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Formulation And Charaterization Of Gamma Oryzanol Loaded Chitosan Nanoparticles

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ABSTRACT :- The elevated blood levels of cholesterol and low-density lipoproteins result in hyperlipidemia. The available expensive prophylactic treatments are kindred with severe side effects. Therefore, we fabricated the polymeric nanoparticles of gamma-oryzanol to achieving the improved efficacy of drug. The nanoparticles were prepared by ionic gelation method and optimized using 2^3 full factorial design taking drug/polymer ratio (X_1), polymer/cross linking agent ratio (X_2), and stirring speed (X_3) as independent variables. The average particle size, percentage entrapment efficiency, and in vitro drug release at 2, 12, and 24 h were selected as response parameters. The factorial batches were statistically analyzed and optimized. The optimized nanoparticles were characterized with respect to particle size (141 nm) and zeta potential (+ 6.45 mV). Results obtained with the prepared and characterized formulation showed 83% mucoadhesion towards the intestinal mucosa. The in vitro findings were complemented well by in vivo anti-hyperlipidemic activity of developed formulation carried out in Swiss albino mouse model. The in vivo studies showed improved atherogenic index, malondialdehyde, and superoxide dismutase levels in poloxamer-407-induced hyperlipidemic animals when treated with oryzanol and gamma- oryzanol nanoformulation. Based on our findings, we believe that chitosan-mediated delivery of gamma- oryzanol nanoparticles might prove better in terms of anti-hyperlipidemic therapeutics.

KEYWORDS:- Gamma Oryzanol, Chitosan Nano-Particle, Hyperlipidemia,

INTRODUCTION:-

Herbal plant-

Medicinal plants play a key role in the human health care. About 80% of the world populations rely on the use of traditional medicine which is predominantly based on plant materials 1. The traditional medicine refers to a broad range of ancient natural health care practices including folk/tribal practices as well as Ayurveda, Siddha, Amchi and Unani. These medical practices originated from time immemorial and developed gradually, to a large extent, by relying or based on practical experiences without significant references to modern scientific principles.

Gamma Oryzanol:-

It is a mixture of ferulate esters of sterols (campesterol, stigmasterol and β-stigmasterol) and triterpene alcohols (cycloartenol, cycloartenol, 24-methylenecycloartanol, cyclobranol). Majorportions of Gamma Oryzanol include cycloartenylferulate, 24–methylene cycloartanylferulate and campesteryl ferulate.It is white to off white powder. It is soluble in acetone, heptane, ether, chloroform, benzene, ethanol (Slightly soluble), and water (Very slightly soluble). The antioxidant property of OZ is provided by radical scavenger actionable to prevent lipoperoxidation.

To protect oil from lipoperoxidation usually being added at concentrations ranging between 2.5 and 10 mmol/kg. OZ increases the induction times. Due to presence of polyunsaturated fatty acids in high quantity it proves oxidative stability of oils those are unstable due to lipoperoxidation (Juliano et al. 146). OZ has found very safe withno major adverse effects.

The usage of gamma oryzanol as a nutritional supplement for strength in athletes is prevalent. The research to date has tended to focus on gamma oryzanol effects in patients, especially hyperlipidemics, rather than on resistance athletes. Bucci et al12 found that the intake of 30 mg ferulic acid per day (extracted from gamma oryzanol) for eight weeks resulted in increasing body weight and muscular strength in weight lifters. In another study conducted by Fry et al10 muscular strength was changed after 500 mg/day gamma oryzanol supplementation in adults with age ≥40 yr.

Therefore, this study was undertaken to determine if dietary gamma oryzanol supplementation during a 9-week resistance training programme significantly altered muscular

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strength and anthropometric measures of young males.

CHITOSAN NANO-PARTICLE:-

Chitosan, as a natural polysaccharide, has a unique structure and multi-functional properties. One of the most prominent specifications of chitosan is high biocompatibility, good biodegradability, low toxicity and antibacterial and antiallergenicity properties. Chitosan has a high potential for controlled drug delivery. Therefore, investigating the loading capacity and release rate of chitosan at different conditions is important. By reducing particle size, chitosan has shown a high ability of teicoplanin loading due to its cationic property, which is important in this research. The aim of this study was to investigate chitosan nanoparticle potential for use in biomedical devices for drug delivery systems. Nanoparticles were prepared by ionic gelation with tripolyphosphate (TPP) ion, and the factors that affected chitosan nanoparticle size were investigated. The prepared samples were characterized using DLS, FTIR, TGA, DSC and XRD techniques.

It is found at best condition with CS/TPP ratio of 2:1 nanoparticles were obtained at an average size of about 100 nm. The results confirmed that the drug (teicoplanin) loaded on the TPP cross-linked chitosan nanoparticles causes an increase in nanochitosan size and there was no interaction between teicoplanin and chitosan. Also, it is observed that 28.2% of teicoplanin was released in the first 10 h and the release is continued gradually to receive 37.4% in 100 h. Thus, it seems that chitosan nanoparticles mitigate the drug release and are suitable for sustained drug release.

Chitosan a natural polysaccharide, is extensively used in medical formulations [1,2]. Chitosan, is derived from chitin and found as the primary component of cell walls of fungi, the exoskeletons of crustaceans and insects, and scales of fish. It is a cationic polymer composed of (1–4)-2-amino-2-deoxy-β-D-glucan that due its' pH sensitivity, biocompatibility, and bioactive functions has attracted more attention than its base polymer chitin [3,4].

INTRODUCTION OF RICE BRAN:-

Rice bran oil is a form of oil produced from the hard outer layer of rice, which is known for its high smoke point and mild flavor. Rice bran oil is produced from rice bran, an oily layer in between the paddy husk and white rice. This oil is the oil extracted from the hard outer brown layer of rice called chaff or rice husk. It is known for its high smoke point of 232°C (450°F) and mild flavor, making it appropriate for high-temperature cooking methods such as stir frying and deep frying. The Rice bran oil is known as wonder oil for its numerous health advantages. It has a number of benefits over other edible oils because of the presence of a unique antioxidant known as oryzanol.

Fig No.: 1 Rice Bran

INTRODUCTION OF RICE BRAN OIL:-

The Rice bran oil is known as wonder oil for its numerous health advantages. It has a number of benefits over other edible oils because of the presence of aunique antioxidant known as oryzanol. Rice bran oil is regarded as a miracle product obtained from the outer layer of the brown rice. Rice bran is by- product obtained during rice milling function. This is golden reddish cuticle obtained after removal of the husk and through polishing of the rice.

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Fig No.: 2 Rice Bran Oil

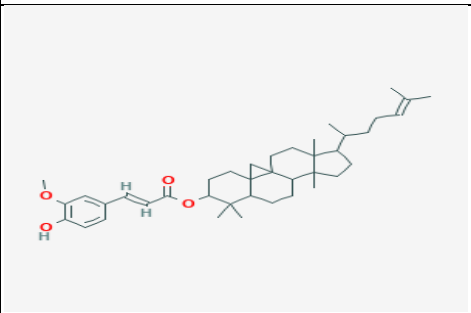
ORGANIC RICE BRAN OIL IN HEALTH:-

Gamma-oryzanol (ferulic acid) is a growth-promoting substance found in grains and isolated from rice bran oil. In the treatment of hot flashes, its primary action is to enhance pituitary function and promote endorphin release by the hypothalamus.

Gamma-oryzanol was first shown to be effective in the treatment of menopausal symptoms, including hot flashes, in the early 1960s.

Subsequent studies have further documented its effectiveness.

DRUG PROFILE:-

Drug Name	Gama - Oryzanol
Type	Small Molecule
Structure	
Kingdom	Organic Compounds
Super Class	Esters
Class	Cycloartenol ferulic acid ester
Sub class	methoxyphenyl

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Moleculer Weight	**Average:** 602.9g/mol **Monoisotropic:**602.43351g/mol
Chemical Formula	C40H58O4
Indication	Used as hypolipidemic agent,anti-ulcer agents
IUPAC Name	[7,7,12,16-tetramethyl-15-(6-methylhept-5-en-2-yl)-6-pentacyclo[9.7.0.01,3.03,8.012,16]octadecanyl](E)-3-(4-hydroxy-3-methoxyphenyl)prop-2-enoate
Melting Point	148-150 °C
Log P	12.1

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