Chapter 1

INTRODUCTION
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Chemistry has a vital role to play in improving the material life of people at large. Phytochemistry, a dynamic science, plays an important role in medicinal chemistry. It helps in determining the chemical constituents and structure of the active principles and opens the door for newer synthetic analogues.

The study of organic chemistry began from the study of substances obtained from living organisms viz., human, animals and plants and the compounds obtained from plants were named as plant products.

Plants have been an essential part of the human society since the beginning of civilization. A large number of plant products were used in India, Egypt, China and Greece before the beginning of Christian era.

Rigveda and Atharvana\textsuperscript{1} Veda described medicinal plants. Around 250 drugs have subsequently been identified from such description. The vast knowledge about the properties of plants must have accumulated through trial and error, instinct and observation of plants used by sick animals, followed by deduction. The Vedic sages used “Rudraksh Mala” or garland made from seeds of \textit{Elaeocarpus genitrus}. (\textit{Sgn. E. Sphaericus}) as rosary beads which are still in use today.
The plants are in fact miniature factories of nature for the production of alkaloids, carbohydrates, proteins, essential oils, vegetable oils, gums and resins, glycosides, dyes, carotenoids, flavonoids, tannins etc. Cosmetics, dyes, medicines and perfumes are the important fields of industrial applications of plant products.

**Indian Medicinal System:**

India has her own glorious past in ancient periods and there was well-established vegetational medicine system\(^2\). This has been mentioned in Rig Veda, which was written in 4500-1600 B. C. and considered as the first representation of human knowledge for herbal treatment. The Indo-Aryans were fully acquainted with herbal and vegetable resources\(^3\).\(^-\)\(^5\). Charak\(^3\)-\(^5\), a renowned ancient Indian physician mentioned about 300 vegetable drugs and classified them into 50 groups according to their effects on body systems. Sushruta and Vaghbhatta described about 700 plants and medicinal preparations in the Upaveda [Ayurveda] \(^7\). Ayurveda served as a foundation stone of ancient medicinal science in India. During this period, when western medicine system began to breathe, India was nourishing her glorious remedial propagations.

The original Ayurveda material medica was superseded to some extent by alchemic and allopathic medicinal systems at about the beginning of the Christian era. During the invasion of India by Greeks, Seythiens and Mohammedans successively the works were unnoticed.
The past and current achievements in these fields were not properly written or recorded to help coming generations. This disharmony cost partial mutilation of the existing knowledge, which could have to be proven advancements in medicinal systems\textsuperscript{8-11}.

The earliest source of western medicine comes from ancient Egypt and Babylonia "Papri" is the earliest reference to medicinal application of plants. Abers papyrus [1600 B.C.] mentioned about 700 herbal remedies including opium. The modern medicine owes a lot to Hippocrates [950 B.C.] a great Greek physician who wrote many books on medicine and firstly introduced the concept of disease as pathologic process. He mentioned about the influence of medicine based on observations, analysis and deductions. He recommended the judicious use of efficacious and simple drugs. Discoroides, a great Greek physician who wrote De-materia-medica [78 AD] in which he described about 600 plants, which could be used as potential drugs for many ointments.

The modern methods of investigation of plants had their birth in the west. By the end of the 18\textsuperscript{th} century, science was advanced so much that it made possible to last mineral poisons like arsenic. In the early 18\textsuperscript{th} century the concept of Homeopathy was introduced with the thought that dilution potentiates the action of drug and it revealed the therapy for various ailments by drugs with varying dilution. These
claims are questionable in present concept of disease, where quick
effect is preferred. Such Homeopathy preparations can neither be
substituted nor verified by experimental methods\textsuperscript{12-17}.

Subsequently herbal medicinal system was taken as the basis of
medicinal advancements and toxicological studies. Such studies were
first reported by a French physiologist, M.T.B. Orfila in 1814. Since
then many other workers have contributed a lot in the field of plants
for medicinal usage. The first International congress on medicinal
plants was held at university of Munich, Germany, which estimated
that about 60,000 plants could be used for medicinal purposes.

Since older times after partial decay of Indian medicinal system,
the knowledge of medicinal plants was exhumed. The establishment of
British rule in India was a period of recompilation and reinvestigation
of properties of Indian flora\textsuperscript{14}. The British workers contributed to
Indian flora though this approach was quite different from older Indian
approaches. These investigations has opened an era of vegetational
studies in medicine. Some of the British workers who contributed in
this field are Jones, Fleming, Ainslie, Roxburgh and Dymock. This
work was followed by Indian workers viz. Kirtikar and Basu\textsuperscript{15}, Chopra
at.al\textsuperscript{16},, Nadkarni\textsuperscript{17}, Mukerjee and Pradhan\textsuperscript{18} and others.

The principal active constituents present in plants are \[1\] essential oils, \[2\] fixed oils, \[3\] glycosides, \[4\] carbohydrates, \[5\]
alkaloids, [6] proteins, [7] coumarins, [8] tannins and [9] colouring matter etc. It is well known that plants are a source of food, industrial products, medicines and their demand is everincreasing. In the present study the plant seeds have been analysed for proteins, fixed oils, carbohydrates and glycosides and their alcoholic extracts and petroleum ether extracts have been screened for antimicrobial, anthelmintic and insecticidal properties from the seeds of *Trifolium alexandrium linn* and *Ficus retusa linn* plants.

**FIXED OILS**

Oils and fats play an important role in agricultural and industrial economies of a country. They are not only one of the basic nutrients in our diet but is also used as valuable industrial raw materials\(^{19-31}\) for the production of soaps, paints, varnishes, toilet soaps, hair oils, plastics, candles, pharmaceutical bases, lubricants etc.

Fixed oils are triglycerides with three fatty acid molecules and also containing minor portions of sterols, vitamins, hydrocarbons, antioxidants, pigments etc. and are obtained from plants or animal by such processes as pressing, extraction by organic solvents or cooking with water steam. Recovery of vegetable oils by bacteria has been proposed by Beckmann\(^ {32}\). Most of the fatty acids have even number of carbon atoms (C\(_4\)-C\(_{26}\)). Fixed oils have been studied and reviewed by
several workers\textsuperscript{33-41}.

A small percentage of unsaponifiable matter is also present in fixed oils, which is soluble in ether. This unsaponifiable matter is an important part of the fixed oil and consists of hydrocarbons, sterols, vitamins and pigments. Among all these constituents, sterols are most important owing to their miscellaneous therapeutic applications. They can be applied for cure of infection, as antifertilitic agents, as anti-inflammatory agents\textsuperscript{42}, as sedatives and tranquilizers\textsuperscript{43} for haemolytic diseases and endocrine properties of steroids are used to cure exaggerated effects. Sterols are colourless crystalline alcohols possessing tetracyclic carbon skeleton with an aliphatic side chain. These are found in free state in nature and also in the from of esters of higher fatty acids. These are optically active compounds. Detailed reviews on steroids have been described by Louis Fieser and May Fieser\textsuperscript{44}, Robinson\textsuperscript{45} and Bergmann\textsuperscript{46}.

GLYCOSIDES AND SAPONINS.

This is a group of substances\textsuperscript{47}, which occur, naturally in low concentrations in all the plants. Glycosides are a diverse group of compounds. They are very reactive and hydrolysed into aglycone and sugar moities. The aglycone part is usually phenol, alcohol, anthraquinone, steroid; triterpene or flavonol .The sugar component of glycosides may be a mono, di, tri, or tetrasaccharides. There is a wide
variety of sugars found in naturally occurring glycosides. The sugar is usually in the pyranose form.

Glycoside occurs widely distributed in nature. They are found in varying amounts in seeds, fruits, roots, bark and leaves. In same cases two or more glycosides are found in the same plant e.g. cardiac glycosides and saponins. Most glycosides are bitter in the taste. Several researchers\(^4\) have studied and reviewed them.

Saponins in which aglycone and sugar units are linked through oxygen atom, have pharmaceutical uses as antitumours\(^5\), bactericides\(^6\), antifertilitic agents\(^7\), antihistamines\(^8\), anti-inflammatory\(^9\), antisickening\(^10\), antihaemorrhagic\(^11\), and antimicrobial agents\(^12\). Triterpenoidal saponins possess remarkable physiological activity and are used as cleaning agents, fish poison, for nervous disorders, in vascular fragility etc. Cardiac glycosides are very useful and are used in cardiac therapy.

Many plant pigments responsible for the colour of flowers are glycosides and variation of the nonsugar part (aglycone) of the molecule leads to the wide range of colours.

The glycoside may serve as sugar reservoirs, as wast products of plant metabolism, as means of detoxication, or as defiance mechanism.
PROTEINS AND AMINOACIDS

As the name of protein indicates (Greek, protos =the first) they have been considered for many years, the primary component of living matter. They are nitrogenous substances, which occur in protoplasm of all animal and plant cells. Their composition varies with source: carbon 46.55%, hydrogen 6-9%, oxygen 12-30%, nitrogen 10-32%, sulphur 0.2-0.3%. Other elements may also be present in small quantities (phosphorous in nucleo proteins, iron in haemoglobin). The basic principle of the chemical structure of protein is quite simple. They consist of long chains of amino acids linked to each other by peptide bonds. Hence on acidic or alkaline or enzymatic hydrolysis protein yields a mixture of amino acids.

Proteins are metabolically interrelated with fats and carbohydrates. They may be conjugated with nucleic acid (nucleo proteins), carbohydrates (glycoproteins) or lipids (lipoproteins). As enzymes, they catalyze many life processes that are essential for maintenance of cell life. In seeds they are stored as reserve energy. In animal and plant cells multiplication is initiated by the nucleus, in which proteins and nucleic acids are associated. We must not forget, however, that growth and reduction, like all processes which involve primarily the formation or degradation of proteins and nucleic acids, depends on the presence of certain enzymes and that all these
enzymes are proteins$^{66}$.

Amino acids are classified as essential and non-essential from dietary point of view$^{67-68}$. Proteins, which contain sufficient essential amino acids, are mainly used in food. Amino acids are also used in industries like paints, plastics, gelatin in photographic films and adhesives. These are assayed and reviewed by a number of workers$^{69-76}$.

**CARBOHYDRATES:**

Carbohydrates are the most abundant constituents of plants and animals. They serve as sources of energy (sugars). They also form the major constituents of shells of crabs and lobsters and the supporting tissue of plants (cellulose). Plants build up carbohydrates from carbon dioxide and water by photosynthesis.

A simplified definition of carbohydrates is that they are polyhydroxy aldehydes or ketones or substances, which may be hydrolysed by dilute acid to these compounds. This classification does not include compounds such as hexitols, hexahydroxy hexananes, and cyclitols (hexahydroxy cyclohexanes), which are nevertheless$^{77-78}$ conveniently studied along with the carbohydrates. Carbohydrates are responsible for transportation of various organic constituents of plants by combining with them. L-Ascorbic acid (Vitamin) is related to
simple sugars and other carbohydrates have unique biological activity. Sugar phosphates are physiologically important intermediates in the transformation of sugars of various classes of compounds. Carbohydrates not only used as foods but also are important in many industries like sugar, paper, textile, fibers, plastics, drugs, vitamins, etc. The sugars can be assayed by standard methods and reviewed by many workers. These are classified as (1) sugars and (2) non-sugars. Sugars are mostly made up of mono and disaccharides, whereas non-sugars are the polysaccharides.

Monosaccharides are simple straight chain polyhydroxy aldehydes, or ketones and are found as free sugars or linked with glycosides in plants.

Disaccharides on hydrolysis give two moles of similar or dissimilar monosaccharides. Polysaccharides have the properties typical to high polymers. The polysaccharides are very widely distributed in nature. Some such as cellulose and chitin are found as the skeleton material of plants and animals. They are consumed in tremendous volume by a number of industries and have been the subject of research by many scientists in different fields.

SYNTHESIS OF BIOLOGICALLY ACTIVE COMPOUNDS:

Heterocyclic compounds are inseparable from mankind’s history since the cell is generally thought to be the unit of human body and
the cell uses them in the form of vitamins, coenzymes and nucleic acids for performing most important functions. The investigations of chemistry of heterocyclic compounds have not only been as essential elements in man's endeavors to unravel the mysteries of the living world, but at the same time these studies have constantly stimulated new directions in which the subject may grow in organic, pharmaceutical and medicinal chemistry. The strength of heterocyclic chemistry lies in its rich diversity.

Heterocyclic compounds are those in which there are one or more rings containing atoms of other elements besides carbon. The most commonly found elements in these rings are nitrogen, oxygen and sulphur. The development of heterocyclic chemistry has gone hand in hand with the investigation of a great variety of natural products. Many plant pigments such as catechins and tannins are derived from benzopyran; indigo is derived from indole and stimulated its study whilst the blood, bile pigments and chlorophyll are the complex derivatives of pyrrole. The chemistry of purines and nucleic acids are involved with that of azole chemistry.

The chemistry of heterocyclic compounds is one of the most complex branches of organic chemistry. As a consequence to the size of subject any single volume is bound to contain more heterocyclic compounds. It is equally interesting for its theoretical implications, for
the diversity of its synthetic procedures, and for the physiological and industrial significance of heterocyclic compounds. The presence of many heterocycles that act in minute quantities of biologically important functions, for example, anticancer, analeptic, analgesic, hypnotic, antihistaminic, anthelmintic etc. has been noted by many biologists and medicinal scientists are isolating or synthesizing the heterocyclic compounds. A great progress can be achieved in the biological examples of such fruitful co-operation.

A wide spectrum of azole in medicines as bactericides, fungicides, allergy inhibitors, antimalarials, analgesic and antispermocidic agents.

Among a wide variety of heterocycles that have been explored for developing pharmaceutically important molecules, the isoxazole, isoxazolines and thiazolidinone have played an important role in medicinal chemistry. Thiazolidinone Isoxazole, and Isoxazolines are important nitrogen containing heterocyclics possessing diverse biological activities.

**METHODS USED FOR ANALYSIS:**

With the advent of modern physcio-chemical methods, enormous development in the field of natural products as well as synthetic organic chemistry has been possible. The extensive use of
physical methods has been more during the last three decades for successful purification and elucidation of structures of organic molecules. Some of the recent applications of these physicochemical methods used in the present work are briefly reviewed below.

**CHROMATOGRAPHIC METHODS\textsuperscript{106-114}:**

The term chromatography (Greek, chroma-colour and graphy = writing) means colour writing. M. S. Tswett a polish botanist invented it in 1906 for the separation of coloured substances into individual components.

Chromatography\textsuperscript{106} has come to the recognition as a very prominent method for isolation, purification and characterization of individual constituents, when present even in very small amount in mixture of compounds.

In 1938 Reichstein\textsuperscript{107} introduced liquid chromatography and thus extended the applicability of the methods to the colourless substances also.

Now a day's tremendous modifications have been applied to the techniques so that it can be used to separate any given mixture of coloured or colourless constituents. Chromatography is the name given to a particular family of separation techniques in was with great effectiveness.
THIN LAYER CHROMATOGRAPHY:

The idea of using a chromatography adsorbent in the form of a thin layer fixed on an inert rigid support seem to have been suggested by Izmailov and Shraiber in 1938. Meinhard and Hall\textsuperscript{108} (1949), Kirchner, Miller and Keller (1951) \textsuperscript{109}, Mottier (1952), Reitsema(1954) and E. Stahl (1958) used thin layer chromatography for the separation and identification of various compounds\textsuperscript{108-110}.

Thin layer chromatography could be applied to a wide variety of separations. It is also known as surface chromatography. For this technique various coating materials, like silica gel (acidic), alumina (basic), kieselghur (neutral) and cellulose powder are used as adsorbents according to the nature of separating material. In this technique a glass strip is coated with a thin uniform layer of adsorbent. The plate spotted with a small amount of the solution containing test mixture and then placed vertically (slanted) in a suitable solvent in a closed tank. Development of the chromatogram occur by capillary movement of the solvent up the adsorbent layer. This technique has several advantages over other techniques because, it is simple, faster and the separated compounds can easily be recovered by scraping the adsorbent layer and dissolving it in a suitable solvent.

The extensive applications of TLC have been reviewed\textsuperscript{110-117}.
especially for steroids, alkaloids, and methyl esters of fatty acids, saponins, flavones, amino acids and other plant products.

**COLUMN CHROMATOGRAPHY**

The column chromatography technique was developed by American petroleum chemist, D. T. Day. When fixed phase taken in a column is a solid and the moving phase is a liquid the process is usually called column chromatography. The column chromatography is also known as adsorption chromatography.

In this method the mixture is dissolved in a suitable solvent and solution is allowed to pass down the column. In this way the solvents are adsorbed on different parts of the column. The component which has greater adsorbing power is adsorbed in the upper part of the column. The next component is adsorbed in the lower portion. Thus the materials are separated and adsorbed in various parts of the column. In order to separate or to estimate various constituents, the column is eluted by a suitable solvent.

**PAPER CHROMATOGRAPHY:**

Paper chromatography may be regarded as an extension of the application of partition chromatographic and it is a remarkable simple form of chromatographic method. Paper chromatography is a liquid-liquid partition chromatography, has the advantage of possibility of working with microgram quantities, simplicity of material, availability
of material, equipment and efficiency in the separation. The Rf value is the most important means of describing and distinguishing the different constituents\textsuperscript{124}. A considerable range of "modified" filter papers are available commercially for achieving particular chromatographic separation. There are many forms of paper chromatography.

1. Ascending paper chromatography

2. Descending paper chromatography

3. Circular paper chromatography

4. Two-dimensional paper chromatography.

This technique nowadays is mostly used for the separation of fatty acids\textsuperscript{125-127}, carbohydrates\textsuperscript{128-129} and amino acids\textsuperscript{130-131}.

**GAS LIQUID CHROMATOGRAPHY**

One of the newest and most versatile techniques for analysis of complex mixture of substances is gas chromatography. In gas chromatography the compounds in a mixture migrate at different speeds when carried along by an inert gas through a tube that has been packed or treated in a special way. The method was first suggested by Martin and Synge in 1941 that a gas can also be used as a mobile phase. The first gas chromatographic experiment was done by A.T. James and A.J.P. Martin in 1962. They separated a mixture of
fatty acids.

Gas chromatography may be divided into two classes:

(1) Gas solid chromatography (Stationary phase solid)

(2) Gas liquid chromatography (stationary phase-liquid)

When a stationary phase supported on a solid, is a liquid, which acts as a solvent for the sample components, the process is called gas liquid chromatography.

Gas liquid chromatography is based on the Henry's law of partition i.e. \( \frac{x}{m} = K_c \) where \( x \) is the mass of gas sorbed by mass \( m \) of the sorbent \( C \) is the vapour concentration in the gas phase and \( k \) is the constant. According to this phenomenon, if vapour or gas comes in contact with a liquid, a fixed amount of it gets dissolved. The carrier gases are hydrogen, helium, nitrogen and air. Columns are usually made up glass, copper, stainless steel or aluminium tubings. These columns are filled with porous solid support, which absorbs the liquid stationary phase. Most widely used supports are celite, chromosorb W, chromosorb P, etc.

GLC is used for the separation and determination of fatty acid methyl esters\(^{132-133}\) components of essential oils\(^{134}\) unsaponifiable matters\(^{135-136}\), proteins\(^{137-139}\), sugars\(^{140-141}\) and other natural products\(^{142-143}\).
SPECTRAL METHODS:

1. INFRA RED (IR) SPECTROSCOPY

The infrared absorption spectroscopy is based on the absorption of infrared radiations by the molecules\textsuperscript{144}. Infrared spectroscopy is most widely used for identification of organic compounds\textsuperscript{145}. The infrared absorption spectrum of an organic compound represents one of its truly unique physical properties. Infrared spectroscopy has been employed for qualitative as well as quantitative analysis. Organic applications of infrared spectroscopy are concerned with the range 4000 cm\textsuperscript{-1}-660 cm\textsuperscript{-1} (2.5u to 15u). The region from 660 to 50 cm\textsuperscript{-1} (15u to 20u) is called the far infrared and that of frequencies higher than 4000 cm\textsuperscript{-1} is called near infrared.

Infrared spectroscopy has been used to distinguish between geometrical isomers. Infrared spectroscopy has given a great deal of information of tautomeric mixture and finding out hydrogen bond in the molecules.

Bellamy\textsuperscript{146} and Rao\textsuperscript{147} have reviewed the applications of IR spectroscopy. Nowadays many workers use this technique for structure interpretation of terpenes, sterols\textsuperscript{148}, saponins\textsuperscript{149-150} and fatty acids and their derivatives, alkaloids\textsuperscript{151}, glycosides\textsuperscript{152} and all kinds of compounds. Advanced studies have been done in this field.
and illustrated by many workers\textsuperscript{153-158}.

**NUCLEAR MAGNETIC RESONANCE (NMR) SPECTROSCOPY:**

The method of NMR was developed by E.M.Purcell and Felix Bloch (1946). NMR spectroscopy is the most powerful tool for investigation of molecular structure and molecular process. The study of radio frequency radiation by nucleus is called nuclear magnetic radiation (resonance).

The frequency of radio waves lie between $10^{-7}$ and $10^{-9}$ CPS. NMR phenomenon exhibit only by the nuclei. Nuclear magnetic resonance involves the interaction between oscillating magnetic field of electromagnetic radiation and magnetic energy of the hydrogen nucleus or some other type of nuclei. When these are placed in an external static magnetic field, the sample absorbs electromagnetic radiation in radio waves region at different frequencies. Since the absorption depends upon the type of proton and certain nuclei contained in the sample, radio waves are regarded as the lowest energy form of electromagnetic radiation that find valid application in analytical chemistry.

It has been used to determine the molar ratio of compounds in a mixture. Now a days the structure of a number of natural products\textsuperscript{159} as well as other organic compounds\textsuperscript{160} are confirmed by their NMR spectra. It is extensively used in pharmaceutical\textsuperscript{161-162} and polymer
industry\textsuperscript{163-164}. Its applications have been extensively reviewed in several standard works\textsuperscript{165}.

**ULTRAVIOLET (UV) SPECTROSCOPY:**

Systematic investigations of absorption by simple organic compounds in ultraviolet region was made by Henri.

Absorption spectrometry using ultraviolet and visible light was one of the earliest physical methods employed in the examination of molecular structure.

Ultraviolet and visible spectroscopy is primarily used to measure multiple bond or aromatic conjugations within molecules. The electronic spectra of molecules are found in the wavelength region 1000-8000\textsuperscript{\AA} of electromagnetic spectrum. The visible region 4000-8000\textsuperscript{\AA} and the ultraviolet region is again subdivided into [1] near ultraviolet region between 2000-4000\textsuperscript{\AA} and [2] below 2000\textsuperscript{\AA} far or vacuum ultraviolet region.

Number of scientists are\textsuperscript{166-167} using UV and Visible spectroscopy for the determination of degree of unsaturation and nature of double bonds. The UV spectroscopy of fatty acids has been reviewed by Pitt and Morton\textsuperscript{168} and Kass\textsuperscript{169}. UV spectroscopy has also proved to be of great importance for the identification of alkaloids\textsuperscript{170}, sequiterpenes\textsuperscript{171}, coumarins\textsuperscript{172}, anthocyanins\textsuperscript{173}, sterols\textsuperscript{174},
terpenes\textsuperscript{175}, amino acids\textsuperscript{176}, sugars and other compounds like synthetic dyes, cosmetics etc\textsuperscript{177-179}.

**BIOLOGICAL STUDIES:**

For the development in the field of chemotherapy, it is necessary to test new chemicals for their curative properties against various disease causing organisms. So it was thought worthwhile to test thiazolidinone, isoxazole, isoxazolines and alcoholic extracts of the seeds of *Trifolium alexandrium Linn* and *Ficus retusa Linn* for their antimicrobial, anthelmintic and insecticidal activities.

**ANTIMICROBIAL ACTIVITY:**

Microbes play an important role in day-to-day life. They are responsible not only for many life processes such as digestion and assimilation of food, but also play an extremely important role in providing us with food, chemicals and medicines viz., curd, vinegar, alcohols, and antibiotics etc.

Whole human life is spent in contact with various microorganisms. Human health and well being both are influenced by the presence or absence of microorganisms in the environment. Scientists have been captivated by the activities of microorganisms. Many of these microscopically small creatures cause diseases in men, animals and plants.

The theory of spontaneous generation of disease was finally
burried by Pasteur and Koch in 1876 when they convinced one and all that the anthrax disease is initiated by a bacterium obtained from a pure culture. By 1900 E.F. Smith firmly established the study of bacterial disease by bringing in the best methods of study available in animal bacteriology. Agostino Bassi in early 1800's proved that muscardine is a fungal disease, which is most common in silkworms. The common diseases of man and animal which are caused by fungal include actinomycosis, sporotrichosis, atomycosis and epidermophytosis.

Large number of medicinal plants have been used in the treatment of infections and disease in different eras. Preparations made from these plants have been in practice to cure abscesses, stones, ulcers etc.

Agnihotri et. al.\textsuperscript{180} have examined the antibacterial activity of selected Indian medicinal herbs. Aswal et. al.\textsuperscript{181} examined the antimicrobial activity of botanically identified plants. A number of workers have reported the antibacterial and antifungal activity in plant products\textsuperscript{182-199}.

Azole nucleus has been the seat of diverse physiological and interesting biological activities\textsuperscript{200-203}. Thiazolidinone derivatives are well known for their varied biological activities. Isoxazole, and isoxazoline derivatives associated with many interesting biological
activities have been reviewed by many workers\textsuperscript{204-207}. Seeing the requirements for better antimicrobials, 2-and 4 substituted isoxazoles, isoxazolines and thiazolidinone have been prepared and screened for their antimicrobial activities. Antimicrobial screening has been done using filter paper disc diffusing plate method.

**ANTHelmINTIC ACTIVITY:**

Anthelmintic drugs\textsuperscript{208} are those, which are used to rid the parasitic worms from the body.

The anthelmintics are the drugs, which are used to kill or remove parasitic worms known as helminthes from the infected host. These drugs are of great importance because helminthiasis is the most common disease in the world.

Several workers\textsuperscript{209-213} used earthworms because of their anatomical relationship with *Ascaris lumbricoides* and all anthelmintic drugs are toxic to earthworms. Therefore they can be used to test the anthelmentic activity and to compare their relative activity with known anthelmentic drugs.

**INSECTICIDAL ACTIVITY:**

Literally insecticide means insect killer. The chemicals used for the control of insects are termed as insecticides\textsuperscript{214}.

The insects and pests have bothered man from the beginning of
human civilization. The insects cause various diseases to men and animals while the pests cause disease and destruction to all kinds of crops and vegetable plants. They destroy the stored food products, clothings, medicines, etc. Every year crops worth about Rs. Six thousand to seven thousand crores are lost due to the crop pests.

Macro Polo, the ancient traveller and historian, has reported the use of mineral oil and tar for ridding camels of insect parasites. During the 14th century mineral oils, tobacco, pyrethrum, etc. were used for the control of insect's pests. In the year 1773 nicotine fumigation was tried to ward off the insects. Lime sulphur preparations were used latter in 1851 under the name “EauGrison” named after the head gardener of the vassailles palace. The preparations contained calcium polysulphides, which slowly decomposed into the poisonous H_2S gas, which repelled the pests. Mercuric chloride (1860), paris green (1865) phenol and cresols (1860), naphthalene (1882), bordeaux mixture (1883), rosin, fish oil, (1886), calcium arsenate (1907) and nicotine sulphate (1909) were introduced as insecticides and pesticides in the 19th century. These compounds have been classified as first generation insecticides.

During II world war synthetic organic compounds like DDT, and BHC were introduced in the field of insect and pest control. Organophosphorus and organochlorine compounds were developed as
potent pest control agents and introduced as pesticides during 1946. These are classified as second-generation insecticides. These compounds, though very effective in controlling the menace of insects and pests, are highly toxic to men and animals, and persist in biosystem for a long time. This led to research for biological natural products and their synthetic analogues, the so-called third generation insecticides. Some plant products like essential oils, plant gums, esters etc. have been found as useful insecticides and pesticides. These plant products are quite effective, less toxic and biodegradable also.
PROBLEM UNDERTAKEN AND WORK DONE

Man is depending on plant from times immemorial. Many Plant products which are used in preparation of a variety of drugs, food stuffs, cosmetics, perfumes, dyes and other industrial products.

The use of plants for medicinal purposes is well known in several parts of world. Plants have also served as valuable starting material for drug development even in advanced countries. Plants contain pharmacologically and physiologically active constituents. Glycosides are associated with number of interesting biological activities. Therefore, their biological properties were investigated.

Fixed oils, proteins carbohydrates are the important food constituents. Hence, the search was made for other better varieties having high contents of the products and better nutritional quality. Besides the use of these constituents in food and medicinal they also have industrial importance as well.

Nature has endowed India with a rich heritage of medicinal plants with the perennial and a variety of plant material, which may prove useful to successive generations of mankind.

Therefore, in order to meet the rising needs of ever increasing populations for more food, medicines, maintenance and growth of
industrial infrastructure and human welfare, there is need for systematic scientific evaluation of useful plants.

Keeping this in view, the plant products like fixed oils, proteins carbohydrates and glycoside are extracted from the seeds of plants *Trifolium alexandrium linn*, and *Ficus retusa linn* have been taken up for investigation.

The importance of medicinal plants in ancient India cannot be disputed and present importance cannot be underestimated. The process of obtained medicines from plants is tedious and expensive. Moreover depletion of forest cover has led us to seek synthetic pharmaceuticals. Chemical synthesis involves cheap and mass production in less time. Due importance is given to both approaches in the present study.

Therefore, another aim of the proposed work is to prepare some new compounds and to test their biological activities.
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