based on the results and the existing guidelines some preventive strategies were developed.

Keywords: Surgical site infection, Risk factors, SSI Risk Index.

Effectiveness of Misoprostol in the Prevention of Post-Partum Hemorrhage after Cesarean Section – A Prospective Observational Study

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Objectives: PPH remains the major cause for the maternal mortality around the world. The risk of maternal mortality from hemorrhage is seen mostly in the low and middle income countries. The main objectives of our study were to observe the efficacy of prophylactic Misoprostol in the prevention of primary PPH. **Methods:** We have conducted a Prospective observational, comparative study in the department of Obstetrics and Gynecology in SVIMS Hospital, Tirupati, A.P, from the month of August 2018 – January 2019. Our study was approved by the Ethical Committee of SVIMS Hospital (IEC NO: 671), Tirupati. We have collected 100 cases based on inclusion and exclusion criteria who had undergone Cesarean Section. Groups were divided based on the treatment given to them. One group was administered only with Inj. Oxytocin and another group with Inj. Oxytocin in combination with Tab. Misoprostol (rectal route). PPH observed 24 hr post operatively (Primary PPH) was taken. Post-operative Hb levels assessed after 48 hr were recorded and compared. **Results and Discussion:** The maternal age at the time of Cesarean Section, type of Cesarean Section performed and gravida wise distribution of study subjects were similar in both the groups studied. The mean post-operative blood loss in group of population on only Inj. Oxytocin (772±311.06) had observed as low, compared with population on both Tab. Misoprostol and Inj. oxytocin (950±185.40), (p = 0.762). The post-operative Hb levels of both groups (10.48±1.47 in population on only Inj. oxytocin) and (10.48±1.67 in population on both Inj. Oxytocin and Tab. misoprostol) were observed, compared and noted that there was no significant difference (p=0.9858) between them. **Conclusion:** We concluded that, the effectiveness of rectal misoprostol 600µg with Oxytocin 20 IU after delivery of baby in Cesarean Section had shown similar effectiveness as observed in population administered with 20 IU of oxytocin alone in control of PPH.

Keywords: Oxytocin, Misoprostol, Cesarean Section, PPH.

Analytical Quality by Design in the Development of RP-HPLC Method for Quantification of Budesonide in Inhalation Powders

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Background: By considering the current regulatory requirements for an analytical method development, a reversed phase high performance liquid chromatography (RP-HPLC) method for routine analysis of Budesonide in dosage form has been optimized using analytical quality by design approach. **Methods:** Unlike routine approach, the present study was initiated with understanding of quality target product profile, analytical target profile and risk assessment for method variables that affect the method response. A Liquid Chromatography (LC) system equipped with the C_{18} column (250x4.6mm, 5u), a binary pump

and photodiode array detector (DAD) were used in this work. The experiments were conducted based on plan by central composite design (CCD), which could save time. Reagents and other resources sigma tech software was used to plan and analyses the experimental observations and obtain quadratic process model. The process model was used for predictive solution for retention time. **Results:** The predicted data from contour diagram for retention time were verified actually and it satisfied with actual experimental data. The optimized method was achieved at 1.104ml/min flow rate of using mobile phase composition of methanol and water at 85:15 %v/v, wavelength at 250nm. **Conclusion:** The method was validated and verified for targeted method performances, robustness, linearity, repeatability and system suitability during method transfer.
Keywords: Analytical Quality by Design (AQBD), Budesonide, High Performance Liquid chromatography.

Design and Synthesis of some Novel Oxadiazole Derivatives and Evaluation of Antimicrobial Activity Followed by Molecular Docking against 3G7E Bacterial DNA Gyrase

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Objectives: The main aim and objective of the present research work was the design, synthesis, spectral characterization and evaluation of *in vitro* antimicrobial activity of some novel oxadiazole derivatives followed by molecular docking studies against bacterial DNA gyrase. **Methods:** The molecular structures of the synthesized compounds were assigned by IR, NMR and Mass spectral analysis. Molecular docking studies were carried out by AUTO DOCK programme. The *in vitro* antibacterial and antifungal activities of synthesized compounds were carried out by paper disk diffusion and agar streak dilution technique. **Results:** *In silico* molecular docking studies of synthesized compounds (AB1-AB8) were found to be possessed high binding affinity towards the bacterial DNA gyrase with PDB id 3G7E and inhibit the function topoisomerase. The preliminary antimicrobial screening of the synthesized compounds displayed that most of the synthesized molecules were executed significant antimicrobial activity against individual bacteria and fungus. **Conclusion:** Among the synthesized oxadiazole derivatives, compound AB1; AB2 and AB7 were found to have very good antibacterial as well as antifungal potentiality with an MIC range of 13-12 µg/ml; 7-10 µg/ml and 15-18 µg/ml.
Keywords: Antibacterial, Antifungal, Disk diffusion, Molecular docking, NMR and MIC etc.

Investigation of Newer Ion –Pair Reagents in the Development of RP-HPLC Method for the Selected Drugs

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Background: Considering the disadvantages of the existing ion-pair agents such as column damage, ghost peaks, negative peaks, long time column washing, etc., which are contributed by low water solubility and considerable UV absorbance, the present analytical approach focused to identify water soluble ion-pair reagents. **Methods:** The selected ion-pair reagents such beta-alanine, hydroxymethyl aminomethane hydrochloride (TRIS), diethyl amine and N, N, N - cetyl trimethyl ammonium bromide were relatively more polar and were water soluble. The suitability of these selected ion pair reagents was tested on LC system equipped with C_{18} column and photodiode array detector. The ion pair was investigated at 0.2 to 0.3 % concentrations with varying % aqueous from 10% to 50 %. **Results:** TRIS and beta- alanine have demonstrated better efficacy on haloperidol (HLP) elution with 3-fold increase in theoretical plates with half reduction in retention. With the same reagents the efficacy of Aceclofenac (ACF) elution was found to be good with moderate improvement in theoretical plate but the retention was significantly reduced than control elution. The unacceptable tailing of haloperidol peak was reduced to <1.5 with the theoretical plates of more than 4000. The column performance was reproducible and satisfactory even after washing. It indicated that the test ion-pair reagents are completely washable that do not affect the efficacy in non-ion pair applications. **Conclusion:** The linearity was proven with regression co-efficient of >0.99. The % RSD for intermediate precision and repeatability was less 1.6 %. The accuracy was in between 98-102%. The results revealed that the method performance was remained unaffected and was acceptable.
Keywords: Ion-pair reagents, RP-HPLC, Haloperidol, Aceclofenac, Beta-alanine, Tris.

Method Development and Validation for Simultaneous Estimation of Etizolam and Propranolol Hydrochloride by UV Spectroscopy

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Objectives: The present study deals with the UV spectroscopic method development and validation for the simultaneous equation method and first derivative method (VIERODTS method) of etizolam and propranolol hydrochloride in bulk and combined dosage form. **Methods:** Comparatively first derivative method is more sensitive than simultaneous equation method. The methods were validated statistically and parameters like linearity, precision, accuracy, specificity and assay was studied according to ICH guidelines. **Results:** At a determined wave length at 242 and 288 nm, it was proved linear in the range of 0.5- 5 µg/ml and 5- 50µg/ ml and exhibit good correlation coefficient (R^2= 0.9872 and 0.9977) respectively and excellent mean recovery (98- 102%). **Conclusion:** Simple, sensitive, rapid economic UV spectroscopic methods were developed for the estimation of etizolam and propranolol hydrochloride in bulk and combined dosage form.
Keywords: Etizolam, Propranolol hydrochloride, Method development, Simultaneous equation method, UV spectroscopy.

Molecular Docking, ADME Prediction of Novel Chalcones from 4-Methoxy Acetophenone as Potent Anti-Bacterial and Anti-Tubercular Agents

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Background: As per the current scenario of WHO the necessity to develop potent, novel anti-microbial agents is more essential due to resistance developed in micro-organisms towards the existing drugs. Chalcones bears a very good synthon and diversity in the biological response profile more attracted to develop novel chalcones to its multiple potential against micro-organisms. **Methods:** Initially molecular docking studies was performed against DNA Gyrase Subunit B (1aj6) and Enoyl acyl carrier protein reductase (2b35) by SWISS Docking, the compounds exhibited good interactions and docking score. On this basis chalcones were synthesized by reacting 4-methoxy Acetophenone with various substituted aromatic aldehydes in ethanol by the addition of Sodium hydroxide at 15 – 20°C, the reaction mixture was further stirred for 3hrs, cooled and refrigerated overnight. Later obtained crude chalcones were filtered, dried and recrystallized by using ethanol. The purity of the synthesized compounds was established by TLC using benzene and ethyl acetate as mobile phase. **Results:** The final compounds were characterized by melting point, FT-IR, ^{1}H NMR and Mass spectra. Drug likeness and good skin permeation and other molecular properties were calculated by Swiss ADME. The synthesized chalcones were screened for *in vitro* anti-bacterial and anti-tubercular activities.

Conclusion: From the results the compounds 1B, 1C and 1D showed better activity due to their α, β –Unsaturated ketone between two aryl rings as pharmacophore and electron releasing substituent's compared with standards.
Keywords: Chalcones, Swiss ADME, Docking studies, Anti-bacterial and Anti-tubercular activity.

Preparation and Preliminary Evaluation of Ready to Serve Herbal Beverages

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Objectives: The study of the ready to serve herbal drink based on *Hemidesmus indicus* (sugandhi pala), *Madhuca longifolia* (iluppai or vippa puvvu), *Phoenix dactylifera* L. (date palm), *Vitis vinifera* grapes, *Punica grantam* pomegranate, lime and herbal extracts revealed that this drink is palatable and acceptable throughout its storage period. **Methods:** No preservative was added to increase the shelf life of the drink and the natural herb extracts present in the developed drink have contributed in keeping the bacterial count at bare minimum level. This drink is a blend of various essential vitamins and minerals. So instead of consuming various products, this one drink would be sufficient to replenish the needs of the body. The herbal mix is expected to provide a refreshing drink with sweet taste and minimal calories for those who have to restrict sugar in their diet. This test was conducted once in the beginning of the storage and once at the end of the 30-day period. **Results:** The microbial test revealed that no growth of microbes was observed on day 0, in nutrient agar condition. Whereas there was insignificant growth of microbes, even after day 30. **Conclusion:** The drink was acidic in nature and this might be a cause for the endurance of inhibition of microbial growth. The results were observed and the feedback was obtaining by using hedonic scale.
Keywords: Herbal beverage, Preservative, Microbial test.

Rapid and Sensitive Bioanalytical Method Development and Validation for Quantification of Metoprolol using LC-MS/MS in Human Plasma

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Objectives: A simple, sensitive and selective LC-MS/MS method was developed and validated for the quantification of Metoprolol in human plasma. **Methods:** Propranolol was used as internal standard and K2 EDTA was used as anti-coagulant. Metoprolol is a lipophilic cardio selective β_1- adrenoreceptor antagonist, used in the treatment of hypertension, angina pectoris and other cardio vascular diseases. The analyte was extracted from human plasma by liquid – liquid extraction technique with tert-butyl methyl ether. Chromatographic separation was achieved on aKromasil C_{18} column (5µ, 100 × 4.6 mm) with an isocratic mobile phase of 5mM Ammonium Formate pH 3.5 and Acetonitrile (15:85 % V/V). Electrospray ionization technique was used for sample ionization in positive ion mode and enhanced selectivity was achieved by tandem mass spectrometric analysis via two multiple reaction monitoring (MRM) transitions, m/z 268.15→115.90 for Metoprolol and 260.17®115.90 for Propranolol respectively. **Results and Conclusion:** The assay was validated for human plasma over a concentration range of 1.505-538.254ng/mL with the precision and accuracy ranging from 4.67 to 7.41% and 90.66 to 98.15% respectively. The stability of the analyte was evaluated in plasma under different storage conditions.
Keywords: Metoprolol, LC-MS/MS, Kromasil, Electrospray, K2 EDTA, Human Plasma.

Stability Indicating Method Development and Validation of Fidoxomicin by using HPLC

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Objectives: A stability indicating method has been developed for the determination of Fidoxomicin by using HPLC method. **Methods:** The analyte was separated from its degradation products on C_{18} column the mobile phase used in this method was containing the mixture of 0.1% OPA Water: Acn: Methanol (20: 36.5: 43.5) at flow rate was 1 ml/ min whereas the variable wavelength detection wavelength was at 260nm. Validation of method was done as per ICH Q2 guidelines. **Results:** The linear regression coefficient found 0.999 at a concentration range from 5-30 mcg/ml. The % Relative standard deviation for intra and inter - day precision was 1.5% and 1.6 %. The LOD and LOQ were found to be 0.4 mcg /ml and 1.3 mcg/ ml respectively. **Conclusion:** Under the stress conditions such as acid hydrolysis, base hydrolysis, oxidation and thermolytic degradation the drug was degraded and two degradants were formed under the basic condition. The specificity of the method is suitable for a stability indicating assay.
Keywords: Stability indicating assay, Fidoxomicin, Regression coefficient.

Synthesis and Anthelminthic Activity of some Novel 4- [substituted (benzylidene-hydrazinyl)]-2-alkyl-5,6,7,8-tetrahydrobenzo[b]thieno[2,3-d] pyrimidines

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Objectives: The present study was aimed to prepare novel thienopyrimidines for anthelminthic activity. **Methods:** A series of some novel 4-[substituted (benzylidene hydrazinyl)]-2-alkyl-5,6,7,8-tetrahydrobenzo[*b*]thieno[2, 3-*d*]pyrimidines were synthesized following appropriate synthetic schemes and characterized by spectral and analytical means. The title compounds were evaluated for anthelmintic activity by using adult Indian earthworms. **Results:** All the compounds exhibited significant anthelmintic activity which is on par with standard drug, piperazine adepate. Further, compounds 5c and 5d have shown significant activity at 80 µg/ml [mean paralytic time of 3.81 min., 3.98 min. and helminthicidal time of 23.4 min., 24 min. respectively] which was better when compared with that of the standard drug, piperazine adepate (6.25 min. of paralysis time and 24.5 min. of death time at 100 µg/ml). **Conclusion:** It is observed that moderate electron withdrawing groups like Cl (compounds 5c and 5d) showed activity better than that of the standard which were also statistically significant, it appears that other similar moderately electron withdrawing groups may be tried out to get better active compounds. Thus they can serve as a lead for further modification of the molecule.
Keywords: Thienopyrimidines, Anthelminthic activity, Piperazine adepate.

Synthesis, Characterization of Some Novel Benzimidazole Compounds and its Prediction of Biological Activity through Computer-Aided Drug Design

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Objectives: 4-chloro-3-nitrobenzoic acid is very cost-effective available com-

pound for the synthesis of multi reactive building blocks that can used as a starting material in Heterocyclic Oriented Synthesis (HOS) prominent to various condensed nitrogenous cycle. **Methods:** This work describes its ability for the preparation of a series of Benz imidazole derivatives (PH19-1 to $PH19_{4A-4C}$). The final synthesized derivatives were elucidated by UV, IR, ^1H NMR and Mass spectral analysis. **Results and Conclusion:** In an IR spectrum, all the synthesized compounds were accomplished above 3100 cm^{-1} due to N-H stretching vibration and in $PH19_{3A-3C}$, showed the region of 1315 – 1322 cm^{-1} due to presence C=O stretching of ester group. In ^1H NMR spectra of Benz imidazole derivatives showed well resolved peaks at 7.10-7.64 ppm as a result of Ar-H, at 4.57-4.60 ppm due to five protons in ester group and at 1.13-1.15 ppm due to three protons in methoxy group of aromatic ring. The synthesized compounds were predicted by Prediction of Activity Spectra for Substances (PASS) software through computer-aided drug design.

Keywords: 4-Chloro-3-nitrobenzoic acid, Benz imidazole, CADD, PASS software.

In vitro Antitubercular Screening of Thirteen Polyphenolic Fractions from Edibles by LRP Assay Method against Mycobacterium Tuberculosis $H_{37}RV$

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Objectives: Isolation of polyphenols in edibles and screening of their antitubercular activity. **Methods:** There were thirteen polyphenol rich edibles were subjected to preparation of polyphenolic rich fractions using hydroalcoholic mixture containing ethanol and water (80:20 % v/v). The edibles used in this study are flax seed meal (*Linum usitatissimum*), Capers (*Capparis spinosa*), Dried rosemary (*Rosmarinus officinalis*), Peppermint (*Menthax piperita*), Spearmint (*Mentha spicata*), Star anise (*Llicium verum*), Clove (*Syzygium aromaticum*), Blue berry (*Cyanococcus*), Black Current (*Ribes nigrum*), Dried thyme (*Thymus vulgaris*), Cocoa powder (*Theobroma cacao*), Mecxican oregano (*Lippia graveolene*) and Red onion (*Allium cepa*). The obtained extracts were subjected to proximate analysis and total phenolic contents were estimated by folin-ciocalteu method. The yield (%) of the extract was in between 5-15%. The prepared polyphenolic fractions were lyophilized to powders (Processed time between 2-4 hr). These powders were screened against *Mycobacterium tuberculosis* $H_{37}Rv$ using LRP assay method at 100 and 500µg/ml. **Results and Conclusion:** Results revealed that among the extracts, all extracts showed 98-99% growth inhibitions except blackcurrent (0% at 100µg/ml and 500µg/ml) and clove (14% at 100µg/ml) extracts. (Acknowledgement: The research is supported by AICTE, New Delhi, India under RPS Scheme 2017.

Keywords: Polyphenols, Phenolic content, Folin-ciocalteu method, LRP assay method, *Mycobacterium tuberculosis*.

Structure Based Computational Screening of Small Molecule Inhibitors against *Sphingosine-1-Phosphate Lyase* for Targeting Multiple Sclerosis

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Background: Multiple Sclerosis (MS) is a chronic neurodegenerative condition caused by aberrant hyper activation of immune cells against one's own myelin sheath leading to an autoimmune response. Many recent studies have addressed the importance of targeting SPL in the pathogenesis of Multiple Sclerosis. Most of the therapeutic agents against MS are monoclonal antibodies and there is a reasonable deficiency of active small molecules in spite of a few existing ones. We hypothesize that since SPL is an emerging target and there are no known approved candidates against this enzyme, developing small molecule inhibitors could definitely be a reliable strategy for therapeutic intervention of MS. **Objectives:** Our present study attempts to identify some potential leads through *in-silico* structure based screening. **Methods:** The selected brief chemical library comprising 29 ligands in total was screened using a combination of computational tools against the crystal structure of *Human Sphingosine-1-Phosphate Lyase 1 (SGPL1)* (PDB Code: 4Q6R) retrieved from Protein Data Bank with a resolution of 2.40A°. **Results:** This led to the identification of 5 potent leads with an agreeable target interaction scores and kinetic properties. **Conclusion:** This preliminary approach could set a stage for the development of several promising candidates with improved features enabling clinical benefits.

Key words: Multiple Sclerosis, Sphingosine -1-Phosphate Lyase, Sphingosine-1-Phosphate.

Anti-tubercular Screening and Proximate Analysis of *Murraya koenigii, Spinacia oleracea, Rivea ornate* and *Annona squamosal*

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Objectives: Hydro alcoholic separation of polyphenols in edibles and screening of their antitubercular activity. **Methods:** Hydroalcoholic mixture ethanol and water 80:20%v/v was used for the extraction of polyphenols in polyphenol rich edibles like leaves of *Murraya koenigii, Spinacia oleracea, Rivea ornate* and *Annona squamosa*. The obtained extracts from these edibles were subjected to find different parameters like total moisture, ash value, water soluble ash, acid insoluble ash, acid value, saponification value and LOD. **Results and Conclusion:** The results indicate the purity of the extracts. The yield (%) of the extract was found between 10-15%. The extracted fractions were powdered by processing for about 1-4 hr in lyophilizer. Then these powders were evaluated for anti-tubercular activity using LRP assay method against *Mycobacterium tuberculosis* $H_{37}Rv$ at concentrations 100 and 500µg/ml. The anti-TB results exhibited that among the powdered extracts, all powders showed 99% growth inhibitions except *Annona squamosa* (29%). (Acknowledgement: This research is supported by AICTE, New Delhi, India under RPS Scheme 2017.

Keywords: Polyphenols, Ash value, Anti-tubercular activity and LRP assay method.

Molecular Docking, Drug Likeness Properties and Toxicity Studies of Some Novel Imidazolidine-4-Ones

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Background: Imidazolidine derivatives are the important pharmacophores with various therapeutic activities like anti-bacterial, anti-fungal, anti-tubercular, anti-cancer, anti-inflammatory, analgesic, adrenergic receptor agonist, anti-parasitic, oral hypoglycemic and anticonvulsant activities etc. In modern drug discovery, this wide scope of the pharmacophore attracted to develop the best candidates with the aid of *in silico* methods. **Methods:** The interactions and docking score of the compounds towards Crystal structure of *Mycobacterium tuberculosis* enoyl reductase (InhA) inhibited by Triclosan (2B35) and Crystal structure of sterol 14-alpha demethylase (CYP51) from *Trypanosomabrucei* bound to an inhibitor (3GW9) by molecular docking Glide schrodinger software. **Results:** The compounds S3, G1, S5, S1, G3, G4, S2 showed better docking

score compared with the standards Triclosan and Isoniazid towards 2B35 protein. While, the compounds S1, S4 and S6showed better docking score compared with Fluconazole towards 3GW9. Drug likeliness propertieslike Lipinski rule of 5, TPSA, Molar refractivity, GI absorption, BBB permeation, Solubility, Skin permeation and synthetic accessibility etc by SWISS ADME online software. Predicted toxicity parameters like LD_{50}, toxicity class, hepatic toxicity, carcinogenicity, immune toxicity, mutagenicity and cytotoxicity etc by Protox online software. **Conclusion:** The results of the ADME and Protox represents all compounds obeyed Lipinski rule and are safe, belongs to the predicted toxicity class was 4. The compounds G4 and S4 exhibited Hepatotoxicity, Carcinogenicity and S4 also shows Mutagenicity and Cytotoxicity.

Keywords: Imidazolidines, Glide, Swiss ADME, Protox, *Mycobacterium tuberculosis*.

Development and *in vitro* Evaluation of Pioglitazone Aloe vera Leaves Mucilage Extended Discharge Matrix Tablets

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Background: The work aimed to explore an extended discharge matrix Pioglitazone tablets with *Aloe vera* leaves mucilage (AVLM) and to study its functionality as a matrix former for the extended discharge of Pioglitazone from tablet formulations. **Methodology:** Physicochemical possessions of parched AVLM powder were studied. Various formulations of Pioglitazone with AVLM were made by direct compression practice. **Results:** The tablets passed uniformity of weight, Pioglitazone content and other constraints. The swelling nature and *in vitro* discharge rate were assessed and were within the standards. **Conclusion:** The dissolution explores the matrix forming property of AVLM in designing an extended discharge Pioglitazone tablets.

Keywords: Aloe, Discharge, Tablets, Pioglitazone.

Econazole β-Cyclodextrin Complex Ocuserts Designing, Assessing *in vitro* and *in vivo*

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Background: The main drive of the existing study was to develop ocuserts of Econazole β-CD (beta-cyclodextrin) complex and to assess *in vitro* and *in vivo* constraints. **Methodology:** Econazole was made a complex with β-CD and the discharge rate was protracted by HPMC K4M and Ethyl cellulose using dibutyl Phthalate as penetrability accompaniment. Econazole- excipients relations were deliberate by DSC and FTIR studies. The designed ocuserts were assessed for physicochemical restrictions of *in vitro* discharge and in vivo infusion in rabbits. The optimized formulations (F-5 and F-8) were endangered to stability studies. **Results:** The films showed appreciable mechanical constraints both *in vitro* and *in vivo*. The optimized films maintained their features even after hassled environments. **Conclusion:** The study explored as an effective way of making ocuserts for retentive the Econazole levels at the envisioned site of action for appropriate duration and to provoke the anticipated therapeutic outcome.

Keywords: Econazole, β-CD, Film, Eye.

Formulation Development and Evaluation of Aceclofenac fast Disintegrating Tablets Employing Natural Super Disintegrants

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Background: Fast disintegrating tablets are defined as solid dosage forms containing medicinal substances which disintegrate rapidly, usually within a matter of seconds when placed upon the tongue. The present work is concerned with the formulation and *in-vitro* evaluation of fast disintegrating tablets of an inflammatory drug using natural super disintegrating agents like jack fruit seed powder and oats powder to achieve rapid disintegration. **Methodology:** The tablets were prepared by direct compression method. Ten formulations were developed with different concentrations (2%,4%, 6%, 8% and 10%) of natural polymers like jackfruit seed powder and oats powder. FTIR and DSC studies showed no evidence of interaction with drug, natural super disintegrating agents and other excipients. Precompression parameters were evaluated for all the formulations and were in the acceptance limits. Post compression parameters like hardness, friability, disintegration test and dissolution test were evaluated. **Results:** The *in-vitro* drug release of F5 formulation which contains jack fruit seed powder exhibited 98.7% of drug release at the end of 30 min and the disintegration time was found to be 32 seconds and follows first order kinetics. **Conclusion:** The study can be considered as a promising formulation to provide rapid therapeutic benefit.

Keywords: Aceclofenac, Disintegration, Jackfruit seed powder, Oats powder.

Formulation and Evaluation of Broad-spectrum Herbal Shampoo Powder

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Background: The shampoo sector is the biggest unit sale amid the hair care products, as shampoos are one of the cosmetic products used in daily life. Artificial preservatives and detergents used in them adversely affect the hair and scalp. A more fundamental tactic in minimizing the synthetic components is by adding natural extracts whose functionality is analogous with their synthetic one. Added profits are anticipated viz., conditioning, smoothing, silky hair viz., anti-dandruff, grime, greasiness and lice. **Methodology:** This herbal shampoo was made using natural ingredient like *Azadirachta indica* (neem), *Acacia concinna* (shikakai), *Spindus mokorossi* (reetha), *Ocimum sanctum* (Tulsi), *Aloe barbadensis* (aloe), *Embelica officinlis* (amla), *Lawsoniainerms* (Henna), *Trigonella foenum-graecum* (Fenugreek), *Hibiscus rosa-sinensis* (China Rose) and *Centlla asiatica* (brahmi) with established effectiveness of hair carries made. The amalgamation of such components from nature made it conceivable to secure highly operative dry powder shampoo. The shampoo was prepared in the laboratory as per GLP and assessed for the number of strictures to ensure its protection and usefulness. **Results:** The prepared shampoo was found to have near to neutral pH and pale green colour. The anti-microbial activity shown was satisfactory. **Conclusion:** The prepared shampoo powder was found to have anti-microbial activity with good texture.

Keywords: Assessing, Effective, Poly herbal, Shampoo.

Enhancing the Water Solubility of Chrysin through Semi-synthetic Approach-Efficacy Enhancement for Anti-bacterial Activity

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Background: Flavonoids belongs to a large group of natural poly phenolic compounds and have a wide range of pharmacological activity but many of them have extreme low solubility in aqueous media. While, the solubility is one of the major biopharmaceutical characteristics that largely determine the drug bioavailability. Among the flavonoids chrysin was reported for many activities. The present work is concerned with the synthesis of semi synthetic derivatives of chrysin by amine substitution. The objective of this study was to improve their Anti-bacterial activity by increasing their aqueous solubility. **Methods:** The compounds were synthesized by various amine substitutions. These derivatives were characterized by TLC, NMR and IR Spectroscopy. Five compounds were developed and performed molecular docking by selecting DNA gyrase as target (one click docking). And tested for antibacterial activity by taking ofloxacin as standard and using *S. aureus* (by Agar diffusion method) by measuring the zone of inhibition. **Results:** Anti-bacterial studies showed that synthesized compounds have better activity when compared to chrysin at relative concentrations (higher zone of inhibition). **Conclusion:** Semi synthetic derivatives of chrysin are showing good anti -bacterial activity than the chrysin. Derivatives which are having good water solubility are showing good anti- bacterial activity. So this indicates that by enhancing the water solubility of flavonoids the biological activity also increases.

Keywords: Flavonoids, Chrysin, Docking, Solubility, Zone of inhibition.

Isolation and Identification of *Bacillus mycoides* from Contaminated and Stored Starchy Food

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Objectives: Good quality and fresh food is responsible for health. This work reveals that the stored food cause the food borne diseases. **Methods:** Streak plate technique was used for isolation. Nutrient agar plates were incubated for 24 hr at 37°C. The plates were examined for growth. The isolated bacteria species were identified as *Bacillus cereus* and *Bacillus mycoides* and *Escherichia coli*. All biochemical characters are identified through various tests which gave positive results to starch hydrolysis test, vogesproskauer, catalase test, citrate utilization and negative results to indole production test, methyl red test, gelatin hydrolysis test, casein hydrolysis and oxidase tests. **Results and Conclusion:** Effect of various physico-chemical parameters such as temperature, PH and NaCl were studied on the growth of degrading bacteria. Good growth of Bacillus *sp* was obtained in 0.2 to 0.5% of NaCl solution. The results obtained indicate that the growth of the *Bacillus species* involved in degrading the food because the abundant supply of various elements the growth of fungi and other infectious organisms causing various diseases. This study revealed that street foods are potential vehicles for transmitting food borne diseases.

Keywords: *Bacillus mycoides*, Starchy food, Contaminated food, Food borne diseases.

Bioremediation of Heavy Metals by Gamma Proteobacteria and *Micrococcus luteus* for Copper and Lead Biosorption from Industrial Effluents and Biological Wastes

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Objective: *Micrococcus luteus* and pseudomonas alcaligenes were immobilized for continous removal of copper and lead ions from waste-waters, biological wastes and industrial heavy metal contaminated effluents. **Methods:** Both metal-resistant and non-resistant bacteria from activated sludge treating both metal-contaminated industrial effluents and municipal wastewater were isolated and identified. One yeast strain was identified (*Candida albicans*). Ten species of metal-resistant bacteria and ten dominant species of metal non¬resistant bacteria were isolated from activated sludge for biosorption of heavy metals. Among these isolates, gamma proteo bacteria those are resistant to chemical antimicrobials and *Micrococcus luteus* were selected for further investigations due to their high copper and lead biosorption capacities. **Results and Conclusion:** Cells of gamma proteobacteria and *M. luteus* could be used for at least five alternate biosorption and desorption cycles without loss of copper removal capacity. Immobilization of *M. luteus* in 2% calcium alginate and 10% polyacrylamide gel bead increased copper uptake by 61 %. *M. luteus* and *Pseudomonas alcaligenes* may have potential applications in removing and recovering copper and lead respectively from industrial effluents.

Keywords: Gamma proteo bacteria, Biosorption, Immobilization, Heavy metals.

Development and Characterization of polyherbal formulation: Evaluation of its potential in alleviating oxidative stress – induced liver damage in Albino Rats

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Background: There is a gradual increase in the morbidity and mortality of the liver problems which needs better remedies to curtail them. The present study involves the development of poly herbal formulation by using four different plants i.e (Cicerarietinum, Tabebuiaargentea, Acacia leucophloea, Biophytum-sensitivum) relating to hepatoprotective and antioxidant activity. **Methods:** Polyherbal syrup was formulated by taking equal proportions of methanolic extracts of selected plants and characterized by various tests. Freshly collected and authenticated plants were extracted using methanol and formulation was prepared by mixing with simple syrup in 1:5 proportions. **Results:** The final formulation was characterized to evaluate organoleptic parameters (color, odor, taste and appearance), physicochemical parameters, stability testing and refractive index. Hepatoprotective and antioxidant activity of formulation was determined by assessment of antioxidant enzymes and liver biomarkers in CCl4 (1ml/kg) and Paracetamol (3gm/kg) induced hepatotoxicity rat's models. **Conclusion:** The formulation showed significant hepatoprotective and antioxidant activity at dose of 400mg/kg dose, which was compared to 50mg/kg of Silymarin.

Keywords: Hepatotoxicity, Poly herbal formulation, Oxidative stress.

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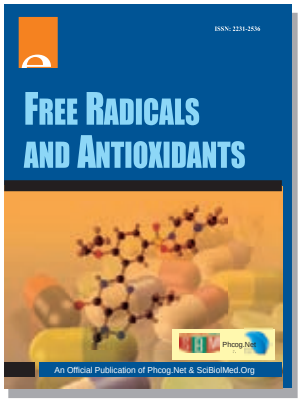

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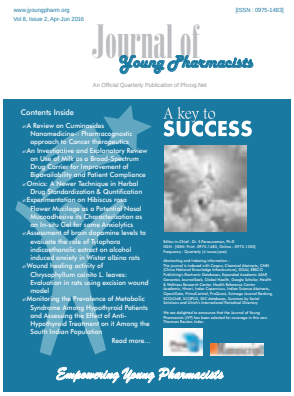

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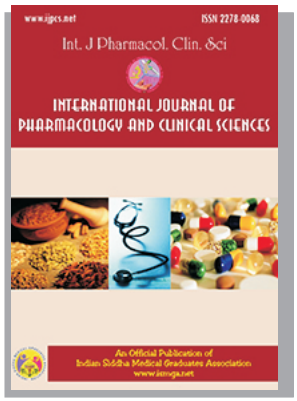

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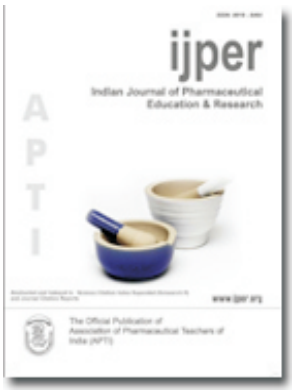

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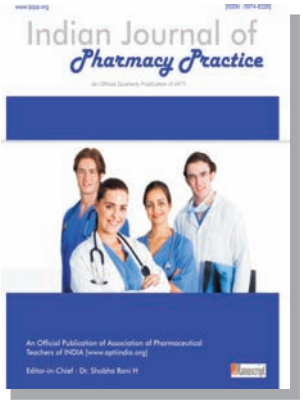

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