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INVESTIGATE THE EFFECT OF *MOMORDICA CHARANTIA* AND *SPONDIAS MOMBIN* ON DIABETIC RATS AGAINST STZ INDUCED DIABETES

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ABSTRACT

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels. This study aimed to investigate the potential antidiabetic effects of Momordica charantia (bitter melon) and Spondias mombin (yellow mombin) on streptozotocin (STZ)-induced diabetic rats. The experiment involved six groups of rats: a normal control group, a diabetic control group, a group treated with Metformin as standard drug,a group treated with Momordica charantia, and a group treated with Spondias mombin and a group treated with combination of both herbal drug Spondias mombin and Momordica charantia . Diabetes was induced in the rats using a single intraperitoneal injection of STZ. The treatment groups received oral doses of the respective plant extracts for a duration of four weeks.

The results demonstrated that both Momordica charantia and Spondias mombin exhibited significant antidiabetic effects in the diabetic rats. Treatment with these plant extracts resulted in a reduction in fasting blood glucose levels, compared to the diabetic control group. Furthermore, the plant extract-treated groups showed improved glucose tolerance and increased insulin sensitivity compared to the diabetic control group. Biochemical analysis revealed that the plant extracts effectively restored altered lipid profile parameters, including total cholesterol, triglycerides, and low-density lipoprotein cholesterol, towards normal levels.

Moreover, treatment with Momordica charantia and Spondias mombin significantly attenuated oxidative stress by increasing antioxidant enzyme activity and reducing malondialdehyde levels.

Histopathological examination of pancreatic tissues showed that both plant extracts preserved pancreatic architecture and reduced STZ-induced damage, such as beta-cell degeneration and inflammatory cell infiltration.

In conclusion, the findings of this study indicate that Momordica charantia and Spondias mombin have potential antidiabetic properties and may provide beneficial effects in managing diabetes. These plant extracts exhibited hypoglycemic, hypolipidemic, antioxidant, and pancreatic protective effects in STZ-induced diabetic rats. Further research is warranted to explore the underlying mechanisms and identify active compounds responsible for these effects, which could lead to the development of novel therapeutic interventions for diabetes management.

Keywords: Momordica charantia, Spondias mombin, Streptozotocin, Diabetic Mellitus, T1DM, T2DM.

INTRODUCTION

1.1 HERBAL PLANTS:

The practise of herbal medicine was the earliest kind of healthcare ever utilised by humans. Herbs have been used by all cultures throughout history. It made an important contribution to the development of contemporary civilization. They carefully compiled information on plants before producing concise herbal pharmacopoeias. In reality, the pharmacopoeia of scientific medicine, which goes back to the early 20th century, depends heavily on the herbal knowledge of the people living there. Today's most widely used medications often have a botanical basis [1].

According to estimates from the World Health Organization, herbal medicine is currently used by nearly four billion individuals, or 80% The human population of the globe, for some part of rural healthcare. Medicines made from herbs are an integral element of the traditional therapies used in Ayurvedic, Homoeopathic, Naturopathic, Ancient Oriental, and Native American Indian medicine. Around the world, between 70 and 90 percent of people utilise complementary and alternative medicine. Herbs have been used in conventional medical practises since the dawn of mankind. The early man discovered herbs by experimentation and failure, and he taught his progeny about them. It is conceivable that plants have been used for both medicinal and magical purposes for ten thousand years. [2]

India holds the unenviable title of "Diabetes capital of the world" for having the highest proportion of diabetes patients in the world. If immediate preventative action is not done, the Diabetes Atlas 2006, a publication of the International Diabetes Federation, predicts that India's present 40.9 million-strong diabetes population would increase to 69.9 million by 2025. The American Diabetes Association (ADA) requirements for determining the presence of DM include signs (such as polyuria, polydipsia, and unexplained weight loss) and a blood sugar level greater than 200 mg/dL (11.1 mM) at random, more than 126 mg/dL (7mM) at fasting, or greater than 200 mg/dL (11 mM) at least two hours after ingesting an oral glucose load. The Indian Council of Medical Research has lately named type 2 diabetes as one of the chronic diseases that for which the present-day allopathic healthcare system cannot provide a satisfying cure and for which appropriate alternative therapies need to be researched. With reference of around 45,000 species, India has a long history of using medicinal herbs in its Ayurvedic, Siddha, and Unani systems of medicines. Over the past few decades, a great deal of plant preparations have been claimed to have hypoglycemic action. 800 plants were mentioned in a database that contains natural hypoglycemic substances compiled by Mexican scientists. Over 150 plants belonging to different plant groups having hypoglycemic action have been used, according to Indian researchers. Over 1,200 medicinal plants are included in a recent cross-cultural

compendium as being utilised in diabetes. In India, there are over 6000 producers of herbal products. Ayurvedic medications are produced in over 4000 sites. [3]

Ethanopharmacological Significance

Naturally botanicals constitute some of the oldest known medicinal remedies, having been used for millennia by people all over the world. They play a significant role in several countries' conventional medical formulas. In addition to having uses as nutraceuticals, cosmetics, herbal tea, and other medical products, there has been a significant increase in curiosity concerning the study of plants for medicinal purposes, especially in India [8]. The majority of the plants that are that are currently employed to treat diabetes have their roots in medicinal plants, and conventional medicine and ethnobotany are both excellent sources of information on the efficacy and pharmacological impacts of medicinal plants [4].

As Per World Health Organization (WHO)

The WHO publications provide information on plant substances that have been shown to treat diabetes through clinical research, are listed in pharmacopoeias, or are mentioned in reputable sources. In WHO publications on traditional medical plants, which are validated by clinical data, WHO assesses and classifies botanical species that have been publicly certified by one or more regions of the world as having anti-diabetic properties [4]. Up to 90% of people in impoverished countries use herbs and their byproducts as medicines for routine medical care, according to the World Health Organization (WHO). The World Health Organization (WHO) has compiled the 21,000 species that are utilised medicinally over the world. There are 2500 of these species of plants in India. There are over 800 plants known to have beneficial effects on diabetes. The therapy of Diabetes mellitus may benefit from the use of a wide number of plant-derived active elements that reflect a diversity of active substances [2].

Medicinal Plants as an Alternative Source of Anti-diabetic Agents

Numerous plants are being tested as natural therapies for a number of pathological conditions, including diabetes mellitus, or DM, and associated side effects. There are now a wide variety of herbs used for their glucose-lowering properties, and this practise is related to a cultural tradition that is passed down through centuries [5]. Among Indian ayurvedic herbs, the following: Allium sativum (garlic), Allium cepa (onion), and Allium indicum (cumin) are the most frequently suggested. *Azadirachta indica* (Neem), *Aloe barbadensis (Aloe vera), Beta vulgaris (Beetroot), Cinnamomum cassia (Cinnamon), Catharanthus roseus (Vinca rosea), Curcuma longa (Curcumin), Eugenia jambolana (Jamun), Plant-based chemicals are abundant in all of the aforementioned plants [2], [7].*

Therapeutic Scope of Herbal Plants

A total of approximately 400 hypoglycemic plant varieties. Nevertheless, study of novel anti-diabetic, plant-based medications is currently ongoing due to possible safety concerns. Alkaloids, glycosides, terpenoids, flavonoids, and carotenoids are present in almost all plants and have been associated with their beneficial effects on diabetes. A variety of plants have been demonstrated to have anti-diabetic properties in addition to having hypoglycemia properties [23]. The majority of commonly used drugs are fundamentally derived from organic compounds found in plants for medicinal purposes [9]. Throughout the beginning of time, Galega officinalis L. (Fabaceae) has been used to treat diabetes mellitus. It was the first herbal remedy with confirmed hypoglycemic efficacy. The species, which is sometimes referred to as goat's rue, French lilac, or Italian fitch, was used to produce galegine, a guanidine derivative. The capacity of the extract from plants to lower plasma glucose levels is a result of this compound, which shares a chemical structure with the hypoglycemic drug Metformin [9], [10].

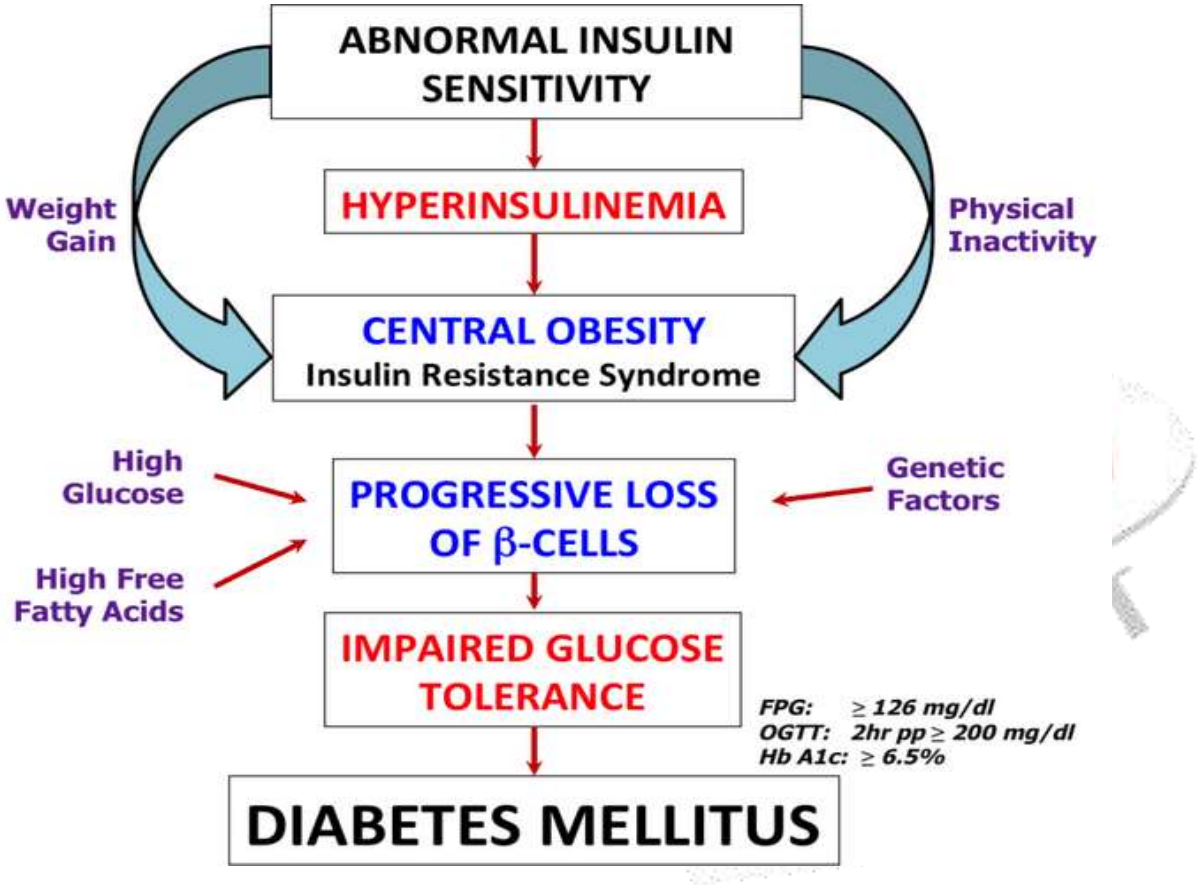
Modern Impact of Herbal Drugs in India

Future efforts to produce new drugs will be greatly aided by the identification of promising lead compounds in natural goods, especially those of plant origin. Due to its accessibility, affordability, and lack of negative

consequences, plant-based preparations constitute the primary component of all modern medications, particularly in rural regions [4]. In recent years, a number of evaluations on herbal medicines and natural cures with hypoglycemic properties have been created. The role of herbal remedies and therapeutic procedures in the prevention and management of T2DM was investigated. Experimental studies and several notable medicinal plants' ability to treat diabetes are both mentioned [10].

1.2 DIABETES MELLITUS:

Type 2 diabetes is a long-term hormonal illness brought on by insufficient insulin production that is characterised by hyperglycemia, altered protein, carbohydrate, and lipid metabolism, and a greater risk of coronary artery disease consequences. The characteristic symptoms of polyuria, polydipsia, polyphagia, and weariness are caused by metabolic irregularities and an absolute or approximate insulin shortage. Gangrene, polyneuropathy, and uraemia are examples of chronic complications associated with diabetes mellitus [8].



Hyperglycemia is a global disease, and its effects are one of the most important causes of premature mortality in many countries. [20]. Over a period of time, diabetes causes impairment and mortality by causing harm to, malfunctioning in, and failure of different systems of the body, including the cardiovascular system, blood vessels, eyes, kidneys, and nerves. The degree of harm caused by hyperglycemia to different parts of the body may be inversely related to how long the disease has persisted and how well it has been treated [4]. According to the International Diabetes Federation (IDF), there were a total of 366 million diabetics worldwide in 2011 and an estimated 4.6 million deaths from the disease. The hyperglycemia pandemic has spread to the Indian subcontinent. The condition known as type 2 diabetes affects 8.31% of the adult population in India, 9.85% of individuals in Bangladesh, 3.03% of individuals in Nepal, 7.77% of individuals in Sri Lanka, and 6.72% of individuals in Pakistan. Indians have a substantially greater prevalence of age-associated hyperglycemia than those in other nations [2].

Types of Diabetes Mellitus

A team of specialists assembled by the American Diabetes Association divided hyperglycemia into the following categories:

Type I Diabetes (also known as juvenile diabetes or insulin-dependent diabetes))

- Type I Diabetes is a kind of diabetes brought on by the death of the islet cells in the pancreas by the immune system.
- 12% of all instances of Type 2 diabetes are caused by it.
- Although it may affect anybody, within the ages of 3 and 18 account for about 75% of occurrences. It is the most prevalent kind of hyperglycemia that affects kids and teenagers.

Type I diabetes is classified into:

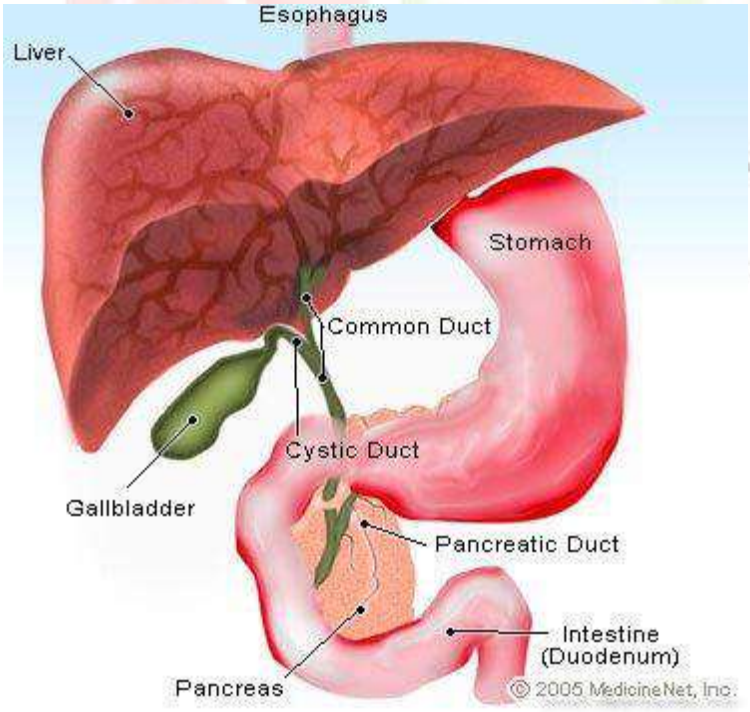
- Type I a - The pancreatic beta cells are destroyed by type I an autoimmune disease.
- Type I b - Pancreatic beta cell unexplained deterioration

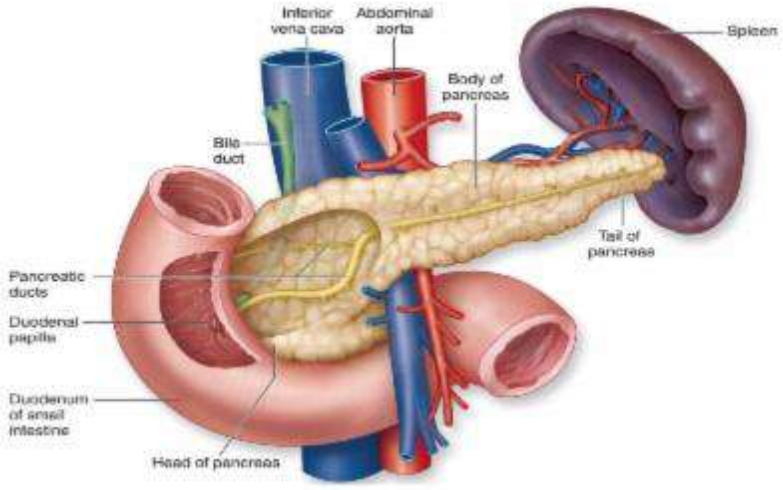
Type II Diabetes (Non-insulin dependent Diabetes Mellitus or Maturity-onset Diabetes)

The resistance of insulin and an insufficient compensating insulin secretor responsiveness are two traits that define Type 2 Diabetes.

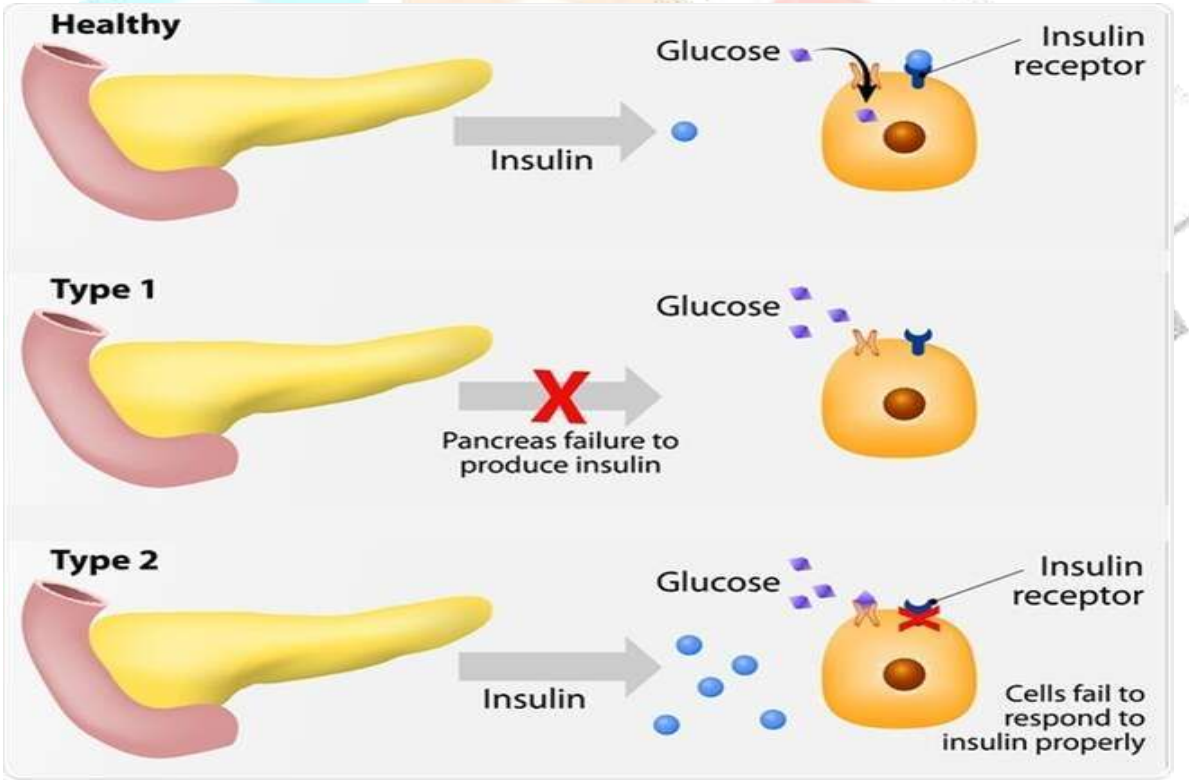
Other Specific types of Diabetes

- Genetic abnormalities that affect the hormone insulin activity and beta cell activity
- Exocrine pancreatic conditions, endocrinopathies, and medically or drug-induced insulin insufficiency
- Pregnancy-related Type 2 Diabetes





Notwithstanding the fact there certainly are various forms of Three of the most common kinds associated with diabetes are type 1, type 2, and gestational diabetes. The major causes include obesity, a lack of physical activity, and a change in lifestyle [14]. Based on the aetiology and medical signs, Diabetes of the type 1 (insulin dependent diabetes mellitus, IDDM) and Type 2 diabetes (non-insulin dependent diabetic mellitus, NIDDM) are two different types of diabetes [15].



T1DM is sometimes referred to as adolescent or childhood-onset diabetes or insulin-dependent diabetes. It is distinguished by a shortage of insulin production in the circulatory system and is brought on by the loss of pancreatic islet beta cells. Individuals the maintenance of Type 1 diabetes requires constant injections of insulin regulate their blood sugar levels since they run the danger of developing ketoacidosis. Young people and adolescents are more likely to have T1DM. The overwhelming majority of people who have diabetes worldwide have T2DM, called diabetes without insulin dependence often or adult-onset diabetes, which is brought on by the body's inefficient utilisation of insulin and hyperglycemia. Target tissues develop insulin resistance when they become less responsive to normal blood levels of insulin. Race, genetic susceptibility of diabetes, and prior pregnancy-related diabetes all raise the chance of developing diabetes.Along with becoming older, being overweight or obese, eating poorly, being inactive, and smoking. T2DM diabetes,

which affects virtually all adults but is rapidly affecting youngsters these days [4], The most prevalent kind of diabetes. (90 percent) in the population. The third kind of diabetes, known as gestational diabetes, is a condition that appears during pregnancy as a result of glucose intolerance. Women with gestational diabetes are more prone to experience complications during pregnancy and delivery. Although gestational diabetes is only temporary, it raises the long-term risk of Type 2 diabetes [7]. Due to enhanced free radical generation and compromised antioxidant defences, oxidative stress is a recognised pathogenic factor in the onset, development, and consequences of hyperglycemia [7].

Signs and Symptoms of Diabetes

Indications of neurological damage in people include:

- sensations of ting weakness, or pain in the their hands, arms, limbs, the toes, or fingertips.
- withering of the hands' or feet' muscles
- feeling dizzy, dizziness, or vomiting
- diarrhea or constipation
- difficulty urinating or feeling lightheaded as a result of a reduction in blood pressure after standing or positioned up
- Male erection dysfunction or female genital dryness among mammals
- Rats with diabetes exhibit a variety of unusual behavioural reactions to nociceptive stimuli, which may indicate the existence of excessive pain. These consist of lowered paw withdraw limits to mechanical input, sped-up tail flicks when exposed to heat stimulation, and heightened flinching after the chemical formalin injections through the paw.
- A increasing understanding of the processes behind normal pain perception (nociception) and aberrant chronic pain brought on by nerve damage (neuropathic pain) has been stimulated by the rising interest in such models, which has led to the application of comparable studies to experimental forms of diabetes. These findings demonstrate that diabetic rats have physiologic, neurochemical, and behavioural indicators indicative of impaired sensation of pain, making them potentially valuable for examining the etiologic pathways connecting hyperglycemia with painful neuropathy.

Risk factors for Diabetes mellitus

- Weight gain
- Age
- history of diabetes in the family.
- a background of diabetes Previously having gestational diabetes (diabetes when pregnant).
- Blood pressure levels more than 130/80 mmHg.
- Defects in glucose metabolism.
- Lack of physical activity.
- African Americans, Hispanic/Latino, and other races/ethnicities.
- Hispanic/Latino, African Americans, and other ethnic groups and races.
- Hawaiians and Pacific Islanders are especially vulnerable.

Pathophysiology of Diabetes mellitus

Whereas type 2 diabetes is possibly varied, a number of significant metabolic abnormalities frequently cause diabetes. These significant flaws include of the following:

- Reduced muscular tissue transport of carbohydrates activity leading to peripheral diabetes and insulin resistance.
- The production of insulin in response to elevated glucose is impaired.
- Increased levels of hepatic glucose synthesis.

- In openly diagnosed diabetes, all three of these abnormalities in metabolism exist and fuel the autoimmune condition. [12].

Treatment of Type II Diabetes mellitus

The primary goal of intensive type II diabetes treatment is to avert both microscopic and macrovascular chronic consequences. The following are the pillars of hypoglycemic therapy:

Diet: While the suggested calories allocation has changed over the years, the general strategy is to reduce calories from fat, minimise cholesterol and saturated fatty acids, and allow small quantities of protein along with complex carbohydrates, with a balanced diet that roughly consists of 50% carbohydrates, 30% fats, and 20% proteins.

Exercise: Exercise should be recommended for the great majority of people with diabetes on a regular basis. Workout is a crucial supplement for controlling blood sugar levels, dropping weight, maintaining a reduced body weight, managing cardiac diseases, and overall wellbeing. Exercise training improves insulin action in skeletal muscle, which elevates HDL cholesterol, decreases blood pressure, and increases insulin sensitivity by 20–40%. [13]

Pharmacological Therapy: The introduction of numerous novel categories of oral hypoglycemic medications has revolutionised the treatment of type II diabetes during the past several years.

Management of Diabetes Mellitus

Pharmacological therapy

Nevertheless, there is currently no specific medication approved to treat diabetes-related neuropathy disease. The World Health Organisation (WHO)'s classic pharmacological ladder has restricted application for the management of pain caused by neuropathic disorders. This is due to the fact that medications called non-steroidal anti-inflammatory drugs and basic painkillers be frequently ineffective in treating nerve-related pain. The illness history is autonomous in peripheral nerve damage, which includes cerebral palsy, PDN, and truncal neuropathy. In most instances, healing on its own occurs within a couple of weeks. Either LDDP and localised neurological disorders can make it challenging to manage pain. Combining codeine phosphate with carbamazepine, phenytoin, clonazepam, or paracetamol can be beneficial.

- Tricyclic antidepressant medications, including imipramine or amitriptyline, are frequently beneficial; the recommended daily dose varies between 30-150 mg. Tricyclic SSRIs may make hypotension of the spine worse. Pregabalin and duloxetine, two recently approved medications, are additionally helpful.

Physical Therapy

For people with type 2 diabetes, exercise might be a successful alternative treatment choice. This could lessen the need for painkiller medication treatments. Common signs of neuropathy caused by diabetes, for example severe tenderness in the soles of the scorching or sensation in the feet and legs in the legs and feet, muscular cramps, weakness in the muscles, inability to erection, and feet with diabetes, may be relieved with the aid of certain physiotherapy treatments.

Specific Therapy

There is proof to show that during diabetes, free radicals are produced as a result of the breakdown of sugar, which alters vascular reactivity and the function of endothelial cells. Alpha lipoid acid has demonstrated good outcomes in the study of animals research. It is believed that vitamin C lowers cellular levels of oxygen species that are reactive and raises nitrogen oxide (NO) concentrations that are comparable to alpha lipoic acid concentrations. In addition to raising levels of decreased glutathione and nitrogen oxide-mediated vasodilation, vitamin C lowers plasma free radical levels.

Anti-Diabetic Drugs and their Side Effects

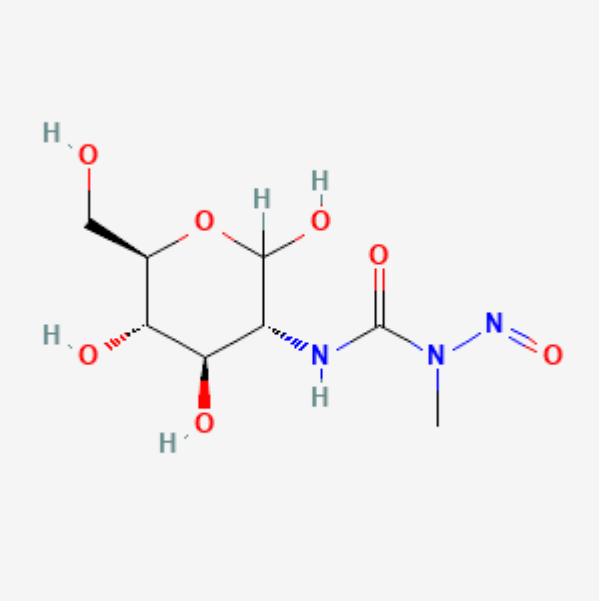
Anti-diabetic drugs are administered to regulate the amount of sugar in the blood in the medical management of Diabetes mellitus [16]. Current DM management strategies include a variety of medicines, including novel chemical hypoglycemic drugs, as well as dietary and lifestyle modifications (such as dietary counselling and exercise). These anti-diabetics include biguanide (Metformin), glucosidase inhibitors (acarbose), and sulphonylureas (glibenclamide) [17], [22].

These artificial oral hypoglycemic drugs have serious adverse effects, such as

- Hypoglycemia,
- Obesity,
- Hepatic damage,
- Cardiovascular Disease,
- Abdominal discomfort,
- Nausea and
- Diarrhea [22].

There are a number of downsides connected to the use of such oral anti-diabetic drugs, such drug resistance (reduced effectiveness), adverse reactions, as well as toxins. Over a period of six years of therapy, sulfonylureas, for instance, have been reported to lose their effectiveness in around 44% of individuals, while glucose-lowering drugs are thought to be unable to manage high cholesterol levels. Due to several issues with the use of currently available artificial medicinal products for diabetes, research for novel natural anti-diabetic therapies continues [4].

Streptozotocin



Structure of Streptozotocin

Name : Streptozotocin

Mol. Formula : $C_8H_{15}N_3O_7$

Molecular Wt : 265.22

IUPAC Name : 1-methyl-1-nitroso-3-[(3*R*,4*R*,5*S*,6*R*)-2,4,5-trihydroxy-6-

(hydroxymethyl)oxan-3-yl]urea

Melting point : 115 °C

Solubility : Soluble in 100% ethanol (200 proof at 0.92mg/ml) or water (nH_2O at 102.8mg/ml).

The U.S. Food and Drug Administration has given streptozotocin the go-ahead to treat advanced islets in the pancreas cellular carcinoma. Although it seldom treats carcinoma and entails a significant risk of harmful effects, its usage is often restricted to individuals who have cancer that cannot be surgically removed. [18]

STZ has a molecular mass of 265g/mol and is made up of a sugar molecule at one of the ends and a nitrosourea molecule with an additional methyl group added. According to the Ayurvedic the pharmacist's manual of India, streptozotocin (STZ), also known as 2-deoxy-2-((methyl (nitroso)amino)carbonyl)-amino)-D-glucopyranose, is a naturally occurring compound generated by the bacterium Streptomyces achromogenes.[19].

1.3 PLANT PROFILE:

1.3.1 *Momordica charantia*

M.Comordica charantia, often referred to as bitter melon, bitter pear, or karela, is a tropical herbal plant that be popular in Indian cuisine and has a long history of usage in conventional medicine as a treatment for hyperglycemia. Momordica is a Latin word that meaning "to bite" in reference to the leaf's jagged edges, which resemble bite marks. The fruit is regarded as tonic, stomachic, stimulant, emetic, antibilious, bowel movements, and alterative in Ayurveda. For an extended period of time, bitter melon has been utilised in several Asian traditional medical practises. Like other meals with a bitter flavour, bitter melon encourages metabolism. While this can be beneficial for persons with problems with stool, dyspepsia, and slow digestion, it can occasionally aggravate indigestion and ulceration. However, according to scientific research and conventional accounts, bitter melon seldom does have these adverse effects because it is both a demulcent and at least modest inflammatory modulator. MC is a blooming plant in the the cucumber family, sometimes known as bitter melon or bitter guard.[20]

Scientific classification of *Momordica charantia*-

Kingdom	:	Plantae
Clade	:	Tracheophytes
Clade	:	Angiosperms
Clade	:	Eudicots
Clade	:	Rosids
Order	:	Cucurbitales
Family	:	Cucurbitaceae
Genus	:	Momordica
Species	:	M. charantia

Botanical Description:

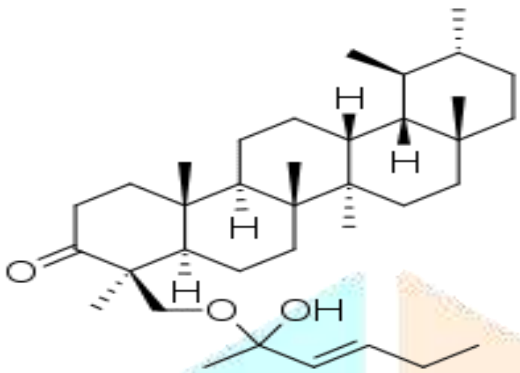
In addition to the fact that it is a resident of the tropical regions, the organism's ancestral habitat is unknown. Tropical regions such as the Amazon, eastern Africa, Asia, and the Caribbean all support the

growth of bitter melon. It is cultivated extensively throughout the Indian subcontinent, including in India, as well as in China, Southeast Asian countries, the African continent, and the Caribbean. Simple, mostly palmately 5-7 divided leaflets with one or two branches on the tendrils. The 5 m-long, herbaceous, tendril-bearing vine. It has 4–12 cm wide, alternating, simple leaves through 3–7 deeper lobe divisions. Fruits can be ovoid, ellipsoid, or spindle-like frequently warty or ridged, and can dehisce sporadically into a mushy capsules with three valves or remain indehiscent. The interior of the fruit is rectangle in shape and has an outward look that is distinctly warty. It features a hollow segment, a thin layer of flesh covering a vast cavity, and pith in addition to flat, enormous seeds. Unripe fruits contain white pith and kernels, which become red as they mature. The texture of the interior is fluid and crisp, similar to that of a green-colored bell pepper, cucumber, or chayote. It has lovely and sensitive skin. Orange and squishy fruit signals that it is completely ripe. There are many different sizes and forms of bitter melon. The usual Chinese phenotypic is between 20 and 30 cm long, rectangular, sharply tapered at the tip, pale green in colour, and warty on its outermost layer. The bitter melon that serves as the representative of India is thinner, has pointy ends, and has grooves and sharp trapezoidal "teeth" all over its outermost layer. Green or white colouring is prominent. There are several transitional varieties that fall among both of these poles. Some produce little fruit that is just 6 to 10 cm long and can be eaten as stuffed veggies. Both India and Southeast Asia are big fans of these little fruits. Balsamino is the name for bitter melon in Colombia. When mature, the pods are smaller and have scarlet seeds that are quite tasty. blooms are stain blooms, generally solitary on a bracteate scape, with a deep hypanthium, five lobed calyx, five distinctive the petals, generally yellow, and one to three with incised plates at the base, introduced towards the bottom of hypanthium, threads separate, broad, the anthers different or consistent, 2 each one dithecal, the remaining one monothecal, cells in order bent or flexuous; pistillate blossoms typically isolated on a bracteates scape, hypanthium rectangular attached to spindle formed perianth typically lesser compared to stain petals, staminodes missing or 3, eggs multiple, horizontal, prejudices 3, 2 lobed. Few to many, ovate, and often carved seeds. Yellow male and female flowers are produced separately by each plant. No proof could be found to back up the assertion that quinine is the source of bitterness in bitter melon.

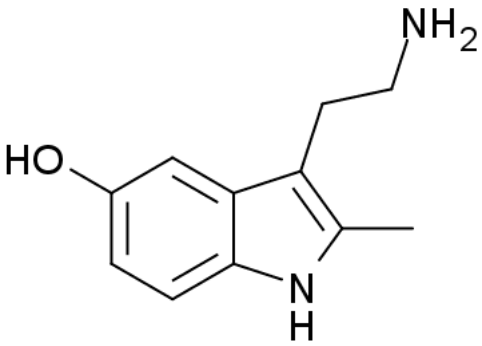
Momordica charantia

Phytochemistry

Alkaloids, also charantin, charine, cryptoxanthin, cucurbitins, cucurbitacins, cucurbitanes, cycloartenols, diosgenin, elaeostearic acids, erythrodiol, galacturonic acids, gentisic acid, goyaglycosides, goyasaponins, guanylatecyclase inhibitors, oleic acid, oxalic acid, pentadecans, peptides, petroselinic acid, polypeptides, proteins, ribosome-inactivating proteins, rosmarinic acid, rubixanthin, spinasterol, steroidal glycosides, stigmasta-diols, stigmasterol, taraxerol, trehalose, trypsin inhibitors, uracil, v-insulin, verba Ascorbigen, aspartic acid, serine, glutamic acid, thycine, alanine, g-amino butyric acid, and pipecolic acid are among the amino acids. lutein, lycopene, pipecolic acid, b-sitosterol-d-glucoside, elasterol, citrulline, and flavochrome.



Momordicilin



Hydroxytryptamines

Therapeutic Uses

The fruit is regarded as alterative, laxatives that antibilious, emetic, addictive, tonic water, and stomachic. Gout, arthritis, and acute hepatic and splenic conditions can all benefit from the fruit. It is used to cleanse the blood, remove melancholy, and get rid of foul odours. In both humans and animals trialsfurther shown to possess hypoglycaemic qualities. Types of diseases caused by intestinal parasites and worms include diabetes, malaria, colic, sores and wounds, infections, and hepatitis cirrhosis of the liver. Leaf serves as a galactogogue. An astringent root. Demulcent, dermatosis, diabetes, diarrhoea, indigestion, eczema, emmenagogue, emollient, high body temperature, febrifuge, anthelmintic, aphrodisiac, burn, catarrh, constipation, digestion, haemorrhoids, hepatitis, hypoglycemic, aggravation (liver), filth, leucorrhoea, leukaemia

1.3.2 *Spondiasmombin*

The yellow mombin (Spondiasmombin L.), a member of the Anacardiaceae order, may be encountered in tropical parts of Northern and Northeastern Brazil as well as America, Asia, and Africa. In Brazil, it is referred to as cajá or taperebá, in Mexico and Ecuador as ciruelaamarilla, in the region of Central America as jobo, and in North America as hogplum or yellow mombin. Both the coastal region and the rain forest support its growth. It has a height range of 15 to 22 metres. Deep cuts in the bark of the trunk frequently result in the production of a brown resinous material. The tips of the branches are where the foliage and flowers are located. The majority of the leaves on the tree are stripped off before it begins to bloom. The fruit is an oval in shape, yellow plum that is 1 and half inches long. It has a leather exterior and a thin covering of fruit pulp that has a highly unusual flavour. It hangs from the tree in various groups totaling more than twelve. The berry consists primarily of an oblong bean and is extremely high in vitamins B1 and C. Cuttings taken and seeds are the plant's primary means of proliferation.

Scientific classification of *Spondiasmombin*

Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms
Clade	Eudicots
Clade	Rosids
Order	Sapindales
Family	Anacardiaceous
Genus	Spondias
Species	S. mombin

Botanical Description:

a tree that is typically between medium and big in size with long compound leaves that have between nine and nineteen leaflets on each leaf. The leaves are often alternating, but clustered at the ends of the branches, radiating forth from the branch like spokes of a wheel. With the exception of the final ones, the leaflets are opposite. The leaf stem sometimes becomes crimson towards the outer leaflets, especially on young plants. The fragrance of crushed leaves is somewhat turpentine-like. Grey in colour, the trunk and bark can occasionally have identifiable tiny, blunt, grey spines that resemble warts more commonly than spines (Nelson,1951).According to Bosco, Soares, AguiarFilho, and Barros (2000), the fruit is a tiny, oval drupe that is 3 to 5 cm length with a lean yellow peel and a tart-sw eet flavour.

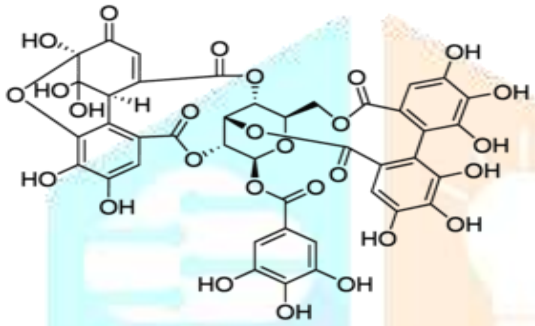
Spondiasmombin

Phytochemistry

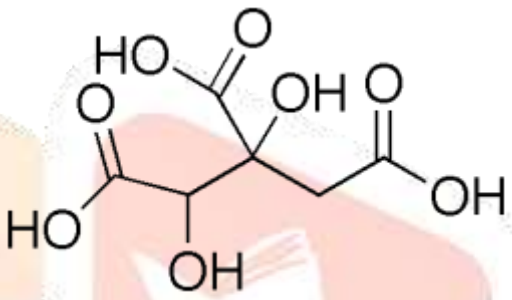
HPLC examination of Spondias mombin indicated the occurrence of carotenoids that phytoene, α -trans-beta-carotene, α-carotene, betacrytoxanthin (cis and trans), zeinoxanthin, and lutein, according to Hamano and Marcadante (2001). According to (Leon-De-Pinto et al. 1995), the gum exudates from Spondiasmombin include arabinose, mannsone, and the rhamnose and are hence particularly soluble in water. The ash gums'

cationic composition include significant amounts of calcium, potassium, sodium, and magnesium. There is proof that the Spondias gums include arabinofuranose residues as structural elements.They are called galloygeraniin and geraniin. According to Apori (1998), spondiasmombin has a high polyphenol and tannin readily extracted content. According to Caraballo et al. (2004), a variety of substances, including flavonoids, naphthoquinones, sesquiterpenes, quassiniods, indole and and quinoline alkaloids, along with anthraquinones, berberine, and others, may contribute to Spondiasmombin's anti-malarial effect. According to Abo et al. (1999), Spondiasmombin consists of the substances saponins, tannins, and anthraquinone glycosides that have been demonstrated substantial antibacterial action but no such effect against fungi. More than 54 elements that make up of the natural oils of Spondiasmombin were identified by (Moronkola et al. 2003), with caryophyllene being the most prevalent compound, followed by µ-cadinine, α-muurolene, α-gurjunene, 5-isocedranol, and -cadinene. Antiviral Geraniin, Ballyl (Geraniin et al 1991), Chorogenic acid, Butylester, and Allohydroxycitric Acid, (Corthout et al. 1992)

PHYTOCONSTITUENTS



Geranin



Allohydroxy citric acid,

Therapeutic Uses

The fruit's juices is used as a febrifuge and diuretic. The pungent bark's decoction can be used as an emetic, therapy for diarrhoea, diarrhoea, haemorrhoids, gonorrhoea, and leukorrhea, as well as a medicine for dysentery. It is thought to remove bladder calcifications in Mexico. On wounds, the powdered bark is administered. Tea produced from the blossoms and leaves is used to treat ocular and throat pain as well as urinary tract infections, cystitis, and biliousness.A infusion of the young leaves is used as a treatment for diarrhoea and dysentery in Belize. Poultices are applied to wounds and inflammatory conditions using the juice of crushed leaves and the powder of leaves that have been dried. According to Rodrignes and Hesse (2000) and Rodrigne and Samuels (1999), the gum is used as an expectorant and to expel tapeworms. The fruit juice is used as a febrifuge and diuretic medication. The acidic bark's extract can be used as an emetic, therapy for diarrhoea, diarrhoea, haemorrhoids, gonorrhoea, and leukorrhea, as well as a medicine for dysentery. It is thought to remove bladder calcium deposits in Mexico. On injuries, the powdered bark is administered. Tea produced from the blossoms and leaves is used to treat eye and throat discomfort as well as urethritis, cystitis, and biliousness. In Belize, a suspension of the fresh leaves is used as a remedy for diarrhoea. Utilising the juice of chopped leaves and the powder of dried leaves, poultices are applied to wounds and inflammatory conditions. The gum is used as an expectorant and to expel tapeworms, according to (Rodrignes and Hesse (2000) and Rodrigne and Samuels 1999).

Spondiasmombin

The yellow mombin (Spondiasmombin L.), a member of the Anacardiaceae order, may be encountered in tropical parts of Northern and Northeastern Brazil as well as America, Asia, and Africa. In Brazil, it is referred to as cajá or taperebá, in Mexico and Ecuador as ciruelaamarilla, in the region of Central America as jobo, and in North America as hogplum or yellow mombin. Both the coastal region and the rain forest support its growth. It has a height range of 15 to 22 metres. Deep cuts in the bark of the trunk frequently

result in the production of a brown resinous material. The tips of the branches are where the foliage and flowers are located. The majority of the leaves on the tree are stripped off before it begins to bloom. The fruit is an oval in shape, yellow plum that is 1 and half inches long. It has a leather exterior and a thin covering of fruit pulp that has a highly unusual flavour. It hangs from the tree in various groups totaling more than twelve. The berry consists primarily of an oblong bean and is extremely high in vitamins B1 and C. Cuttings taken and seeds are the plant's primary means of proliferation.

Scientific classification of *Spondiasmombin*

Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms
Clade	Eudicots
Clade	Rosids
Order	Sapindales
Family	Anacardiaceous
Genus	Spondias
Species	S. mombin

Botanical Description:

a tree that is typically between medium and big in size with long compound leaves that have between nine and nineteen leaflets on each leaf. The leaves are often alternating, but clustered at the ends of the branches, radiating forth from the branch like spokes of a wheel. With the exception of the final ones, the leaflets are opposite. The leaf stem sometimes becomes crimson towards the outer leaflets, especially on young plants. The fragrance of crushed leaves is somewhat turpentine-like. Grey in colour, the trunk and bark can occasionally have identifiable tiny, blunt, grey spines that resemble warts more commonly than spines (Nelson,1951).According to Bosco, Soares, AguiarFilho, and Barros (2000), the fruit is a tiny, oval drupe that is 3 to 5 cm length with a lean yellow peel and a tart-sweet flavour.

Spondiasmombin

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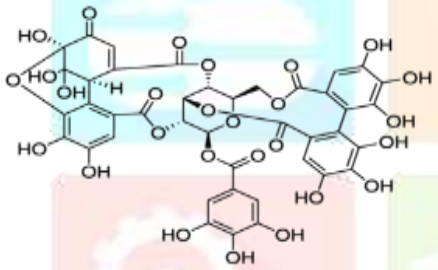
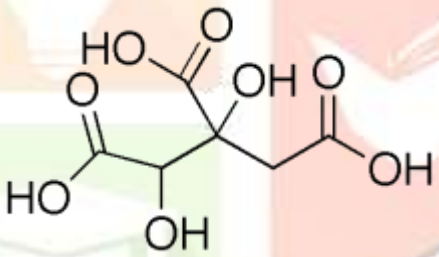


Geranin



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MATERIAL & METHODS

Chemical and Drugs-

The following list includes all of the analytical-grade compounds that were utilised. belowin a Table. 4.1.

Table 4.1: List of equipments and chemicals

A) Drugs & chemical	
Normal Saline	Albert David Ltd, Ghaziabad
Streptozotocin	Spectrochem Pvt Ltd Mumbai (India)
Metformin 500 mg	
Diethyl ether	S.D. Fine Chemicals, Mumbai, India
Formaldehyde	S.D. Fine Chemicals, Mumbai, India
Methanol India	Fisher scientific Ltd, Mumbai,
Chloroform Ltd(Q22465)	Thermo fisher scientific India Pvt.
Xylene	SRL Chem. (54717)
Wax	Titan Biotech Ltd.(C3HSIN01)
B) Enzymatic Kits	
Cholesterol	Span diagnostics Limited, Surat (71LS200-60)
ALT (GPT)	Span diagnostics Limited, Surat (76LS200-60)
Alkaline Phosphate	Span diagnostics Limited, Surat (75DP200-50)
Triglyceride	Span diagnostics Limited, Surat (72LS100-60)
Infinite LDH UV Kinetics	Accurex Biomedical Private Limited, Mumbai (L81914/L82014)
Total Protein	Span diagnostics Limited, Surat (83LS100-600)
Albumin	Span diagnostics Limited, Surat (84LS100-600)
Bilurubin	Span diagnostics Limited, Surat (78LS200-66)

C) Equipments	
Micropipette (10-100 µl & 100-1000 µl) Superfit	Superfit
Centrifuge	Remi centrifuge Ltd. (VCDJ-4711)
Biochemical analyzer	Microlab odel no. RX-05
U.V.Spectrophotometer (Double Beam) Pharmaspec UV-1700, Shimadzu	Pharmaspec UV-1700, Shimadzu
Digital Balance	Sortorious Lab (S/N 0034008578)
Microscope	Olympus (India)Pvt. Ltd. (CH2OIBLMF)
Digital water bath	Scien tech (IIRT/TFB-023)
Refrigerator	White Westinghouse (RTD16VCMCWO)
Microtome	Yorco scientific Pvt. Ltd (YSI-115)
Blood Glucose Meter	Dr. Morepen
Glucometer Strips	Dr. Morepen

Selection of Plant for Authentification:

Momordica charantia and Spondiasmombin were purchased online from Amazon in dried form. For authentication, I made a Herbarium file in which plants part are attached, these were authentified from the BGIR, NOIDA by the Scientist Dr. Priyanka Ingle. The plants were identified as Momordica charantia and Spondiasmombin.

Collection of plant material for extraction:

After authentication Momordica charantia and Spondiasmombin were collected from the supplier, and checked. The Momordica charantia and Spondiasmombin were shade dried and powdered with a mechanical grinder then passed through the sieve No. 80 and stored in an air tight container.

Extraction Procedure:

Extraction of Spondias mombin: Spondias mombin powdered was determined, and a 7-day maceration procedure using a solvent made from methanol and constant stirring was performed in a conical flask that was kept at the temperature of the room. After the maceration procedure is finished, muslin cloth is used to filter the leaf extract. Next, the extract is dried by rotary evaporation. Up to its next usage, the MESM will be kept at 80°C (Samuggam et al., 2021).

Extraction of *Momordica charantia:* The dried fruit was homogenised during the night while being ground into a fine powder and extracted with water that had been double-distilled (1:3). For additional purification, the resulting solution was passed through filters and centrifuged (3000 x g, 10 min). To get M. charantia water-based extract, the supernatant was further lyophilized until completely dry.

PHARMACOGNOSTIC EVALUATION

Morphological and microscopic analysis was performed of the sample.

MORPHOLOGY

Momordica charantia:

Straight bole, longitudinal fissured bark, imparipinnate and elliptic leaves, fragrant flowers in dense panicles, and winged, flat pods are characteristics of this species. The tree may grow up to 30 metres tall and 2.5 metres wide.Bark has a rough, scaly, and longitudinally fissured outer layer. Each leaflet is 8 to 13 cm long, oblong, elliptic, or rotund in shape, and has 15 to 20 pairs of transverse veins. There are five to seven leaflets total.

Spondias mombin:

Spondias mombin is a tiny, somewhat buttressed evergreen tree that may reach heights of 20 metres (66 feet) and girths of 1.5 metres (4.9 feet). It has thick, corky bark that is severely split. It is light pink when cut, quickly becoming darker. Lower stems have hairless branchlets.

Powder Microscopy

In powder from the aerial portion, a soft, microscopic feature of colour was investigated.

Proximate Analysis

Calculations were made for the powder product's expected moisture level, overall ash worth, acidic and water-soluble and ash, extract alcoholic compatible values, and extraction soluble in water values.

Moisture Content

The method of drying loss specified in the Indian Ayurveda Pharmacopoeia was used to determine the contents of the powder products sample.From the Petri plate that had previously been weighed, 5 g of the product powder were taken out and baked for 5 hours at 105 ° C. After cooling down, the Petri plate was measured in a desiccator. It absorbed the weight disparity. After 30 minutes of heating and chilling, the drying and weighing were maintained until a steady weight was achieved.

Ash Value

This is carried out to evaluate the consistency and quality of a synthetic material. Ash is made up of organic radicals like sodium, potassium, magnesium, calcium, etc. as well as inorganic radicals like phosphates and carbonates, and silicates.

Total Ash

A silica crucible dish should be weighed and heated. Only a little amount of the medication, less than 2 g, was incinerated in a compact dish in a muffle furnace at a temperature no more than 450 ° C until it was carbon-free, after cooling, weighed. The burnt material ought to be washed in hot water, the residue collected on an ash-free filter pad, and the residues vaporised if a carbon-free ash cannot be obtained in this manner.Filtrate should be added, followed by a rinse and a flame set at no higher than 450 ° C. With an air-dried product, figure out how much ash is there.

Calculation:

Total value of ash of the specimen = $\frac{(Z - X) \times 100\ \%}{Y}$

Where, X= empty dish weight (g)Y= drug weight (g)

Z= dish weight + ash (g)

Acid-Insoluble Ash Values

This is carried out to evaluate the consistency and quality of a synthetic material. Ash is made up of organic radicals like sodium, potassium, magnesium, calcium, etc. as well as inorganic radicals like phosphates and carbonates, and silicates.

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Calculation:

$$\text{Total value of ash of the specimen} = \frac{(Z - X) \times 100\ \%}{Y}$$

Where, X= empty dish weight (g)Y= drug weight (g)

Z= dish weight + ash (g)

Acid-Insoluble Ash Values

The ashes gathered from the aforementioned procedure should be boiled for five minutes while the insoluble material is concentrated on ashless filter paper with 25 ml of distilled hydrochloric acid, washed with hot water, and ignited to continual heat. Determine how much acid-insoluble ash there is relative to the dry medicinal product.

Calculation:

$$\text{value of ash insoluble in acid of the specimen} = \frac{100 \times A\ \%}{Y}$$

Where, A= residue weight (g)Y= drug weight (g)

Ash insoluble in acid is often less than Total ash content of the same material.

Water-Soluble Ash Values

Heat the ashes in 25 ml of water for five minutes, subsequently store he undissolved material on ashless filter paper and place it in the water that is boiling. Finally, burn the mixture at a temperature no more than 450 ° C for 15 minutes.

Calculation:

$$\text{value of the ash soluble in water of the specimen} = \frac{100 \times A\ \%}{Y}$$

Where, A= residue weight (g) Y= drug weight (g)

Extractive Value

The extractive values have been crucial in determining the quality of the raw material and providing evidence of the phytochemical ingredients included in a medicinal substance. This was helpful in evaluating certain elements because they could be evaluated using the same extracting solvent.

Alcohol-Soluble extractive value

A closed flask was used for the maceration and finely grind 5 g of the air-dried product with 100 ml of the recommended strength alcohol throughout the course of 24 hours, shaking it once every six hours and letting it sit for 18 hours. Filter readily, take pains to prevent solvent loss, and reduce 25 ml of the filtrate to drying in a weighted flat-bottomed deep dish before drying it at 105 ° C to a consistent weight. Furthermore to the dried medication, estimate the extraction value of the alcohol.

Calculation:

25 ml of alcoholic extract gives = x g of residue 100 ml of alcoholic extract gives = 4 x g of residue

5 g of air-dried drugs gives – 4x g of alcohol soluble residue

100 g of air-dried drugs gives – 80x g of alcohol soluble residue Extractive value soluble in alcohol of the sample = 80x %

Determination of Water-Soluble Extractive Value

A closed flask was used for the maceration and finely grind 5 g of the air-dried product with 100 ml of the recommended strength alcohol throughout the course of 24 hours, shaking it once every six hours and letting it sit for 18 hours. Filter readily, take pains to prevent solvent loss, and reduce 25 ml of the filtrate to drying in a weighted flat-bottomed deep dish before drying it at 105 ° C to a consistent weight. Furthermore to the dried medication, estimate the extraction value of the alcohol.

Calculation:

25 ml of water extract gives = x g of residue 100 ml of water extract gives = 4 x g of residue

5 g of air-dried drugs gives – 4x g of water-soluble residue 100 g of air-dried drugs gives –

80x g of water-soluble residue extractive value soluble in water of the specimen = 80x %

Phytochemical investigation-

1. Phytochemical investigation of *Momordica charantia*

The primary types of chemical components included in the extracts some are as follow glycosides, alkaloids, tannins, saponins, terpenoids, carbohydrates, cardiac glycosides, , flavonoids, and phenols were identified using the colour reactions [29].

2. Phytochemical investigation of *Spondiasmombin:*

The active ingredients in extracts, such as steroid, tannins, phenols, flavonoids, alkaloids, cardiac glycoside, triterpinoids, carbohydrates, proteins, and Quinones, were checked using standard procedures [30], [31].

Preliminary Phytochemical Screening of *Momordica charantia* -

The observed finished product was subjected to an excellent phytochemical screening procedure in order to identify the key chemical categories (glycosides, alkaloids, tannins, saponins,, cardiac glycosides, anthraquinones glycosides, flavonoids, and phenols) present in plant extracts [29].

Detection of Alkaloids:

Mayer's Test and Dragendroffs's test:

The resulting substance was heated and screened following the addition of 10 ml of acidified alcohol to 0.1 g. The following step included combining and carefully shaking 0.4 ml of diluted ammonia, 1 ml of chloroform, and 1 ml of filtrate. The specimen's chloroform layer was removed with the use of 2 cc of acetic acid. Dragendroff's reagent (potassium bismuth iodide solution) was administered to one side, while Mayer's reagent (potassium mercuric iodide test) was administered to the other. When an alkaloid test is positive (using Mayer's or Dragendroff's reagents, respectively), a cream or a reddish-brown precipitate is created [29].

Detection of Glycosides:

After heating or steaming on a vessel filled with water, 0.2 g of the test sample was extracted using 5 ml of each diluted sulfuric acid and water. After passing the acid extracted over filters, it was neutralised with a 5% solution of sodium hydroxide. The water extract received the same amount of water that was used to dilute the sodium hydroxide in the case of the acid extract. After being mixed to make both Fehling's solutions A and B alkaline, the mixture was heated in a water bath for two minutes. There may be glycoside present if the acid extract produces more red precipitation than the water extract [29].

Detection of tannins:

Two millilitres of water/dimethyl sulfoxide (DMSO) was heated with 0.1 grammes of the extract, and a few droplets of ferric chloride solution at 0.1 percent were added. The coloration was next checked for blue-black or brownish-green tones [29].

Detection of saponins:

The maximum amount of three drops of olive oil that have been added to a foam created by mixing 0.1 g of extract with 1 ml of distillation-derived water results in the formation of an emulsion, proving the presence of saponins [29].

Detection of triterpenoids:

Salkowski's test-

A reddish brown hue appeared at the interface when strong sulfuric acid and 0.4 ml chloroform were added to 0.1 g of the extract, suggesting an abundance of terpenoids [29].

Detection of Proteins:

The appearance of a violet colour after adding 2 ml of biuret reagent to the test solution (2 ml) indicates the existence of proteins [29].

Detection of flavonoid:

Shinoda test-

The detection of flavonoids was adding a few magnesium turnings and adding intense hydrochloric acid droplet until a few pink scarlet, crimson red, or occasionally green to blue hues appeared [29].

Detection of Phenol:

Whenever 50 mg of the extraction were diluted in 5 ml of distilled water, the appearance of a dark green colour with the addition of just a few droplets of a neutral 5 percent ferric chloride solution was regarded as an indication for phenolic components [29].

Test for carbohydrates:

Molisch's test-

When Molisch's reagent (-naphthol dissolved in ethanol) with herbal drug, accompanied by just a few droplets of strong sulfuric acid, a purple ring manifests at the interface between the test material and the acid, indicating the presence of carbohydrates [29].

Preliminary Phytochemical Screening of *Spondias mombin* -

The preliminary phytochemical examination was used to evaluate the existence of compounds including alkaloids, flavonoids, saponins, tannins, phenols, proteins, glycosides, terpenoids, and carbohydrates. employing the methods outlined below [31].

Detection of Alkaloids:

Mayer's Test: (Potassium mercuric iodide test)-

The resulting solution was put into a test tubes in 1.2 ml volume. 0.2 cc of diluted hydrochloric acid and Mayer's reagent were applied. An alkaloid is present when a yellow-buff tinted precipitation forms [32].

Dragendroffs's test: (Potassium bismuth iodide solution)-

Dragendroff's reagents and 0.1 ml of diluted hydrochloric acid were added to a test tubes containing a 2 ml solution of extract. By forming an orange-brown coloured precipitate, an alkaloid's existence was demonstrated [32].

Detection of Glycosides:

Legal test-

The substance being extracted was dissolved in pyridine, and the resulting solution was then made alkaline by adding sodium nitroprusside solution. Pink red was the result [32].

Detection of tannins:

Ferric chloride test-

5 ml of the extracted solution were combined with 1 ml of a 5 percent ferric chloride solutions. The greenish black hue served as a clue that tannins were present [32].

Potassium dichromate test-

5 ml of the extracted were combined with 1 ml of a 10% aqueous potassium dichromate preparation. The production of a brownish brown precipitate indicated the presence of tannins [32].

Detection of saponins:
Foam test-

Distilled water was used to reduce a 1 ml extract solution to 20 ml, and the mixture was then stirred for 15 minutes in a graduated cylinder. The emergence of solid foam hinted at the presence of saponins [32].

Detection of triterpenoids:
Nollar's test-
The test solution was added to the test tube together with 2 ml of a thionyl chloride solution containing anhydrous stannous chloride at a concentration of 0.01 percent. Triterpenoids are present when a deep crimson hue transforms from purple to deep red after a few minutes [32].

Detection of Protein and Amino Acids:
Ninhydrin test-
The test sample containing the extract was given ninhydrin (tri-ketohydrindene hydrate) treatment at a pH range 4 to 8. Amino acids appeared to have a positive impact on the formation of purple hue [32].

Detection of flavonoid:
Shinoda test-
The resulting substance was coloured red by adding magnesium turnings and conc. hydrochloric acid (HCl) to it [32].

Detection of Phytosterols:
Libermann-Burchard Test-
10 mg of the herbal drug dose was mixed in 1 ml of chloroform. No reddish violet colour appeared despite the addition of 1 ml of acetic anhydride and 2 ml of strong sulphuric acid, indicating the lack of steroids [32].

PHARMACOLOGICAL STUDIES:
Experimental animals:
For anti-diabetic activity, 30 male *Albino wistar* rats weighing 150-200 gm will be taken from LUVAS, Hisar ,Rajasthan. The experimental animals were kept in normal polypropylene cages and accessibility to free nourishment and drinking water.

Groups number: 6
No. of Rats per group: 5
Condition of Environment: Cycle of dark/light for 12 hrs., 45% humidity and 25±1°C temperature.

Diet and accommodation: The rats have open access, within strict sanitaries, to regular rat canister with *ad labium* water. Grouped in polypropylene cages with a grill roof in steel material and fresh paddy husk amenities.

Approval: Experiment was conducted according to approval and guidelines ofIAEC guideline.

This study used adult wistar rats (150-200 grammes) of either sex. They were fed a regular food (Pranav Agro, India) and given free access to water in an animal house facility under standard laboratory settings. During the study, the experimental animals were acclimatised to predictable laboratory conditions in a cross ventilated animal housing at 25°C, relative humidity 44–56%, and a 12:12 hour Day night cycle, and were fed a standard meal and water ad libitum. The IAEC has given their approval as per experimental guideline. Animals will be divided into six groups of five animals each as Group 1 (normal group), Group 2 (diabetic group), Group 3 (paracetamol treated), Group 4 (test 1), Group 5(test 2) and Group 6 (combination of both herbal drugs) Group 1 received normal saline for 7 days. Group 2 received Streptozocin (50mg/kg) as single dose on day one followed by distilled water for 7 days i.p. following Streptozocin

administration. Group 3 received Streptozocin (50mg/kg) as single dose on day one followed by Metformin (500mg/kg/day) for 7 days. following Streptozocin administration. Group 4 received Streptozocin (50mg/kg) as single dose on day one followed by ethanolic extract of *Spondias mombin* (125mg/kg) for 7 days h orally. following Stretozocin administration. Group 5 received Stretozocin (50mg/kg) as single dose on day one followed by ethanolic extract of *Momordica charantia*(300mg/kg)for 7 days. Group 6 received *aqueous extract of Momordica charantia (*300mg/kg) with *Spondias mombin* (125mg/kg) following Stretozocin administration.

Table 1. *Momordica charantia* and *Spondiasmombin*

S. No	Group Name	Description	Dose	Animal / Group
1.	I-Control Group	Salinesolution	As per body weight (orally)	5
2.	II-Disease Control	STZ	50mg/kg (I.V)	5
3.	III- Standard Drug	STZ + Metformin	50mg/kg(I.V)+ 500mg/kg/day(orally)	5
4.	IV- Test Drug-I	STZ +Methanolic extract of Spondias mombin	50mg/kg(I.V)+125mg/kg/day	5
5.	V- Test Drug-II	STZ + aqueous extract of Momordica charantia	50mg/kg(I.V)+ 300mg/kg/day(orally)	5
6.	V- Test Drug-Combination	STZ + methanolic extract of Spondias mombin +aqueous extract of Momordica charantia	50mg/kg(I.V)+ 200mg/kg/day(orally) +125mg/kg/day(orally)	5

Animals

Male Wistar rats of (150-200 g) were used t the experiments. The animals were procured from Lala Lajpat Rai University, The rats were acclimated for a week before to the experiment's start. The quarantine facility was kept at standard requirements for the environment including temperature (26 + 20C), relative humidity (45-55%) and 12 hours of darkness and light. All of the rats were kept in proper hygiene conditions and given rats pellet diet (provided by Golden Feeds Ltd., India). IAEC permission for the animal research to be conducted.

Dosing Schedule of Animals: The dosing of the drug and test compound were given as per given in Table 1**.**

Diabetes Induction in Rats: The Diabetes was induced by streptozotocin at dose level 50mg/kg/body weight.

Route of administration: The test drug Metformin (500mg/kg/day-orally) and Ethanolic extract of *Momordica charantia* (300mg/kg/day-orally) and *Spondias mombin* (125mg/kg/day-orally), anti-diabetic

drugs and standard were administered orally by gavage feeding.

Antidiabetic activity:

Streptozotocin induced: After going without eating for 16 hours, the blood sugar level was measured while having free accessibility to water. A single intraperitoneal injection of 50 mg/kg of STZ (Spectro Chemical Private. Ltd., Lucknow, India) in 0.1 M citrate buffer at pH 4.5 was used to cause hyperglycemia.The hyperglycemic rats (glucose level 200 mg/dl) were divided and placed into 6 groups, each consisting of 7 rats, after 3 days of streptozotocin injection. Regarding the diabetic-preventing effects of medicinal plants extract, the normal control, diabetes control, and standard groups were kept the same. With the exception of the normal control and diabetes control groups, the therapy (p.o.) began on the exact same day and lasted for 60 days.Animals in all groups had unrestricted access to both water and food throughout this time., blood sugar levels and body weight were assessedIn rats that had been starved overnight, the On "0" day 7th, 15th, 30th, and 60th days after intervention. Rats were carotid bled to obtain specimens of blood on the fifteenth day for biochemical analyses. All of the rats' whole pancreases were promptly extracted and preserved in 10% formalin solution for histological analysis.

The various groups used in experiments:

Group I- normal control (Saline solution).

GroupII- diabetic control and received (Streptozotocin).

Group III- Streptozotocin + Metformin (500mg/kg p.o.) and served as standard.

Group IV- Streptozotocin + Methanolic extract of Spondias mombin (300mg/kg/day-orally) each

Group V- Streptozotocin + aqueous extract of Momordica charantia (300mg/kg/day-orally) respectively.

GroupVI- Streptozotocin + Methanolicextract of Spondias mombin (125mg/kg/day-orally) + aqueous extract of Momordica charantia (300mg/kg/day-orally respectively.

Methodology:

The parameters studied areas follows:

- Biochemical analysis include;

a) Blood glucose. Fasting and random
b) HbA1C
c) Serum total cholesterol.
d) Liver Function Test
e) Lipid profile
f) Serum protein.

- Morphological parameter includes; Body weight.

Biochemical Studies:

The plasma glucose concentration during fasting was tested in accordance with the manufacturer's recommendations using commercially available Ecoline/Inoline Kits. According to the manufacturer's instructions, readily accessible kits were additionally utilised to quantify lipase and amylase.

Histopathological studies:

Processing of isolated pancreas:

The pancreas of the rats was isolated after their sacrifice. Small sections of the isolated pancreas were broken up and kept in 10% formalin for two days. The pancreatic pieces were then cleaned for roughly 12 hours under running water. The next step was to dehydrate using isopropyl alcohol of progressively higher strengths (70%, 80%, and 90%) for 12 hours at a time. Finally, 100% alcohol was used to dehydrate for around a total of three modifications of 12 hours each. Chloroform was used for clearing, with two 15 to 20 minute long changes between each. The organ pieces were washed, then treated using an automated tissue processing machine that infused beeswax.

Embedding in paraffin by vacuum:

Hot bess wax was poured into L-shaped blocks after hard paraffin had been melted. After that, the pancreatic sections were swiftly put into paraffin that was molten and let cool down.

Sectioning:

The blocks were divided into slices with a width of 5 using a microtome. On a micro slide coated with the albumin from eggs (a sticky material), the slices were taken. The portions were then left in the oven at 600C for a further hour. Egg albumin breaks down and beeswax melts, attaching tissues to the slide.

Staining:

Acids stains include eosin. As a result, it gives all of the cell's fundamental components a pink colour. Consider (RNA, Cytoplasm). The basic stain haematoxylin turns the DNA in the nucleus and all other acidic elements in cells blue.

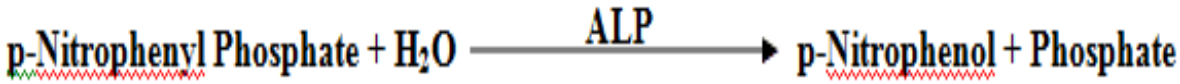
Procedure:

1. Wash the parts in chloroform for around 15 minutes to deparaffinize them..
2. By soaking the portions in isopropyl alcohol (100%, 90%, 80%, and 70%) of varying strengths, the segments were hydrated.
3. Afterwards rinsed with water.
4. 15 minutes of haematoxylin staining
5. Washed with running water.
6. 3 to 10 fast dips in 1% acid alcohol resulted in separation, which was examined under a light microscope. The surrounding area was exceedingly light (or colourless), and the nuclei were clearly visible.
7. Used tap water to wash.
8. parts are dipped 3-5 times in lithium carbonate till they turn vivid blue.
9. 9. Rinsed for 10 to 20 minutes with running tap water. Eosin won't stain uniformly if washing is done properly.
10. According to the condition of the eosin and the preferred depth of the surface stain, stained with eosin for 15 seconds to 2 minutes. Slides should be dipped numerous times for even staining results before being left to sit in eosin for the required amount of time.
11. After removing excess eosin, the samples were dehydrated in 95% and 100% isopropyl alcohol for two minutes each. The samples were then examined under a microscope.
12. Two three-minute changes of pure isopropyl alcohol.
13. Chloroform, two 2-minute changes.
14. DPX (Desterenedibutyl Phthalate Xylene) mounted 14.

Alkaline phosphatase test:

Assay Principle-

At a pH of 10.3, alkaline phosphatase catalyses the hydrolysis of the neutral compound p-Nitrophenyl phosphate into the yellow compound p-Nitrophenol with phosphate. The amount of activity generated by ALP present in the sample is proportional to the frequency change at 405 nm, which is kinetically calculated.



Assay Parameters:

Mode	:-	Kinetic
Wavelength	:-	Increasing
Flow- cell temperature	:-	37°C
Optical path length	:-	1 cm
Blanking	:-	Purified water
Sample volume	:-	20 µL
Reagent volume	:-	1000 µL
Delay	:-	30 seconds
Interval	:-	30 seconds
Number of reading(s)	:-	4
Permissible reagent-Blank absorbance	:-	<0.1 AU
Kinetic factor	:-	30 seconds
Maximum ΔA/minute	:-	4
Linearity	:-	<0.1 AU
Units	:-	30 seconds

Procedure:

Pipette into tube marked	Test
Serum/ Plasma	20 µL
Working ALP Reagent	1000 µL

Mix well and aspirate immediately for measurement.

Configure the analyzer using the assay's parameters.

1. 1. Use water that has been purified to clean the analyzer.
2. After 30 seconds, measure the amount of absorption again. Do this up to a period of 120 seconds later at an effective wavelength of 405 nm..
3. 3. Calculate the average change in absorption per minute. (ΔA/minute).

Calculations:

ALP activity (IU/L) = ΔA/minute x Kinetic factor

Where

ΔA/minute = Change in absorbance per minute

Kinetic factor (K) = 2712

Kinetic factor is calculated using following formula

$K= 1/M \times TV/SV \times 1/P \times 10^6$

M = Molar extinction coefficient of p-Nitrophenol and is equal to $1.8x10^3$ lit/mol/cm at 405 nm

TV = Sample volume + Working Reagent volume

SV = Sample volume

P = Optical path length

10^6 = Constant

Clinical Significance-

Evaluation of serum ALP is particularly relevant to hepatobiliary illness and bone disorders. The liver's cells near biliary canaliculi and active osteoblasts are where this enzyme is mostly synthesised. It is known that a liver would synthesise more ALP as a reaction to any type of biliary tree blockage.

Increased activity: In bone illnesses such Metastatic disease, Rickets, Paget's disease, repairing broken bones, and intra- or extrahepatic blockage in the liver, serum ALP is elevated. As children develop, elevated amounts are noticed because of osteoblastic activity, which is the creation of new bones. Increased ALP activity may sometimes be the initial sign of hepatotoxic medication effects. In the absence of jaundice but in the presence of the original cause, a significant rise may be a sign of metastasis.

Decreased activity: Insufficient amounts of ALP are seen in Pernicious Anaemia, Hypophosphatasemia, and an extremely uncommon congenital defect.

AST Determination: The kinetics analysis was carry out in accordance with the AST assay procedure since it is identical to the ALP analysis described above.

RESULT & DISCUSSION

PHARMACOGNOSTICAL EVALUATION

Momordica charantia has undergone evaluation. The computed average is shown below in the table along with the results, which are 5.1, 5.2, and 5.3. Three repeats of every evaluation were run in order to determine the final outcome.

Ash Value

Momordica charantia was found to have an overall ash value of 6.5%w/w. Momordica charantia was found to have an acid in soluble ash value of 0.29% w/w and a water-soluble ash value of 3.50% w/w, as shown in Figure 5.1.

Table 5.1: Ash value of powdered of *Momordica charantia*

Name of the Plant	Ash value % (w/w)		
	Total	Acid in soluble	Water soluble
Momordica charantia	6.5% w/w	0.29%w/w	3.50% w/w

Moisture content

Momordica charantia's moisture percentage was measured and determined to be 3.21 % w/w as shown in figure 5.2.

Table5.2: Moisture content of powdered of *Momordica charantia*

Name of the Plant	Wt. of dry Herb (GM)	%moisture content
Momordica charantia	10	3.24

EXTRACTIVE VALUE

The medicinal plant Momordica charantia was discovered to have a 36.7% (w/w) soluble in water extracting value and a 19.4% (w/w) alcohol-soluble extraction values.

Table5.3:Extractive value of powdered of Momordica charantia

Extract	Plant powder taken	Yield% (w/w)
WATER	**100gm**	**36.7**
ALCOHOL	100GM	**19.4**

QUALITATIVECHEMICALEXAMINATIONEXTRACT

The extracted was put through qualitative chemical analysis in order to identify the chemical elements that were present, as given in table 5.4. The aq included alkaloids, flavonoids, saponins, glycosides, proteins, amino acid carbohydrates, phenolic and tannins. Momordica charantia extract.

Table 5.4 Phytochemical examination of *Momordica charantia* extract

S.No.	Tests	Aqueous extract
1	**Test for Alkaloids**	
A B C D	Mayer's testDragendorff'ste stWagner's testHager'stest	+ + + +
2	**TestforGlycosides**	
A **B** **C**	**ModifiedBorntrager'sT** **est Baljet's TestKeller-** **Killiani Test**Legal'stest	+ + +

3	**TestforCarbohydrates**	
A B C	Molisch's testBenedict's TestFehling'sTest Killer-killianiTest	+ + +
4	**Test forFlavonoids**	
A B C D	Shinoda testAlkaline reagent testAmmoniumtest Aluminiumchloride test	+ + + +
5	**Detection ofProteinsandAmino acid**	
	Millonstest Ninhydrintest Xanthoproteic test	+ + +
6	**TestforSaponins**	
A	Frothingtest	+
7	**Detection of Phenolic Compounds and Tannins**	
A B C D	Leadsub- acetatetestFerric chloride testGelatinTest ShinodaTest	+ + + +
8	**Detection for Phytosterols**	
A B	Salkowski's test Libermann- Burchard's test	+ +

SPONDIAS MOMBIN

Mombin Spondia has been evaluated. Calculating the median number yielded the results listed in the table below, which are 5.5, 5.6, and 5.7. Three repeats of each test were run in order to determine the result.

Ash Value

Spondias mombin was discovered to have a total ash value of 7.17%(w/w). According to figure 5.1, Spondias mombin's water-soluble ash values has been determined to be 5.19% (w/w) and its acid-insoluble ash value was determined to be 3.12% (w/w).

Table 5.5: Ash value of powdered of *Spondias mombin*

Name of the Plant	**Ash value % (w/w)**		
	Total	**Acid in soluble**	**Water soluble**
Spondias mombin	7.17%(w/w)	3.12%(w/w)	5.19% (w/w)

Moisture content

Spondias mombin's percentage of moisture was measured with the result to be 9.48, as shown in figure 5.6.

Table5.6: Moisture content of powdered of *Spondias mombin*

Name of the Plant	**Wt. of dry Herb (GM)**	**%moisture content**
Spondias mombin	10	9.48

Extractive value

The extractive value of the herbal drugs Spondias mombin in ethanol has been determined to be 17.82% (w/w), its extractive value in petroleum ether was found to be 1.95% (w/w), and its extraction value in water was determined to be 16.50% (w/w).

Table5.7: Extractive value of powdered of Spondias mombin

Extract	Plant powder taken	Yield% (w/w)
Water	**10gm**	**16.50**
Ethanol	10gm	**17.82**
Petroleum Ether	10gm	**1.95**

QUALITATIVE CHEMICAL EXAMINATION EXTRACT

The extract that was produced was put through qualitative chemical analysis in order to identify the chemical elements that were present, as indicated in table 5.4 The methenolic extract of Spondias mombin was shown to include Alkaloids, Flavonoids, Saponins, Glycosides, Proteins and Amino Acid Carbohydrates, Phenolic Components, and Tannins.

Table 5.4 Phytochemical examination of *Spondias mombin*extract

S.No.	Tests	Methenolic extract
1	**Test for Alkaloids**	
A	Mayer's	+
B	testDragendorff'ste	+
C	stWagner's	+
D	testHager'stest	+
2	**TestforGlycosides**	
A	**ModifiedBorntrager'sT**	+
B	**est Baljet's TestKeller-**	+
C	**Killiani Test**Legal'stst	+
3	**TestforCarbohydrates**	
A	Molisch's	+
B	testBenedict's	+
C	TestFehling'sTest	+
	Killer-killianiTest	
4	**Test forFlavonoids**	
A	Shinoda testAlkaline	+
B	reagent	+
C	testAmmoniumtest	+
D	Aluminiumchloride test	+
5	**Detection ofProteinsandAmino acid**	
	Millonstest	+
	Ninhydrintest	+
6	**TestforSaponins**	
A	Frothingtest	+

7	**Detection of Phenolic compounds and Tannins**	
A B C D	Leadsub- acetatetestFerric chloride testGelatinTest	+ + + +

Fasting Glucose: The diabetes-induced by streptozotocin rats overnight fasting blood sugar levels significantly rose on each of the three days that followed (0, 15, 30 and 60). Furthermore, using Metformin showed in a considerable drop in overnight fasting blood sugar levels. Treatment of diabetes experimental rats with low quantities of Momordica charantia (fruit) and Spondias mombin (flower) show a significant reduction (P 0.005) as compare with diabetic normal group. In comparison to diabetic controls, Momordica charantia (stem wood) and Spondias mombin (leaves) showed a significantly significant reduction (P 0.001) when administered in high doses to treat a diabetes caused by streptozotocin model.

Table .5.9 Effect on fasting glucose (mg/dl) in Wistar male rats with continuous oral dose of Metformin, Momordica charantia (fruit), and Spondias mombin (leaves) for 60 days.

Group	**Dose**	**Fasting blood glucose (mg/dl)**			
		0 day	**15th Day**	**30th Day**	**60th Day**
	As per body weight (orally)	125.94±4.95	118.71±6.88	113.59±4.78	113.52±6.27
II	50mg/kg (i.p)	132.23±5.20	277.00±16.05	265.04±11.16	257.21±11.48
III	50mg/kg(i.p)+500mg/kg/day(orally)	112.84±4.44	158.28±9.17	151.45±6.38	145.89±13.34
IV	50mg/kg(i.p)+300mg/kg/day(orally	105.79±4.16	202.80±11.75	185.25±7.80	170.05±11.2
V	50mg/k(i.p)+125mg/kg/day(orally	117.88±4.64	222.59±12.90	199.50±8.40	188.10±8.17
VI	50mg/kg(i.p)+300mg/kg/day(orally)+125mg/kg/day(orally) (swaras)	120.90±4.46	202.80±11.75	194.05±8.17	182.61±7.39

Values (Mean±SEM;n=5 significantly ($p<0.05$) using one way ANOVA following Tukey's B multiple comparison Post Hoc test.

Table5.10 Showing the HbA1c Level

Group	Dose	Group(s)	HbA1c	
			Before	After
I	As per body weight (orally)	Normalcontrol	5.2± 0.2	5.2 ±0.25
II	50mg/kg (i.p)	Diabeticcontrol	5.2± 0.2	7.2±0.50
III	50mg/kg(i.p)+500mg/kg/day(orally)	Inducer+Metformin(500mg/kg p.o.)	5.1± 0.2	6.5 ±0.43
IV	50mg/kg(i.p)+300mg/kg/day(orally	Inducer+herbal extract (300 mg/kg/p.o.)	5.2±0.3	6.8±0.11
V	50mg/k(i.p)+125mg/kg/day (orally	Inducer+ herbal extract(125mg/kg)	5.1±0.2	6.9±0.23
VI	50mg/kg(i.p)+300mg/kg/day(orally)+125mg/kg/day(orally) (swaras)	Inducer+ 300mg/kg/day(orally)+ 125mg/kg/day(orally)	5.0±0.2	6.7±0.21

Values (mean±SEM;n=5) significantly ($p<0.05$) using one way ANOVA following Tukey's B multiple comparison ANOVA test.

ENZYMATIC PROFILE:

Both of the low as well as high dosage groups receiving treatment showed a substantial rise in ALP, ALT, and ASP. Blood concentrations of aspartate amino transferase, alanine amino transferase, and alkaline phosphatase have been determined in each group. Alkaline phosphatase (ALP), alanine amino transferase (ALT), and aspartate amino transferase (AST) blood levels were measured in each group to determine the functioning of the liver., and we observed no statistically significant differences in any of the research groups.

The value of each calculated enzyme was found to be considerably lower and equivalent to control group levels following the administration of the standard medication streptozotocin. The ALP, ALT, and ASP levels significantly increased in both the low and high dosage treatment groups.

Table 5.11 Effect of oral administration Metformin and herbal extract continuously for 60 days on ALP, ALT and AST in Wistar male rats

G.No	Group(s)	ALP (IU/L)	ALT (IU/L)	AST (IU/L)
I	As per body weight (orally)	171.47 ±8.42	51.09±2.51	56.16±2.76
II	50mg/kg (i.p)	194.43 ±9.54	56.86 ±2.79	67.00± 3.29
III	50mg/kg(i.p)+500mg/kg/day(orally)	178.32 ±8.75	51.89 ±2.55	58.45 ±2.87
IV	50mg/kg(i.p)+300mg/kg/day(orally	187.27 ±9.19	54.07 ±2.65	60.73± 2.98
V	50mg/k(i.p)+125mg/kg/day(orally	179.52 ±8.81	53.28 ±2.61	59.24 ±2.91

VI	50mg/kg(i.p)+300mg/kg/day(orally)+125mg/kg/day(orally) (swaras)	181.65 ±8.92	52.88 ±2.60	60.24 ±2.96

Values(mean±SEM;n=5) ($p<0.05$)using one way ANOVA following Tukey's B multiple comparis on Post Hoc test.

LIPID PROFILE: The total levels of cholesterol were found to be considerably higher in those who were administered with herbal extract (p0.005) for both lower and higher concentrations as a result of the streptozotocin administration. The readings of total cholesterol rose when using Metformin in a study compared with the standard controls. The use of herbal extract in the streptozotocin-induced diabetic animal significantly reduces the levels of TRI, LDL, and HDL in similarity to the normal control grouping.

Table 5.12 Effect of oral administration Metformin and herbal extract continuously for 60 days on lipid profile triglyceride (TRI), total cholesterol in Wistar male rats.

S.No.	Group(s)	TRI(mg/dl)	Total cholesterol(mg/dl)
I	As per body weight (orally)	134.29±6.59	64.01± 3.16
II	50mg/kg (i.p)	194.03±7.57	141.06 ±3.82
III	50mg/kg(i.p)+500mg/kg/day(orally)	144.83±7.11	58.80 ±3.34
IV	50mg/kg(i.p)+300mg/kg/day(orally	160.53±6.90	96.61 ±3.45
V	50mg/k(i.p)+125mg/kg/day(orally	149.40±6.75	81.99± 3.33
VI	50mg/kg(i.p)+300mg/kg/day(orally)+125mg/kg/day(orally) (swaras)	153.97±7.07	81.17 ±3.46

Table 5.14 PPBS (mg/dl): The Post Prandial Blood Sugar was calculated using glucometer (Dr. Morepen).

G. No	Dose	Post Prandial Blood Sugar(mg/dl)			
		0 day	**15th day**	**30th day**	**60th day**
I	As per body weight (orally)	130±7.91	132.20±5.40	128.80±5.93	127.00±6.40
II	50mg/kg (i.p)	129±9.19	361.00±12.94	373.00 ±14.83	380.20± 12.56
III	50mg/kg(i.p)+500mg/kg/day(orally)	131.60±7.44	190.40±18.53	168.40±13.58	168.60±5.77
IV	50mg/kg(i.p)+300mg/kg/day(orally	124.60±3.58	246.00±13.42	239.20±16.90	233.40±9.71
V	50mg/k(i.p)+125mg/kg/day(orally	126.20±10.62	269.00±14.32	275.20±19.04	260.40±7.96

VI	50mg/kg(i.p)+300mg/kg/day(orally)+125mg/kg/day(orally) (swaras)	127.60±7.92	236.20±6.10	234.20±8.11	232.60±8.73

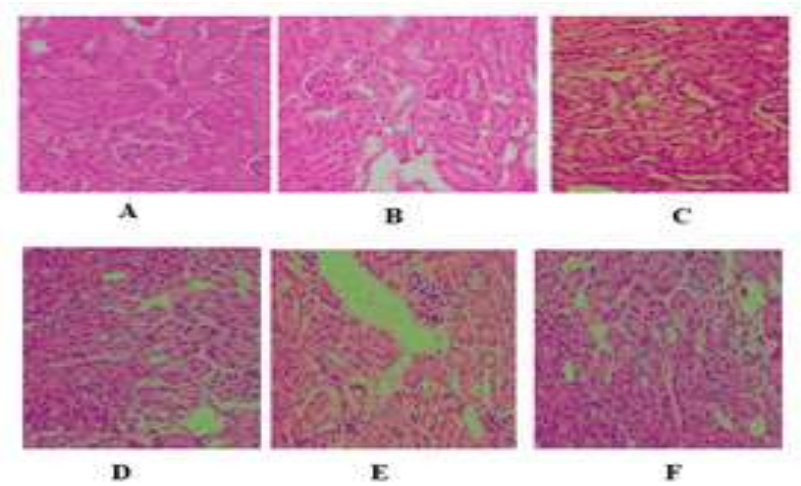
Values (Mean±SEM;n=5) significantly ($p<0.05$) using one way ANOVA following Tukey's B multiple comparison Post Hoc test.

Free Radicals and Histopathology:

Span Diagnostics Ltd. in Surat measures serum glutathione (GSH), the enzyme superoxide dismutase (SOD), catalase, and malondialdehyde (MDA). After two ice-cold saline rinses, the excised liver tissue was blotted, cleaned, and measured. The relative amount of liver mass to body weight was then used for establish the proportion of liver weight. For the purpose of histopathological tissue analysis, a tiny amount of the tissue was soaked in 10% formalin.

G. No.	Dose	GSH (mg/dl)	SOD (mg/dl)	CATALASE (µmol/ml)	MDA (µmol/ml)
I	As per body weight (orally)	65.36 ±1.73	72.49 ±2.57	2.11 ±0.07	54.89 ±1.94
II	50mg/kg (i.p)	60.06 ±2.10	65.19 ±2.61	1.89 ±0.12	62.45± 3.73
III	50mg/kg(i.p)+500 mg/kg/day(orally)	63.07 ±2.23	70.47 ±2.49	2.07 ±0.07	54.61 ±1.93
IV	50mg/kg(i.p)+300 mg/kg/day(orally	55.84 ± 5.24	72.39±2.56	2.03 ±0.07	55.37 ±1.96
V	50mg/k(i.p)+125 mg/kg/day(orally	64.60 ±2.29	68.45 ±2.42	2.10 ±0.07	49.22 ±1.74
VI	50mg/kg(i.p)+300 mg/kg/day(orally) +125mg/kg/day(orally) (swaras)	63.96 ±2.26	67.76 ±2.40	2.07 ±0.07	48.73 ±1.72

Histopathological Data-
Kidney:



Histopathology of kidney of diabetic rats (a) Group I , (b) Group II ,(c) Group III, (d) Group IV ,(e) Group V, (f) Group VI.

Summary:

While kidney histopathology in first group is normal, a little lesion is observed in group II. Group III exhibits hydronephrotic lesions. Hydronephrotic lesions are somewhat repaired in Groups V as well as VI compared with Group III, and they are completely restored in Groups IV and VI.

Liver:

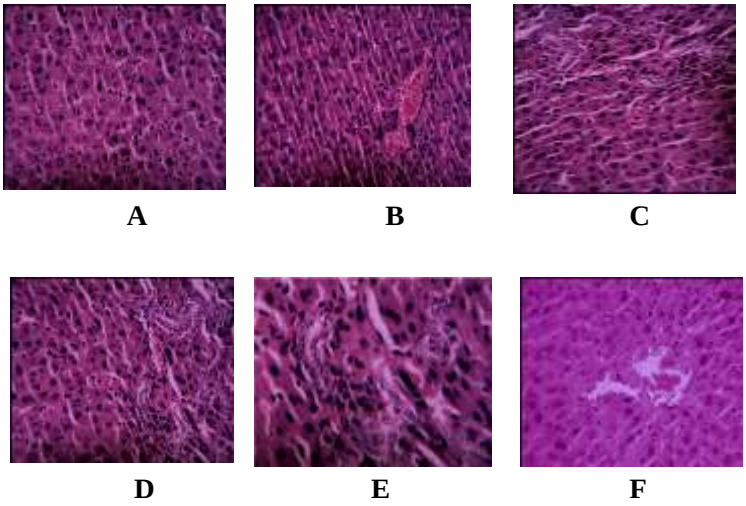


Fig. 5.3 Histopathology of experimental rat liver(a) Group I (b) Group II (c) Group III (d) Group IV (e) Group V (f) Group VI.

Summary:

Lobular fibrin-ring granulomas with a core fat vacuole and an intermediate fibrin ring are seen in the Groups I as well as II. The granulomas in third Group are aberrant in comparison to those in Group II. The parent state is entirely recovered in Groups V and VI, but is only partially recovered in Groups IV and VI.

CONCLUSION

Momordica charantia and Spondias mombin have been the subject of extensive scientific study, which has shown that they are important medicinal plants used in a variety of ethnomedical treatments, particularly for gastrointestinal discomfort, antiemetic, cancer, osteoarthritis, stomachache in children, conjunctive dysfunction bowel movements, depurative, loose stool, dieresis, emmenagogue, a high body temperature, flatulence, gastralgia, gastritis

According to the study, the combination therapy helped the rats' sensitivity to insulin and lower blood glucose levels. It also led to a reduction in oxidative stress and liver inflammation, two diabetes consequences that are frequently present.

These results imply the possibility of using Momordica charantia and Spondias mombin in combination as an adjunctive medication for the management of type 2 diabetes. To determine the safety and effectiveness of this combination therapy in humans, more study is necessary.

According to the research, Momordica charantia and Spondias mombin together had a considerable beneficial

impact on diabetic and hyperlipidemic rats administered STZ.

The study's findings indicated that treatment through Momordica charantia as well as Spondias mombin reduced blood glucose levels and enhanced lipid profiles as well as insulin sensitivity. Additionally, it has been demonstrated that the combo therapy lessens hepatic inflammation and oxidative stress, two major side effects of hyperlipidemia and diabetes.

According to these results, Momordica charantia and Spondias mombin may be utilised in conjunction with one another to treat hyperlipidemia and diabetes. The synergistic effects of both herbs led to a higher improvement in the health of the rats than each plant alone, which is another benefit of combining natural therapies.

To evaluate the safety and effectiveness of this combination medication in people, more research is required. It is crucial to keep in mind that this study was carried out on animals. Prior to implementing any new medications into a management plan for diabetes or hyperlipidemia, it's crucial to seek medical advice.

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