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VALIDATION OF ANTI-DIABETIC AND ANTIOXIDANT POTENTIAL OF A SIDDHA POLYHERBAL PREPARATION MARUTHAMPATTAI KUDINEER -A REVIEW

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ABSTARCT

Siddha system is not merely a science of therapeutics based on herbs, animals and mineral resources, it is claimed to be a humanistic discipline of life and living. The system has a wide range of internal and external medicines and one among them is *Maruthampattai kudineer* a polyherbal drug mentioned in the siddha classical text *Agasthiyar* 2000. This review work is an initial step towards, scientifically studying the drug "*Maruthampattai Kudineer*" an anti-diabetic formulation. The *In-vitro & In-vivo* studies of most of the Ingredients like *Syzygium cumini, Terminalia arjuna, Strychnos potatorum, Cyperus rotundus* shows potent anti-diabetic and anti-3 oxidant activity. The review validates that all ingredients of *Maruthampattai kudineer* have anti-hyperglycemic and antioxidant potential based on the data collected in Siddha literature and recent researches. Therefore this study substantiates *Maruthampattai Kudineer* as a successful Siddha formulation in the management and improving the quality of life in both Pre-diabetic and Diabetic patients.

KEYWORDS: Siddha system *Maruthampattai kudineer* patients.

INTRODUCTION

WHO defines Diabetes mellitus is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin

produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves.[1] Depending on the etiology of the DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization, and increased glucose production. The metabolic dysregulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system.[2]

Diabetes prevalence is increasing rapidly; previous 2013 estimates from the International Diabetes Federation put the number at 381 million people having diabetes.[3] The number is projected to almost double by 2030.[4] Until recently, India had more diabetics than any other country in the world, according to the International Diabetes Foundation,[5] although the country has now been surpassed in the top spot by China.[6] Diabetes currently affects more than 62 million Indians, which is more than 7.1% of the adult population.[7] The average age on onset is 42.5 years. Nearly 1 million Indians die due to diabetes every year.[5]

According to siddha system of medicine, *neerizhivu* or *madhumegam* is characterized by excessive and frequent urination, presence of ants and house flies in the urinated place, sweet smell on heating of urine, loss of weight resulting in the gradual deterioration of the *udal thathukal* (7 physical constituents).[8] There are a number of formulations mentioned in siddha classics for the treatment of diabetes and one among them is *Maruthampattai kudineer* mentioned in *Agathiyar* 2000.

The Poly herbal Anti-diabetic drug ‘’Maruthampattai Kudineer’’ contain 11 drugs and their brief descriptions are given below.

Ingredients[9,10,11,12,13]

1. Maruthampattai.
2. Navalpattai.
3. Karuvellampattai.
4. Athipattai.
5. Avaraithol.
6. Kadalalinjilpattai.
7. Thetrankottai.
8. Kalipakku.

9. Kadukkai thol.
10. Nellivatral.
11. Thandrikai thol.

Tamil Name / Common Name	Botanical Name / Family	Action	Uses in Siddha
Marutham pattai/ Arjuna	Terminalia arjuna / Combretaceae	Tonic, cardiac stimulant, astringent	Heart disease, Diabetes, leprosy, leucorrhoea
Nellikai / Indian gooseberry	Phyllanthus emblica	Astringent, laxative, diuretic, refrigerant	Sinusitis, vomiting, anaemia ascites, piles
Kadukkai / hebulic myrobalan	Terminalia chebula / Combretaceae	Stomachic	Ulcer, asthma, ascites, brain tumour, fistula
Thandrikkai / Belleric myrobalan,	Terminalia bellerica / combretaceae	Astringent, laxative, tonic, expectorant.	Hypertension, venereal diseases, leucorrhoea,
Thettran kottai / clearing nut	Strychnos potatorum / Logainaceae	Tonic, stomachic, alterative	Diabetes, cough, piles, anaemia, ascites,
Karuvelam pattai / Gum Arabic tree	*Acacia nilotica* / Fabaceae	Astringent	Diabetes
Kadalalingil pattai / salacia,kotala himbutu	*Salacia reticulate* / Celastraceae	Demulcent, astringent	Diabetes, diarrhoea, fever, Tinea infection
Navalpattai / jambul	*Syzygium cumini* / Myrtaceae	Astringent, diuretic, tonic, stomachic	Eczema, diabetes heat, sweating, swelling
Aththi pattai	*Ficus racemosa* / Fabaceae	Astringent	
Kalipakku	*Areca catechu* /Arecaceae	Astringent, stimulant	Diarrhoea, tastelessness
Avarai thol	*Cassia auriculata*/Fabaceae	Astringent	

Anti diabetic and antioxidant activities of the ingredients of Maruthampattai kudineer

Terminalia Chebula: Naik G H et al; observed that aqueous extract of T. chebula was an excellent scavenger of DPPH radicals and inhibited xanthine/xanthine oxidase activity.[14] Kannan et al; explained that *T. chebula* fruit and seeds exhibited dose dependent reduction in blood glucose of streptozotocin induced diabetic rats in toxicity studies and also had renoprotective activity.[15] Gandhipuram Periasamy Senthilkumar et al; described that the ethanolic dry fruit extract showed reduced blood glucose, glycosylated hemoglobin, urea, and creatinine as well as fructose, Hexose, hexosamine and sialic acid in the diabetic rats. The efficacy of the fruit extract was comparable with glibenclamide, a known hypoglycaemic drug.[16]

Termialia Arjuna: Ragavan et al studied that the Antidiabetic effect of T. arjuna bark extract in alloxan induced diabetic rats. The Ethanolic extract of bark was administered to the alloxan induced Diabetic rat. They studied the activities of hexokinase, aldolase and phosphoglucoisomerase, and gluconeogenic enzymes such as glucose-6-phosphatase and fructose-1,6-diphosphatase in liver and kidney of normal and alloxan induced diabetic rats.

The study clearly shows that the bark extract of T. arjuna possesses potent anti-diabetic activity.[17] Amit Gupta et al; suggests that aqueous stem bark extract of Terminalia arjuna and Emblica officinalis showed anti-diabetic activity with respect to enhancement of granulocytes count and decrease in free haemoglobin content including total cellular content in diabetic human.[18]

Syzgium Cumini: Tripathi and Kohli et al; studied the antidiabetic activity of bark extract of *Syzygium cumini* on streptozotocin (STZ)-induced diabetic Wistar albino rats and reported that 30 minutes prior administration of *Syzygium cumini* (L.) extracts before oral glucose loading significantly decreased the rise in postprandial blood glucose levels. However the result was less significant than glibenclamide.[19] Kuncha jayachandra et al; reported the antioxidant activity of methanolic extract of *Syzygium cumini* bark was determined by invitro methods such as 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging assay, Hydrogen peroxide scavenging assay, and Ferric reducing antioxidant power (FRAP) assay. The IC50 value for DPPH and hydrogen peroxide scavenging activity were found to be 53.3% at concentration of 600mg and 42.03% at 1.2mg/ml respectively. FRAP value found to be 810µg Fe2+/gm. The extract showed significant antioxidant activity in all antioxidant assays.[20]

Arecha Catechu: Chempakam B et al; has reported that arecoline a major constituent of Areca catechu have hypoglycemic activity in an animal model of diabetes upon subcutaneous administration. The Subcutaneous administration of alkaloid fraction of Areca catechu (0.05_/0.5 mg/kg) in alloxanized rabbits (140 mg/kg) showed significant hypoglycemic effect lasting for 4/6 hours.[21] Hamsar et al; investigated the *in vitro* effect of methanolic extract of Unripe seeds of *A.catechu* showed the effective GST specific activity inhibition with an IC_{50} of 115.05 µg/mL with maximum inhibition > 70%. These results suggest that areca nut extracts have the potential to prevent oxidative damage in normal cells due to their antioxidant characteristics.[22]

Ficus Racemosa: Kar A, Choudhary et al; reports that β-sitosterol isolated from the stem bark of *Ficus racemosa* was found to possess potent hypoglycemic activity when compared to other isolated compounds.[23] Jahan IA, Nahar et al explains that ethanol extract of fruits, exhibited significant antioxidant activity in DPPH free radical scavenging assay. 3-O-(E)-Caffeoyl quinate showed significant antioxidant activity.[24]

Salacia Reticulata: Matsuda et al; reported the active fraction from S. reticulate shows alpha-glucosidase inhibitory effect which is the primary activity responsible for its hypoglycaemic effect.[25] Shimoda et al. demonstrated that an aqueous extract of SR dose dependently suppressed the serum glucose level induced by sucrose, maltose and alpha starch but not that induced by glucose and lactose.[26] Yoshikawa et al ;explains that the two potent alpha glucosidase inhibitors, salacinaol and kotalanol have been identified consistently in studies and are believed to be responsible for the attenuation of postprandial glucose in rat models as well as humans.[27,28,29]

Strychnos Potatorum: Dhasarathan P, et al., evaluated the anti-diabetic activity of ethanol extract of the plant on blood sugar level, which proved to be effective even at a lower dose (100 mg/kg) in decreasing blood sugar level in alloxan treated rats. The plant extract almost brought down blood glucose level by 50% in diabetic animals.[30] Ekambaram et al; demonstared that SPP and SPE of *Strychnos potatorum* seeds possess hepatoprotective and antioxidant activities against CCl_4-induced acute hepatic injury.[31]

Acacia Nilotica: Infusion of bark (1½ ounces to one pint of water) is given in chronic diarrhoea and diabetes mellitus in doses of 1½ to 2 ounces twice a day.[32] The extracts of Acacia nilotica pod exhibited strong and effective antioxidant property in vitro and in vivo by chelation to metal ions as well as scavenging free radical. It also prevents strand break formation in supercoiled plasmid DNA and protein oxidation.[33-34]

Terminalia Bellerica: Ramesh Kumar et al demonstrated that in vitro assessment of the antioxidant activity of ethanolic fractions of Terminalia bellerica to scavenge 2, 2- Diphenyl-1-picrylhydrazyl (DPPH) and highly reactive hydroxyl radicals showed that the semi pure compounds present in the fractions are useful potential source of antioxidants.[35] M.C.Babu et al; demonstrated that administration of T. belerica extract did not have any significant effect on serum glucose level in alloxan diabetic rats during first five days but started reducing from 6^{th} day onwards. On 9th day when compared with that of control diabetic animals serum glucose in extract treated animals was found to be reduced to 54%.[36]

Phyllanthus Emblica: Priya et al; postulates that the methanolic seed extract of Emblica officinalis has promising free radical scavenging activity of 1,1, Diphenyl-2-picryl-hydrazil (DPPH) in a concentration dependant manner.[37] Jayweera et al; has documented

that *Emblica officinalis* is proved as an important inhibitor of Aldose reductase which has its involvement in the development of secondary complications of diabetes including cataract.[38]

Cassia Auriculata: Daisy et al; investigated the effect of Cassia auriculata crude extracts on plasma glucose level in normal and experimental rats. STZ-treated diabetic rats showed significant increase in the levels of blood glucose when compared to normal rats. a significant elevation in the levels of fasting blood glucose, glycosylated haemoglobin (HbA1c), serum insulin, C-peptide and liver enzyme were observed.[39] Kolar et al; evaluated the antioxidant activity of aqueous and ethanol extracts of four plants from the genus Cassia by various antioxidant assays, including ferric reducing antioxidant power (FRAP), DPPH free radical scavenging, metal chelating activity, phosphor molybdenum reducing power, hydrogen peroxide radical scavenging, hydroxyl radical scavenging, deoxyribose degradation and β-carotene bleaching assay. All the extracts showed antioxidant activity in the tested methods. Among the four species, Cassia auriculata has been found to possess highest activity in most of the tested models.[40]

CONCLUSION

From this review it is evident that most of the ingredients of "*Maruthampattai kudineer*" has Anti-oxidant activity and Anti-diabetic activity which are responsible for its therapeutic activity claimed in literature.

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