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R Susila
Research Officer Siddha, Siddha
Central Research Institute,
CCRS, Anna Hospital Campus,
Arumbakkam, Chennai, Tamil
Nadu, India

R Jeeva Gladys
Lecturer, Velumailu Siddha
Medical College, Sripurumbudur,
Tamil Nadu, India

R Arunadevi
Research Officer Pharmacology,
Captain Srinivasa Murthy
Regional Ayurveda Drug
Development Institute, CCRAS,
Arumbakkam, Chennai, Tamil
Nadu, India

J Jothi
Head of the Dept, Dept. of
Maruthuvam, Velumailu Siddha
Medical College, Sripurumbudur,
Tamil Nadu, India

C Arunachalam
Research Officer Botany,
Captain Srinivasa Murthy
Regional Ayurveda Drug
Development Institute, CCRAS,
Arumbakkam, Chennai, Tamil
Nadu, India

K Balagurusamy
Principal, Velumailu Siddha
Medical College, Sripurumbudur,
Tamil Nadu, India

Correspondence
R Susila
Research Officer Siddha, Siddha
Central Research Institute,
CCRS, Anna Hospital Campus,
Arumbakkam, Chennai, Tamil
Nadu, India

A review on anti-diabetic herbs of Siddha system with special reference to it's organoleptic quality (taste) as per tridosam concept

R Susila, R Jeeva Gladys, R Arunadevi, J Jothi, C Arunachalam and K Balagurusamy

Abstract

Diabetes mellitus is one of the major leading causes of death worldwide, owing to its serious complications. Its complications are not only responsible for morbidity, disability, and mortality but also produces financial burden at individual, family, community, and national levels. As per Siddha system, tridosham or the three humours namely vatham, pitham and Kapham are in a state of equilibrium, potentiate the well-being of human body. Imbalance of any of these humours initiates the disease and its further progression. A proper channel of analyzing and refocusing the alarming disease diabetes, a parallel terminology of Madhumegam in Siddha, in the light of tridosham, it has been revealed that pitham is the prime humour to initiate the disease and the consequent alteration in kapham and vatham results in further vascular complications. Pacifying the vitiated humours by medicinal herbs based on their organoleptic characters especially taste, lays the basis of therapeutic regimen. In this constitution based individualized medicine, taste place a major role in selection of medicinal herb for an individual. This article deals with the siddha intervention of management of diabetes with special reference to the taste of herbs.

Keywords: Diabetes mellitus, Siddha, Tridosham, Taste, Medicinal herbs

1. Introduction

In the past few years there has been an increased global prevalence of diabetes. The traditional Dravidian system of medicine referred popularly as Siddha medicine has been practiced for thousands of years to reduce the ill effects of diabetes and its secondary complications. A proper understanding of siddha pathology of diabetes is essential to arrive at a diagnosis of proper stage of diabetes and treating it based on alleviating the derranged humours. This review article focuses on siddha pathology of diabetes and recent researches on herbs mentioned in ancient literatures; which proves siddha to be a scientific way-out for diabetes. Diabetes mellitus is a multi-factorial disease leading to several complications. It is a heterogeneous metabolic disorder characterized by altered carbohydrate, lipid and protein metabolism resulting from either insulin insufficiency or insulin dysfunction. Type I Diabetes is caused due to insulin insufficiency because of lack of functional cells and type II Diabetes which constitutes 90% of diabetic population are unable to respond to insulin^[1]. Recent estimates by WHO and International Diabetes federation indicate that there were 171 million people in the world with diabetes in the year 2000 and this is projected to increase to 366 million by 2030^[2]. It is estimated that there are approximately 33 million adults with diabetes in India. This number is likely to increase to 57.2 million by the year 2025^[3].

2. Diabetes in Siddha

In Siddha system, Diabetes is known as Innippu neer (sweet urine), Madhumegam (sweet cloud). The various reasons for the cause of this disease are attributed to food, habits, life style changes and also due to hereditary causes. In Siddha the concept of "Andathil Ullathey Pindam" that is the happening of human body (microcosm) is same that of the cosmos (macrocosm), and the Tridosham theory of Vatham, Pitham and Kapham are the basic principles of Siddha medicine which plays a vital role in the pathology of Madhumegam. Diagnosis of diabetes in Siddha perspective deals with eight fold examination of patient which includes examination of tongue. Tongue was examined for appearance, color, taste and salivary secretion^[4, 5]. So with specific diseases, taste of the individual is examined to arrive at a conclusion and knowledge of taste of the herb will be utilized to decide treatment regimen.

Table 1: Role of Humors in Human Body [6].

| Vatham | Aakayam (space)+Vayu (air) | Controls movements, action of nerves and sensations. |
|--------|----------------------------|--|
| Pitham | Thee(fire) | Predominant constituent of blood, metabolic activity, Production of warmth |
| Kapham | Mann(earth) + Neer (water) | Controls stability, predominant constituent of fluid, fat. |

According to Siddha literature Pitham (Fire-which is responsible for digestion and various metabolic functions) is the prime humour that is aggravated to initiate the disease due to change of food and life style (Unavaathi Seyal) this results in derrangement of Kapham [7] (water) humour, which on further progression results in diabetes and its complications. Diabetic complications depend on the accumulated kapham in various parts of human body such as eyes (retinopathy), kidneys (nephropathy) and nerves (neuropathy). When there is a predominant increases in pitham humour (fire) there is an increased metabolic fire as pitham is an important component of digestion and metabolism. This attributes to increased hunger (polyphagia) and increased thirst (polydipsia) [8]. The increased kapham (water) attributes to polyuria and the further progression of kapham results in catabolic phase of morbidity [9]. As it is mentioned in Siddha literature “Sethuma seethamaai thudaithu” [10] at the end of life all the edge kapham is degenerative component that is responsible for vascular complications (microangiopathy) and constitutes degenerative diabetic retinopathy, degenerative diabetic nephropathy and degenerative diabetic neuropathy. In all these conditions there is an increased accumulation of fluid (kapham).

Selection of herbs based on Taste (suvai)

In Siddha perspective, regular elimination of dosham is important because normal metabolic processes continuously produce them. The level of production of tridosham of our body depends primarily on which taste we consume. Tastes influence the balance of the dosham in the body. They have profound effect on all parts of the body, not merely the tongue. Sweet taste composed mainly of earth and water,

sweet increases kapham, decreases pitham and vatham. It nourishes and exhilarates body and mind relieving from hunger and thirst. Sour taste composed of earth and fire, increases kapham and pitham, decreases vatham. It is refreshing, helps in elimination of waste, and improves appetite and digestion. Salty taste composed mainly of water and fire, increases kapham and pitham decreases Vatham. It eliminates wastes and cleanses the body, increases the digestive capacity and appetite. Pungent taste composed of fire and air, increases pitham and Vatham, decreases Kapham. Pungent flushes all types of secretions from the body, and reduces all kapha-like tissue such as fat. Bitter taste composed of air and ether, increases vatham, decreases pitham and Kapham. Bitter purifies and dries all secretions, is anti-aphrodisiac and tones the body by returning all tastes to normal balance. Astringent taste composed mainly of air and earth, increases Vatham, decreases pitham and Kapham. Astringents heals, purifies all parts of the body.

In order to balance both the elevated pitham and kapham, the taste kaippu (bitter) and thuvarpu (astringent) are found to be suitable for the selection of anti-diabetic herbs.

Pacifying tastes for pitham - Sweet, Astringent, Bitter [11]

Pacifying tastes for kapham - Pungent, Astringent, Bitter [11]

In selection of herbs, sweet and pungent were eliminated as they both contradict with each other and increases kapham and Pitham (sweet increases kapham and pungent increases pitham) [12]. Hence herbs with predominant astringent or bitter or combination of both are chosen for better antidiabetic action. Table 3 depicts the anti-diabetic herbs used in Siddha system of medicine, for its taste in pacifying the derranged dosham along with its part to be used and states the scientific validation available for the historic claims.

Table 3: List of herbs described in Siddha literatures [11] with their unique taste pacifying the vitiated dosham and their systemic validation as anti-diabetics.

| S. No. | Plant Name | Tamil Name | Part used | Taste | Indication in Siddha script | Validated effects |
|--------|-----------------------------|--------------------|---------------------|-------------------|--|--|
| 1 | <i>Saraca asoca</i> | asoca | Bark, seed, flowers | Astringent | Diabetes, Diabetic ulcer Joint swelling | Ethanol extract reduced oxidative stress, found to possess hypo lipidemic, hypo glycemic, activity [13]. |
| 2 | <i>Ficus racemosa</i> | athi | Latex | Astringent | Diabetes | Ethanol extract reduced blood glucose level in dose dependent manner [14]. |
| 3 | <i>Nymphaea nouchali</i> | vellalli/ chevalli | Seeds | Astringent | Diabetes | Hydro alcoholic extract of seeds restored blood glucose and lipid profile and hepatic and renal markers [15]. |
| 4 | <i>Ficus bengalensis</i> | aalamaram | Bark | Astringent | Diabetes | Aqueous extract possessed anti diabetic activity [16]. |
| 5 | <i>Cassia auriculata</i> | aavarai | flowers | Astringent | Diabetes | Its extract possessed insulinogenic action, improved carbohydrate metabolic pathway [17]. |
| 6 | <i>Zingiber officinalis</i> | inji | rhizome | pungent | Diabetes | Raw ginger possessed hypoglycemic, hypocholesterolemic and hypo lipidemic potential. Reverses proteinuria in diabetic rats [18]. |
| 7 | <i>Phoenix dactylifera</i> | pereechangai | Fruit | sweet | Diabetes | Date fruit aqueous extract has potential to prevent diabetic hazard and causes improvement in diabetic neuropathy [19]. |
| 8 | <i>Salacia reticulata</i> | kadazhinchil | leaves | Astringent | Diabetes | Water extract of the leaves could be a beneficial food material for the prevention of diabetes and obesity [20]. |
| 9 | <i>Terminalia chebula</i> | kadukkai | Fruit | Astringent | Diabetes | Ethanol extract of fruit has potential hypoglycemic action and the effect was found to be more than glibenclamide [21]. |
| 11 | <i>Cocculus hirsutus</i> | kattukodi | aerial part | Bitter/Astringent | Controls excess urination in diabetes mellitus | Methanolic extract found to posses antidiabetic activity and acted in a similar fashion to glibenclamide [22]. |

| | | | | | | |
|----|-------------------------------|-------------------|---|--------------------------------|--|--|
| 12 | <i>Areca catechu</i> | kamugu | seeds | Astringent | Urinary tract infections associate with DM | Its extract controlled hyperglycemia and hyperlipidemia in diabetic rats [23]. |
| 13 | <i>Acacia catechu</i> | karungali | Root infusion | Astringent | Diabetes | Ethanolic and aqueous extracts of the hard wood showed improvement on oral glucose tolerance post-sucrose load in normal and diabetic rats [24]. |
| 14 | <i>Benineasa hispida</i> | kalyanapoosanikai | Fruit peels | sweet | Diabetes | Oral dosage of petroleum ether extracts produced significant lowering of blood sugar, serum urea, serum cholesterol and serum triglyceride levels in diabetic rats [25]. |
| 15 | <i>Erythrina variegata</i> | kaliyana Murukku | leaves | hot pungent astringent | Diabetes | Bark extract supplementation is advantageous in controlling the blood glucose level, HbA1c and improved Hb and insulin levels in diabetic rats [26]. |
| 16 | <i>Quamoclit pennata</i> | kaasirathinam | Crushed leaves for external application | Astringent | External application for dressing diabetic ulcer | Thirty days administration of hydroalcoholic extract of whole plant showed a significant reduction in the blood glucose levels of diabetic rats [27]. |
| 17 | <i>Tragia involucrata</i> | kaanchori | leaves | Bitter | Diabetes | Extracts possessed <i>in vitro</i> alpha amylase inhibitory activity [28]. |
| 18 | <i>Citrus aurantium</i> | kichilipazham | Fruit | Astringent, Sour Bitter, sweet | Diabetes | Extract produced significant reduction in blood glucose level [29]. |
| 19 | <i>Holarrhena pubescens</i> | kudasappaalai | bark | Astringent, mild bitter | Diabetes | methanolic extract possessed hypoglycemic activity of glucose tolerance test I [30]. |
| 20 | <i>Coccinia grandis</i> | kovai | leaves | bitter | Diabetes | Leaf extract showed significant anti-diabetic effect in diabetic rats after oral administration [31]. |
| 21 | <i>Tinospora cardifolia</i> | seendil | stem | bitter | Diabetes induced thirst | Stem extracts treatment resulted in improvement in C-peptide levels and regenerating capacity of pancreatic B cells [32]. |
| 22 | <i>Asperagus racemosus</i> | thanneer vittan | root | sweet | Diabetes | Roots have been shown to enhance insulin secretion in perfused pancreas and isolated islets [33]. |
| 23 | <i>Pandanus odoratissimus</i> | thazhai | root | Astringent | Controls excess urination in diabetes mellitus | Ethanol extract has displayed antihyperglycemic activity in oral glucose tolerance test and reduced blood glucose level in diabetic rats [34]. |
| 24 | <i>Strychnos potatorum</i> | thettran | seed | bitter | Diabetes | Extracts reduced fasting blood sugar as that of glipizide [35]. |
| 25 | <i>Mimosa pudica</i> | thottare chinungi | leaves | Sweet Astringent bitter | Diabetes | Ethanol extract showed significant decrease in blood glucose level [36]. |
| 26 | <i>Hemidesmus indicus</i> | nanaari | roots | Sweet, mild bitter | Diabetes | Aqueous extract of the roots exhibited antidiabetic activity [37]. |
| 27 | <i>Syzygium cumini</i> | naval | seeds | Astringent | Diabetes | Oral administration of ethyl acetate and methanol extracts of seeds showed significant decrease in blood sugar level [38]. |
| 28 | <i>Curculigo orchoides</i> | nilapanai | Root tuber | sweet | Diabetes | Both alcohol and aqueous extracts produced significant hypoglycemic activity in diabetic control [39]. |
| 29 | <i>Sterospermum colais</i> | paathiri | leaves | Astringent | Diabetes | Ethanol extract was effective in retarding glucose diffusion [40]. |
| 30 | <i>Annona squamosa L.</i> | pilavai kolli | leaves | bitter | Diabetic ulcer | Aqueous leaf extract was found to posses anti diabetic Activity [41]. |
| 31 | <i>Luffa acutangula</i> | peerkku | fruit | sweet | Diabetes | Methanolic and aqueous extracts possessed anti diabetic and antihyperlipidemic activity [42]. |
| 32 | <i>Terminalia arjuna</i> | marudhu | bark | Astringent | Diabetes | Bark extract possesses potent antidiabetic activity [43]. |
| 33 | <i>Mangifera indica</i> | maa | leaves | Astringent | Diabetes | Aqueous extract of the leaves possess hypoglycaemic activity [44]. |
| 33 | <i>Anacardium occidentale</i> | mundhiri | Root bark | Astringent | Diabetes | oral administration of methanol extract of stem-bark has beneficial effect by improving plasma glucose and lipids in fructose-induced diabetic rats [45]. |
| 34 | <i>Bamboosa arudinaceae</i> | moongil | germ | Astringent | Diet for Diabetes | Aqueous ethanol extract found to possess anti diabetic activity in diabetic rats [46]. |
| 35 | <i>Convolvulus repens</i> | vallai kodi | vine | sweet | Diabetes | Methanolic extracts of the leaves showed potent hypoglycemic activity [47]. |
| 36 | <i>Prunus dulcis</i> | vaadhumai | Seed kernal | sweet | Diabetes | almond seed skin contains highly polymerized polyphenols with strong α -amylase inhibitory activity, which retard absorption of carbohydrate [48]. |
| 37 | <i>Limonia acidissima</i> | vizham | Resin | Astringent | Diabetes | Dose dependant anti-diabetic effect was observed with methanolic extract [49]. |

4. Conclusion

Since the taste of a herb or its part mainly decided by its phytochemical constituents, taste helped the native healers to select and use the medicinal plants for particular ailments. Siddha system follows a unique methodology in diagnosis of disease not only by following approach to the disease (Noi Naadal) and determination of etiology of the disease (Noi mudal Naadal) but selecting suitable treatment especially medicinal plants based on its taste. It is the undue responsibility of every Siddha physician to have a strong and sound understanding of the Siddha pathology for treating the disease as well as understanding the classification of herbs in tridosham aspect. Although researches are presently working on various antidiabetic herbs based on mere phytochemical analysis. Selection of herbs based on tridosha theory with potency to manage the vitiated dhosham in diabetes, would be of immense value for best outcome of antidiabetic herbs under research.

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