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MULBERRY: A MEDICINAL ACTIVITY

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ABSTRACT

Mulberry is the chief food plant for silkworm further mulberry is also having many active chemical components. Mulberry has got high medicinal value which can be used as medicinally important entity. At present, consumption of herbal and natural medicines is more popular than synthetic drugs due to no toxic effect. India is the second largest producer of silk in the world. So, Mulberry is widely cultivated in Maharashtra. The review reveals the wide range of important Pharmacological uses of mulberry including medicinal properties like anti-diabetic, anti-oxidant, lipid lowering**,** anticancer.

KEYWORDS: Mulberry, Morusalba, Flavonoids, Diabetes Mellitus.

INTRODUCTION

Medicinal plant has been considered and used as a healthy source of life for all age group population (pediatric as well as geriatrics) due to its rich therapeutics properties and being 100% natural. Medicinal plant have been used by majority of people to cure various diseases and illness. Some of the herbal preparation use fruits, leaves, roots, bark administered against various diseases.[1] Mulberry is one of the herb which are used in medicines from centuries ago due to its active chemical components and pharmacological functions[2] Mulberry belongs to the family moraceae. The genus morus contains variety of species some of them includes Morusalba, Morusnigra, Morusrubra, Morusindica, Morusaustralis, Moruscathayana etc. Morusalba Linn which is also known as white mulberry. White mulberry is moderately sized tree, three to six meters height. White mulberry is cultivated throughtout the world wherever silkworms are raised. White mulberry leaves are the main food source for the silkworm.[3] Traditionally mulberry fruits has been used to treat weakness, fatigue, anemia, constipation in elder people and anemic etc. Morus alba leaves containing many nutritional components high amount of protein these are also the best feed for silkworms and they have been used in traditional Chinese medicine as an antihyperglycemic to control diabetes mellitus. These plant shows the beneficial effect in lowering serum glucose and blood cholesterol level, these properties is due to presence of many active components such as flavonoids, alkaloids, polyphenols, terpenoidsetc in plant. Different parts of plant shows antioxidative, hypolipidamic, antihyperglycemic, anticancer, anti inflammatory effect.[4] Mulberry has been explored as a medicinal plant and its medicinal properties are testified in various scriptures.[5] Major active compounds are in leaves but many of them can be found in the barks, roots as well as in fruits. Mulberry leaves is well known for its severial biological effects. Mulberry leaves are highly delecious and digestible it contains proteins with good essential amino acid varies from 15-28% depending on the variety, leaves contain the high number of minerals. The leaves of mulberry are one of the important herbal medicines.[6]

Taxonomical Classification.[7]

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Urticales
Family	:	Moraceae
Genus	:	*Morus L.*
Species	:	*Morus alba L.*
Part used	:	Fruit, root, leaves and bark

Fig. 1: Fruit

Fig. 2: Leaves.

Fig. 3: Leaves.

Fig. 4: Root Bark.

Pharmacological Review

Antidiabetic effect

Diabetes mellitus is chronic disorder which is caused by the ineffectiveness of the insulin produced by pancreas. Diabetes not only kills but its chronic effect leads to kidney failure, heart attack etc. So far several medicinal plants have been reported for treatment of diabetes and identified for antidiabetic activity. In old Chinese herbal medicine mulberry was used for reducing blood serum glucose. Both leaves and roots extracts of mulberry plants are having hypoglycemic properties and it is used in the treatment of diabetes.[4] Extract of white mulberry (morusalba) decreases the various number of adverse side effect resulting from development of diabetes such as abnormalities. Mulberry leaves are one of the important herbal medicines used for the treatment of hyperglycemia. It was proved by experiments in animal models that mulberry leaf extract possess antihyperglycemic and antioxidant activities.[4] Deoxynojirimycin (DNJ), a known major antidiabetic principle from mulberry has been shown to inhibit α-glucosidase in small intestine by binding to its active site, resulting in decrease of glucose absorption and blood glucose level. Mulberry leaf extract acts as a natural inhibitor of α- glucosidase due to deoxynojirimycin (DNJ) and its derivatives. Also a hybrid of DNJ and a polysaccharide helps in regulating the expression of the hepatic gluconeogenic enzymes, glucokinase, PEP carboxykinase and glucose 6-phosphatse. In this mixture polysaccharide is able to protect pancreatic islets from alloxan induced damge, repair the destroyed pancreatic islets, upregulate the PDX-1, insulin-1 and insulin-2 expression in pancreas and normal secretion of insulin in serum. Fagomine, one of the active components present in mulberry leaves is capable of inducing insulin secretion in isolated rat islet cells. In patients with type 2 diabetes, mulberry treatment caused an improvement in glycemic control and fall in VLDL production and also it reduce the lipid peroxidation in blood, urine and RBC membrane. Morusalba leaf extract rich in tannins, flavonoids, cardiac glycosides and saponins exhibit significant α-amylase inhibitory activity.

Antioxidant effect

Anthocyanins are the group of natural phenolic compounds responsible for colouring of fruits, flowers and leaves. Anthocyanins are the best source of health benefits as antioxidant and anti-inflammatory compounds. Flavonoids commonly occuring in mulberry contain at least four flavonoids including rutin. Flavonoids possess anti-inflammatory, antioxidant, antiallergic, hepatoprotective, antiviral and carcinogenic activities in human beings. Morusalba extract and its other compounds usually flavonoids have antioxidant properties by scavenging free radicals and protect many organs from oxidative stress. A number of reactive oxygen species (ROS) like singlet oxygen (O_2), superoxide anion radical (O_2^-), hydroxyl radical(OH), nitric oxide radical (NO^-), and alkyl peroxyl (ROO^-) are produced regularly in the human body as a result of oxidation process. Protective mechanisms exist to mediate their harmful effects but sometimes ROS overrides the defense capabilities of the body resulting in oxidative damage to molecules and membranes.[8] In such cases, there is a need to strengthen this mechanism by antioxidant supplementation. Presence of various phenolic compounds especially the presence of different flavonoids and among them quercetin 3- (6-malonylglucoside) is most important for antioxidant potential of mulberry plant. The higher the plant polyphenol content, the stronger the antioxidant activity.[9] The naturally occurring flavonoids, especially those of the root bark of M. alba L. extract, have shown antioxidant activity in different model systems. Morus

alba leaves water extract has highest antioxidant properties as evaluated, through ferric reducing/ antioxidant power assay. Antioxidant potential of Morusalba leaves, root bark and in some instances stem enables its chances of utilization as source of antioxidant but still a lot of things should be addressed.[10]

Lipid lowering

The Mulberry plant extracts have been known to posses hypoglycemic activity in animal studies on strepozotocin induced diabetes in rats1 and in human clinical studies carried out in type 2 diabetic patients in comparison with the glibenclamide treated group 2.The study also showed a significant reduction in cholesterol, triglyceride, free fatty acid LDL Cholesterol, VLDL Cholesterol levels and a significant increase in HDL Cholesterol levels in mulberry treated group. Mulberry (*MorusIndica*) has the potential hypolipidemic action.[11]

Anticancer

Mulberry inhibit the initiation and development of cancer. Their mechanism of action is omni-directional and consists in the elimination of the reactive form of oxygen and nitrogen, and which reduces the number of negative mutations, reducing inflammation, promoting apoptosis and the activation of the immune system.[6] Anthocyanins are the group of natural phenolic compounds with major effect in lowering the risk of cardiovascular diseases and cancer because of its anti-inflammatory, antioxidant, and chemoprotective properties.[4] Flavonoids also have an anti-cancer effect. The biological activity of the plant lectins is determined mainly by the properties of their immunomodulatory and anti-proliferative, which is used among other things in cancer therapy. In the absence of a set of lectins or excess, modified cell is recognized as an antigen and determined as a target for destruction by immune cells. If in that way, damaged cells are eliminated, then the lectins play a supportive role in apoptosis, but in this way the normal cells can be destroyed.[6]

CONCLUSION

Mulberry has got high medicinal value which can be used as medicinally important entity, it can be used as one kind of resources as a raw material in pharmaceutical industry. Mulberry contains various chemical constituents of medicinal value in leaf, fruit, stem, seed and root portions. Thus, the present plant holds a great future for its use as an anti-diabetic, anti-oxidant, lipid lowering, anti-cancer etc. alone or in the formulations. These can revolutionalize herbal market of anti-diabetic formulations and many more available till date. Cost effective formulation will be availed to patients.

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