

PHARMACOLOGICAL IMPORTANCE OF MUSA SPECIES – A REVIEW

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ABSTRACT

Plants based traditional systems of medicines are playing an important role in majority of countries for providing health care to large section of population. It is an important fact that traditional systems of medicines always played an important role in meeting the global health care needs. Many Indian plants have been quoted to be useful as medicinal agents. They are effective with fewer side effects and are also inexpensive. Traditional medicine using herbal drugs exists in every part of the world. The major areas are Indian, Chinese and European traditions.

Traditional healers and pharmacists in developing countries are in important source of information about plant sources of new drugs. Only a fraction of the earth's natural pharmacopoeia has been analyzed with modern techniques. Banana plants (Musa species) are of the family Musaceae. They are economic, easily available and found native to the tropical region.

Key Words: *Musa species, Phytotherapy, Herbal drugs, Musaceae.*

INTRODUCTION

Before the introduction of modern medicines, disease treatment was entirely managed by herbal remedies. It is estimated that about eighty percent of the world population residing in the vast rural areas of the developing and under developed countries still rely mainly on medicinal plants. Medicinal plants are the only affordable and accessible source of primary health care for them, especially in the absence of access to modern medical facilities. Studies reveal that there are more traditional medicine providers than the allopathic providers especially in the rural areas. Although herbal medicines are effective in the treatment of various ailments very often drugs are unscientifically exploited and improperly used. Therefore, these plant drugs deserve detailed studies in the light of modern science. The philosophies of these traditional medicines have some resemblance to each other but differ widely from modern western medicine. In view of the progress of western medicine not only new synthetic drugs but also herbal drugs have to fulfil the international requirements on safety, quality and efficacy. Herbal drugs have the advantage of being available for patients in the geographical area of the special traditional medicine. The development procedure of herbal drugs for world-wide use has to be different from that of synthetic drugs. [1], [2], [3].

Practically every country develops its own medical system, which includes the ancient civilization of China, Egypt and India. Thus, the Indian Medical System-Ayurveda came into existence. The raw materials for Ayurvedic medicines were mostly obtained from plant sources in the form of crude drugs such as dried herbal powders or their extracts or mixture of products. Also, Siddha, Unani and Tibb are traditional health care systems have been flourishing for many centuries. Apart from these systems there has been a rich heritage of ethnobotanical usage of herbs by various colourful tribal communities in the country. India unquestionably occupies the top position in the use of herbal drugs. It is one of the foremost countries exporting plant drugs or their derivatives and excels in home consumption too. According to Indian mythology, when the illness and diseases got rampant on the earth, the sages learnt the science of healing from Lord Indra and recorded them in scriptures. It has been estimated that about seventy five thousand species of higher plants exist on the earth. A reasonable estimate of about 10% has been used in traditional medicine. However, perhaps only about 1% of these are acknowledged through scientific studies to have therapeutic value when used in extract form by human.[4-10].

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The threat of imminent extinction of many plant species, especially in tropical areas, makes it urgent that scientists learn as much as possible before old remedies are forgotten or their raw materials are destroyed. This process requires the observation and recording of medical techniques, identification of plant materials and experimental investigation of the ingredients and their effects. Ethno pharmacology can also be an important element of a developing nation's medical and economic system. Third World governments are being encouraged to seek a synthesis between modern and traditional medicine. Although developing countries are providing many of the raw materials needed in drug manufacturing, the final products are often returned as high-priced medicines. As more plants are needed for large-scale production, over harvesting has led to stock depletion. Chemists have so far been unable to reproduce the complex structure of many plant compounds. Further coordinated research into folk traditions, plant species, growing conditions and local medical needs is urged. Care must be taken, however, to preserve the main advantages of traditional medical care low cost and easy access. Many Indian plants have been quoted to be useful as antilithiatic agents. They are effective with fewer side effects and are also inexpensive. One of the important phenomena that characterize renal calculi is its high recurrence. Thus, a protective system is required including ESWL and medicament treatment. Unfortunately, these means remain costly and in most case are invasive and with side effects. Therefore, it is worthwhile to look for an alternative to these conventional methods by using medicinal plants or phytotherapy. Therefore, it is highly recommended to explore new drugs coming from medicinal plants to treat and prevent the formation of kidney stones. Ideally, conventional and phytotherapy should supplement one another and have all the need available for renal calculi patients. [11-14].

Many higher plants produce economically important organic compounds such as oils, resins, tannins, natural rubber, gums, waxes, dyes, flavours and fragrances, pharmaceuticals and pesticides. However, most species of higher plants have never been described, much less surveyed for chemical or biologically active constituents and new sources of commercially valuable materials remain to be discovered. Advances in biotechnology, particularly methods for culturing plant cells and tissues, should provide new means for the commercial processing of even rare plants and the chemicals they produce. These new technologies will extend and enhance the usefulness of plants as renewable resources of valuable chemicals. In the future, biologically active plant-derived chemicals can be expected to play an increasingly significant role in the commercial development of new products for regulating plant growth and for insect and weed control. The wide spread use of herbal remedies and healthcare preparations, as those described in ancient texts such as Vedas are obtained from commonly used traditional herbs and medicinal plants, has been traced to the occurrence of natural products with medicinal properties. The most established type of herbalism are those of Asian origin particularly from India (Ayurveda, Siddha, Unani), China and Japan. [15-19].

These practices incorporated ancient beliefs and were passed on from one generation to another by oral tradition and guarded literature. Before the introduction of modern medicines, disease treatment was entirely managed by herbal remedies. It is estimated that about 80 % of the world population residing in the vast rural areas of the developing and under developed countries still rely mainly on medicinal plants. Medicinal plants are the only affordable and accessible source of primary health care for them, especially in the absence of access to modern medical facilities. Studies reveal that there are more traditional medicine providers than the allopathic providers especially in the rural areas. Although herbal medicines are effective in the treatment of various ailments very often drugs are unscientifically exploited and improperly used. Therefore, these plant drugs deserve detailed studies in the light of modern science. [20-27].

MEDICINAL USES

Kailash P *et al.*, 1993 revealed a study on the effect of banana stem juice for antiurolithiatic activity on albino rats. The alcoholic extract reduced the oxalate, calcium and phosphate in urine. It also increased the urine volume, thereby reducing the tendency for crystallisation. Urolithiasis is a worldwide problem, sparing no geographical, cultural or racial groups. It is nothing but the development of stones in the urinary tract. It is a common disorder of the urinary tract and most painful of urologic disorders. It is considered as the third most common affliction of the urinary tract. It is a complex phenomenon yet not clearly understood. This cannot be contributed to any single factor and may be due to metabolic disturbances, infections, hormonal influences, dietary conditions and habits or obstructions in the bladder or kidney or increased excretion of stone forming components such as calcium, magnesium, oxalate, carbonate, phosphate, urate, cystine etc. The major factors are supersaturation of urine with the offending salt and crystallization. Crystals retained on kidney can become nucleus for stone formation. This process is synonymously known as urolithiasis or nephrolithiasis or renal stones or kidney stones. Jain S R *et al.*, 1967 done a work on hypoglycaemic principle of *Musa sapientum*. Singh Y N *et al.*, 1993 made a study on muscle paralysing components of the juice of the banana plant. They concluded that the two major active principles in the banana stem juice are potassium nitrate and magnesium nitrate having a significant role in their research work. [28-35].

Pillai R G., 1994 done a study on the core of the pseudostem of *Musa* in the treatment of urinary stones. The effect of *Musa* stem juice in the treatment of urinary stones was extensively studied in humans was remarkable and was significant. The study supports the traditional benefit of *Musa* species in the management of renal stones. Seventy one

patients diagnosed to be suffering from urolithiasis were treated with juice of the core of the pseudo stem of *Musa paradisiaca* and *Musa sapientum*. A significant segment of calculi of varying size were passed out after consuming the drug for two weeks. Recurrence of stone formation was also prevented by the treatment. The work mainly concludes that the plant material is quite effective in curing urolithiasis, especially of the calcium oxalate variety.

Prasad K V *et al.*, 2001 done an work in evaluation of *Musa paradisiaca* stem juice for antilithiatic activity in albino rats. Bhattacharjee P R *et al.*, 2005 undergone a work on antimicrobial and pharmacological evaluation of stem, seed and extracts of *Musa paradisiaca*. The research work concluded that the methanolic extract of stems and seeds of *Musa paradisiaca* having antibacterial activities. The seed extract were also able to depress the central nervous system of a albino swiss mice and to show analgesic activity. Singh S K *et al.*, 2007 made a study on assessment of glycemic potential of *Musa paradisiaca* stem juice. The study reveals the effect of *Musa paradisiaca* stem juice on blood glucose level of normal and diabetic rats. The dose of 500mg/kg body weight produces a significant rise of 28.3% in blood glucose level after six hour of oral administration in normal rats. Whereas, in sub diabetic rats the same dose produces a rise of 16.4% in blood glucose levels within one hour during glucose tolerance test and a rise of 16% after four hour in fasting blood glucose levels of severe diabetic cases.

Patankar S *et al.*, 2008 studied the effect of Ayurvedic formulation 'Varuna and banana stem' in the management of urinary stones. They made a prospective, randomised and controlled study to evaluate the efficacy and tolerability of Ayurvedic drug 'Herbmed' which is made up of varuna (*Crataeva nurvala*) and banana stem (*Musa paradisiaca*) was assessed to see reduction and/ or expulsion of urinary calculi and also to assess the role of these drugs to reduce pain during expulsion. In the prospective randomised, double-blind, placebo control trial, total 77 patients with calculi more than 5 mm were included. All patients were evaluated either by X-ray KUB for 3 months. All patients were divided into two groups: group A included patients with calculi 5-10 mm (n = 31) and group B with calculi > 10 mm (n =30) with either active treatment or placebo in both the groups. All patients were asked to keep a record of number of pain episodes, while severity of pain was measured on a visual analogue scale. In group A there was 33.04% reduction in the size of calculi in the active arm while there was a 5.13% increase in the same group in the placebo arm. In the other group B, there was an 11.25% reduction in the active arm and a 1.41% reduction in the same group with placebo. The research work concludes that the formulation having a promising effect for the management of upper urinary tract calculi. It helps to dissolve renal calculi and facilitate their passage. In addition, it also helps in reduction of pain due to renal/ ureteric calculus disease. [36-42].

Debabandya M *et al.*, 2010 made a review study on banana and its by-product utilisation. This review discusses usefulness of banana fruit peel, leaves, pseudostem, sheath, pith and male bud and prospects of using these materials in industry. Swathi D *et al.*, 2011 made a review study on important pharmacognostic studies and pharmacological actions of *Musa paradisiaca*. The review study mainly focused on the use of *Musa paradisiaca* in the treatment of asthma, diabetes, anthelmintic and hypertension. The whole plant as well as specific parts such as leaves, stem, ripe and unripe fruits of plant extract and its active constituents in the treatment of large number of human ailments. Anand R *et al.*, 1994 made a research on antiurolithiatic activity of *Tribulbulus terrestris* and *Crataeva nurvala* in albino rats. The active constituent isolated from *Crataeva nurvala* was lupeol and it was extensively studied. Antiurolithiatic activity of lupeol was assessed in rats by observing the weight of the stone, biochemical analysis of serum and urine and histopathology of bladder and kidney. Lupeol not only prevented the formation of vesical calculi but also reduced the size of the preformed stones. They have concluded that lupeol having significant antiurolithiatic activity.

Atmani *et al.*, 2003 had reported that *Hibiscus sabdariffa* Linn. has curative effect on stone formation induced by ethylene glycol. Joyamma V *et al.*, 2003 had reported that *Mimosa pudica* having good antiurolithiatic property. Ravindra V K *et al.*, 2006 made a study on *Moringa oleifera* root in the management of renal calculi. Bahuguna Y *et al.*, 2009 revealed that *Jasminum auriculatum* flowers having effective anturolithiatic activity. The effect of this plant on calcium oxalate nephrolithiasis has been studied in male albino rats. Ethylene glycol feeding resulted in hyperoxaluria as well as increased renal excretion of calcium and phosphate. Supplementation with alcoholic and aqueous extract of *Jasminum auriculatum* flowers significantly reduced the elevated urinary oxalate, showing a regulatory action on endogenous oxalate synthesis. The increased deposition of stone forming constituents in the kidneys of calculogenic rats were also lowered by this extract treated groups. The result indicates that the flowers of *Jasminum auriculatum* is endowed with antiurolithiatic activity. [43-47].

Jarald E E *et al.*, 2011 made a research work on *Unex* for its antiurolithiatic property. The study mainly focused to evaluate the effectiveness of *Unex* capsule on albino rats as a preventive agent against the development of kidney stones. Activity of *Unex* capsule was studied using the ethylene glycol-induced urolithiasis model and the research work proved that *Unex* capsule restored the urine pH to normal, and increased the the urine volume significantly. Gilhotra U K *et al.*, 2011 made a study on the effect of *Rotula aquatic* on ethylene glycol induced urolithiasis in rats. The alcoholic extract reduced the oxalate, calcium and phosphate in urine. It also increased the urine volume, thereby reducing the tendency for crystallisation. Anbu J *et al.*, 2011 had made a study on antiurolithiatic activity of ethyl

acetate root extract of *Ichnocarpus frutescens* using ethylene glycol induced method in rats. Supplementation with ethyl acetate extract of *Ichnocarpus frutescens* significantly reduced the elevated urinary oxalate, showing a regulatory action on endogenous oxalate synthesis. The increased deposition of stone forming constituents in the kidneys of calculogenic rats were also lowered by this extract treated groups. The result indicates that the root of *Ichnocarpus frutescens* is endowed with antiurolithiatic activity.

Ahmadi M *et al.*, 2012 undergone a study on *Alcea rosea* root extract as a preventive and curative agent in ethylene glycol induced urolithiasis in rats. According to their research concept, *Alcea rosea* showed a beneficial effect in preventing and eliminating calcium oxalate deposition in the rat kidney. This effect is possibly due to diuretic and anti-inflammatory effects or presence of mucilaginous polysaccharides in the plant. It may also be related to lowering of urinary concentration of stone-forming constituents. Suganya P *et al.*, 2012 made a research work on formulation and evaluation of capsule containing poly herbal ingredients as an antiurolithiatic agent. Preformulation, formulation and inprocess quality control tests have been carried out and the product was significant in nature. Potassium nitrate and magnesium nitrate are the major constituents present in *Musa AAB* stem juice and was confirmed by chemical test and UV spectroscopy Literature has proved the explosive and solubilizing property of potassium nitrate. Extracts of stem showed the presence of alkaloids, steroids like β -sitosterol, saponins, flavonoids like quercetin, reducing sugar, tannins and anthraquinones by chemical tests, UV, IR, Flame photometric studies and HPTLC determination. [48-52].

Plantain juice is used as an antidote for snake bite. Studies in rats demonstrate effectiveness for stone lysis. The roots can arrest hemoptysis and possess strongly astringent and anthelmintic properties. *Musa paradisiaca* is available in tincture or capsule No toxicities and contraindication are reported in human yet. The easy digestibility and nutritional content make ripe banana an excellent food, particularly suitable for young children and elderly people. Bananas contain considerable amounts of vitamin B₆, vitamin C, and potassium. The latter makes them of particular interest to athletes who use them to quickly replenish their electrolytes .In India, juice is extracted from the corm and used as a home remedy for jaundice, sometimes with the addition of honey, and for kidney stones. Kidney stones are a painful disorder of the urinary tract. Stones occur four times more often in men than in women. If the crystals remain tiny enough, they will travel through the urinary tract and pass out of the body in the urine without being noticed. Urolithiasis is the medical term used to describe stones occurring in the urinary tract. Other frequently used terms are urinary tract stone disease and nephrolithiasis. The kidney filters waste products from the blood and adds them to the urine that the kidneys produce. When waste materials in the urine do not dissolve completely, crystals & kidney stone are likely to form. Kidney stone form when there is a high level of calcium (hypercalciuria), oxalate (hyperoxaluria) and uric acid (hyperuricosuria) in the urine; a lack of citrate in the urine or insufficient water in the kidneys to dissolve waste products. The kidneys must maintain an adequate amount of water in the body to remove waste products. [53-59]

If dehydration occurs, high level of substances that do not dissolve completely (eg. Calcium, oxalate, uric acid) may form crystal that slowly build up into kidney stones. Urine normally contain chemicals, Citrate, Magnesium, Pyrophosphate, Glycosaminoglycans. These prevent the formation of crystals & low level of these inhibitors can contributes to the formation of kidney stones. Often these citrate is thought to be most important because citrate, or citric acid, is an ordinary component of our diet, present in high amounts in citrus fruits. Citrate binds with calcium in the urine, thereby reducing the amount of calcium available to form calcium oxalate stone. It also prevent tiny calcium oxalate crystals from growing and massing together into larger stones. Finally, it makes the urine less acidic, which inhibits the developments of both calcium oxalate and uric acid stone. Magnesium is also one of the crystal inhibitor which present in urine. It act by increasing calcium solubility (especially in the urine) and reducing calcium absorption, magnesium can help to prevent kidney stone specially those composed of calcium oxalate. It is thought that calcium oxalate stone are most likely to form in people who are magnesium deficient, so it may just correct that deficiency. Inorganic pyrophosphate is a potent inhibitor which appears to affect calcium phosphate more than calcium oxalate crystals. Other urine inhibitors in urine that appear are glycoproteins, which strongly inhibit the growth of calcium oxalate crystals. As a consequence of the presence of these inhibitors, crystal growth in urine is very slow. [60], [61].

CONCLUSION

The traditional medicine refers to a broad range of ancient, natural health care practices including folk/tribal practices as well as Ayurveda, Siddha and Unani. These medical practices originated from time immemorial and developed gradually, to a large extent, by relying or based on practical experiences without significant references to modern scientific principles. The WHO has approved the use of traditional medicines as a part of its health programmes. According to a WHO survey, 80% of the population living in developing countries rely almost exclusively on traditional medicine for primary health care needs. As in almost all the system of traditional medicines, plants play a major role and constitute its back bone. All ancient civilizations have documented medicinal uses of plant in their own ethnobotanical texts. The list of drugs obtained from plant source is fairly extensive. Many remedies have been employed during the ages to treat urolithiasis. Most of the remedies were taken from plants and proved to be useful, though the rationale behind their use is not scientifically established except for a few plants and some proprietary

composite herbal drugs. The plant products and derivatives of their lead compounds as such may not replace the ESWL and surgical removal procedures but may surely help in decreasing the recurrence rate of renal calculi. The *Musa stem* juice may be useful to overcome the major drawback of surgical procedures which is recurrence of stones. In indigenous system of medicine, the stem of *Musa* species (Musaceae) are reported to be useful in the treatment of urinary calculi. Juice of various species of *Musa* are used internally as a diuretic, analgesic, antidiabetic, anthelmintic, food supplement, antioxidant.

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