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Spondias tuberosa: A Review

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ABSTRACT

The review aimed to know the essential aspects of the phytochemical component and pharmacological activities. Based on the ethnobotanical survey states that it can be edible and it exhibits major pharmacological activities which play a key role in drug discovery. Medicinal plant preparations are having more demand due to their fewer side effects and with affordable price. Spondias tuberosa is commonly known as imbu. Various phytochemical and pharmacological investigations have been done by various researchers. The phytochemical investigation has been done on different parts of plants. Each part of plant has some new components that or not present in other parts of plants. Different extracts of spondias tuberosa has been used by various researchers in order to find the bioactive compounds. Different analytical techniques such as chromatography, spectroscopic, and hyphenated techniques have separated and identified bioactive compounds in Spondias tuberosa.

INTRODUCTION

Natural products which are derived from plant extracts are an abundant source of bioactive compounds. Investigation of natural products for identification of different bioactive compounds which play a key role in novel drug discovery. There is evidence that from the post-genomic era more than 80% of the drug substance has been acquired from natural products. [1]. Above 20,000 plant species are used in various traditional medicines around the world and they are reservoirs for the discovery of new drugs [2]. The forest is considered as a storehouse of medicinal plants. Medicinal properties of plants were 1st introduced by dioscorides (40 – 90 AD). Plants have also been used for the treatment of mental disorders and CNS diseases, cardiovascular and respiratory problems, and anticancer activities by plant components [3]. The theory of electronic solutions was developed more in the 20th century. Dissociation of electrolytes by Arrhenius (1859-1927). The concept of PH was published in the year 1909 by Sorensen. Heyrovsky got the Nobel Prize in the year 1959 for the invention of polarography. In 1941 introduction of spectrophotometer in to the market. In the year 1943 IR instruments were introduced, and in 1951 self-recording emission spectroscopy. In the year 1953 NMR and gas chromatography evolved. In the year 1960 atomic absorption spectroscopy was invented. In the 1960's hyphenated techniques were invented by linking chromatographic techniques with spectroscopy (GC-MS).[4]. Advantages and disadvantages of various chromatographic techniques. Gas chromatography was used to find the volatile components in the materials. gas chromatography advantages are linearity is good, it is used in preparative scale because the sample is not destroyed. Disadvantages include low sensitivity, changes occur due to the effect of different temperatures, the biological samples cannot be examined. HPLC advantages include it requires small sample for the analysis, the sample will not disturb during the process. HPLC disadvantages it requires experienced person for the operation. Paper chromatography advantages include sensitivity (small amount of the compounds which can be detected with routine reagents. Disadvantages include volatile components cannot be separated). Advantages and disadvantages of various spectroscopic techniques such as UV, IR, FTIR, NMR, Mass. Main advantage of UV spectroscopy was it is used for detecting the individual electron transfer between orbitals or atomic, ionic and molecular bands. It helps in the detection of aromatic and multiple bands. The disadvantage of UV highly saturated compounds (single bonds) hydrocarbons (alkanes) and sugars are unable to detect in UV-visible spectroscopy. The advantage of near-infrared spectroscopy is sampled can be analyzed with different modes (e.g., diffuse reflectance,

transmittance, transfectants). The disadvantages of this instrument low concentration below 0.1-1 ppm) may not be visible. This technique is not suitable for trace component analysis. Another disadvantage is bonds that attached with hydrogen produce intense bands. (Overtone and combination region). Advantages of mid IR include KBr pellet technique was used. Nowadays ATR is widely used because it gives the direct measurement of solids in their native state. The main disadvantage of MIR is it absorbs more water in the IR region which in turn leads to the hiding of important information due to absorption bands of water. [5]. Applications of analytical techniques in the pharmaceutical filed are the separation and identification of new lead molecules from plants [6]. Calculating the purity of drugs, calculating the impurities that are present in drugs and solvents, developing of method validation. Forensic application is drug abuse detection, murder by poison intake, analysis of narcotic intake by sports person [7]. Food analysis application is food authentication, fraud, trade laws, adulteration, contamination, product tampering. [8]

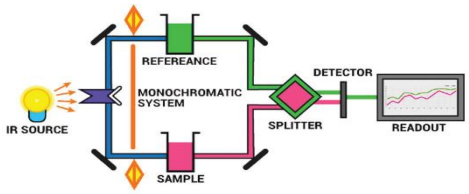

Fig 1.1 1943 infrared spectroscopy [10]

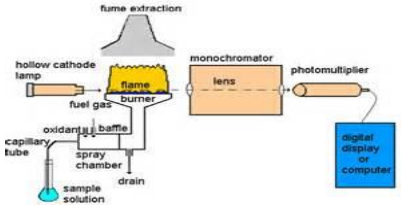

Fig 1.2 1960 AAS[9]

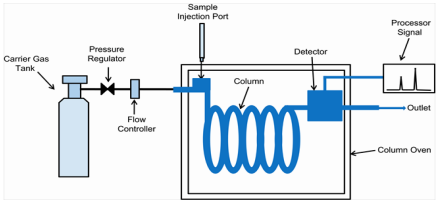

Fig 1.3 gas chromatography [11]

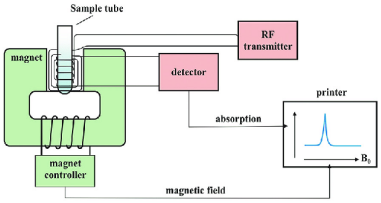

Fig 1.4 1953 NMR [12]

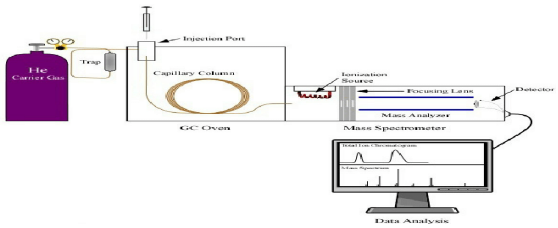

Fig 1.5 1960's hyphenated techniques GC-MS [13]

Taxonomic description of spondias tuberosa

The common name is imbu. Imbu is a deciduous tree with a low, flat-topped profusely branched, wide and very dense crown. It grows around 6 meters tall with a very short bole 40-60cm in diameter. It is an edible fruit. [14]

Fig 1.6[15]

Table 1.1[16]

Kingdom	Plantae
subkingdom	Viridiplantae
infrakingdom	Sterptophyta
Super division	Embryophyte
Division	Tracheophyte
Subdivision	Spermatophytina
Class	Mangnoliopsida
Superorder	Rosanae
Order	Sapindales
Family	anacardiaceae
Genus	Spondias
Species	Spondias tuberosa

PHYTOCHEMICAL INVESTIGATION

Phytochemical analysis by TLC revealed the presence of flavonoids and hydrolyzable tannins and HPLC revealed compounds similar to gallic acid and hyperosid hexane extract of spondias tuberosa leaves.1H NMR showed spectrum showed saturated and unsaturated fatty acids.[17]chlorogenic acid, caffeic acid, rutin and isoquercitrin compounds were identified through HPLC-DAD and HPLC-MS analysis.[18] 3-n-pentadecylphenol (44.1%) from bark and tetratetracontane (38.17 and 28.57%) from leaves and stem was analysed by GC-MS[19] Ultra -performance liquid chromatography coupled to quadrouple / time of flight (UPLC-MS-ESI-QTOF) revealed that information about compounds like dehydroascorbic acid, dehydrophaseic acid hexose quinic acid, galloyal quinic acid isomer, mangiferin, penta-O-galloyl hexoside, caffeoyl-D-glucose, digalloyl glucose may be present based on their molecular weight and retention time [20]. Myricetin-O- rhamoside, anacardic acid compound has been identified from leaf extract by UPLC-HRMS analysis [21]. Comparison between standard β carotene with different mixtures of the pulp of fruits among those mixtures matured pulp flour has high contents of carotenoids [22].

PHARMACOLOGICAL INVESTIGATION

Anti-inflammatory activity: anti-inflammatory activity was determined by introducing the inflammatory agents λ-carrageenan (125-500mg/kg) into the right hind paw of mice this activity is compared with the response of dexamethasone (2mg/kg). based on the result 500mg/kg of S. tuberosa extract showed 63.3% and the response of dexamethasone was 78%. They found that anti-inflammatory effect that produced by S. tuberosa was almost equal to the dexamethasone which was used as standard [18].

Anti-fungal activity: Anti-fungal activity was examined for leaf and root hydroalcoholic extract of spondias tuberosa and compared with the standard response of fluconazole. IC_{50} values for hydroalcoholic extract leaf of spondias tuberosa started from 5716.3 µg/ml to 7805.8 µg/ml and for the hydroalcoholic extract roots of spondias tuberosa 6175.3 to 7805.8 µg/ml and extracts mixed with fluconazole its inhibitory concentration was values are ranged from 2,65 to 278,41 µg/ml. Mixed fluconazole concentration showed the activity against C. albicans, C. tropicalis. root extract showed activity against C. tropicalis. leaf extract showed morphological changes in the two strains [20].

Anti-diabetic activity: Anti-diabetic activity was proved by injecting the hydroethanolic extract of spondias tuberosa (250mg/kg or 500kg/mg) into the diabetic rats and total cholesterol and HDL, triglycerides, hepatic muscle glycogen, urine, total protein, alanine, glucose levels in blood were analyzed. 500kg/mg dosage of the extract reduced the glucose during fasting and post- prandial glucose. [23]

Antioxidant activity: antioxidant properties of ethyl acetate and methanol extracts of spondias tuberosa were evaluated by in vitro methods. ABTS (2,2 Azino-bis- (3 ethylbenzothiazoline)-6 sulfonic acid) method was used to detect the antioxidant activity oxidation reaction was prepared with 7mM ABTS solution +140mM potassium persulfate and this mixture was placed at dark 12-16 hours. The ABTS solution was diluted in ethanol until it reaches the absorbance of 0.07 at 743nm. The effect of the activity was carried out using aliquots of 30µL and mixed with 3µL diluted ABTS + solution.

The solution was absorbed at frequent interval of time. From this examination, it revealed that methanol extract of leaves showed the highest percent oxidation inhibition rate. [24]

CONCLUSION:

Spondias tuberosa has different phytochemicals constituents like carotenoids, oils, caffeic acid, rutin, etc, hence it has shown many pharmacological activities such as antidiabetic, antifungal, antioxidant, and anti-inflammatory activities.

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