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A BRIEF REVIEW ON A-AMYLASE INHIBITORY ACTIVITY OF PLANTS IN TREATMENT OF DIABETES MELLITUS

Mitesh A. Khaleshiya[1]*, Morvi M. Raval[2], Chintankumar J. Tank[3], Dhaval R. Zala[4], Dhrutika J. Barad[5] and Vishvajit N. Parmar[6]

[1,4,5,6]B.Pharm, Final Year Student, Faculty of Pharmacy, Dr. Subhash Technical Campus, Juanagadh.

[2]Assistant Professor, School of Pharmacy, Dr. Subhash University, Junagadh.

[3]Dean, School of Pharmacy, Dr. Subhash University, Junagadh Gujarat, India – 362001.

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***Corresponding Author**
Mitesh A. Khaleshiya
B.Pharm, Final Year Student, Faculty of Pharmacy, Dr. Subhash Technical Campus, Juanagadh.

ABSTRACT

Due to postprandial glucose levels, alpha-amylase inhibitors have gained attention as possible therapeutic agents for the treatment of metabolic diseases like diabetes and obesity. This review examines the several plant species that exhibit alpha-amylase inhibitory characteristics. It also talks about how the phytochemical components in these plants may work in concert to increase their inhibitory efficacy against alpha-amylase enzymes. This review also explores the pharmacological importance of alpha-amylase inhibitors produced from plants, including how they control blood glucose levels and possible uses in diabetes prevention explaining thorough plant profile.

KEYWORDS: Diabetes mellitus, Alpha-amylase activity, Role of metalloenzymes.

INTRODUCTION

Diabetes melitus is a growing problem wordwild entailing enormous financial burden and medical care policy issues. diabetes is characterized by metabolic dysregulation primarily of carbohydrate metabolism, manifested by hyperglycemia resulting from defects in insulin secretion.[1]

According to the world health organization (WHO), upto 90% of the population in developing countries uses plants and it's product as traditional medicine for primary health care.[1]

The WHO has listed 21,000 plants, which are used for medicinal purposes around the world. among these, 2500 species are Indian.[2] The international diabetes federation (IDF) reported 425 million people with diabetes melitus (DM). It is a chronic metabolic illness characterized by sustained high levels of circulating glucose (hyperglycemia) due to impaired insulin secretion by pancreatic beta-cells. DM is a chronic endocrine disorder of carbohydrate, fat and protein metabolism characterized by an increase in both fasting and postprandial glucose level.[2]

Common Name	Biological Source	Family	Part Used	Active Constituents
Neem	*Azadirachta indica*	Meliaceae	Leaf	Azadirachitin nimbin
Bitter guard	*Momordica charantia*	Curcubitaceae	Fruit	Charantin, Sterol
Cinnamon	*Cinnamoum*	Lauraceae	Bark	Cinnamaldehyde
Fennugreek	*Foenum graecum*	Fabaceae	Seeds	Steroid, Saponins
Ragi	*Eleusine coracana*	Poaceae	Grains	Polyphenol, Phytic acid

Plant profile

1. Neem[3]

Synonyms: Margosa, Neem tree

Biological source: Neem consist of the fresh dried leaves and seed oil of *azadirachta indica* (Melia indica or M. Azadirachta linn.)

Family: Miliaceae **Genus:** Azadirachta **Species:** Indica

Geographical source: Assam, Bamgladesh, Pakistan, Nepal

2. **Bitter guard**[4]

Synonyms: Balsam apple

Biological source: Bitter guard consist of fresh green fruits of the plant from *momordica charantia*

Family: Cucurbitaceae

Genus: Momordica

Species: *Momordica charantia Linn*

Geographical source: India, East asia, Africa and South America

3. Cinnamon[5]

Synnonym: Dalchini, Ceylon cinnamon

Biological source: Cinnamon is obtain from dried inner bark of the shoots of coppiced tree of *cinnamomum zeylanicum*

Family: Lauraceae

Genus: Cinnamoum

Species: Cinnamoum verum

Geographical source: Sri lanka, Myanmar, West indies, South America

4. Fenugreek[6]

Synonyms: Methi, Venthium, Alba

Biological source: Methi consist of dried ripe seeds of *trigonella foenum graecum*

Family: Leguminaceae

Genus: Trigonella

Species: Graecum

Geographical source: Northern india, Europe, Pakistan, France, Morocco, Egypt

5. Ragi[7]

Synonyms: Birds foot, Coracana, Finger millet

Biological source: Ragi is obtained from *Eleusine Coracana*

Family: Poaceae

Genus: Elucine Gaertn

Species: Coracana

Mechanism of action of plants having an α-amylase inhibitory activity

Diabetes consist of stimulation of endogenous insulin secretion.[8] Increase of activity of insulin at target tissues as well as inhibition of alpha-amylase enzyme to reduce the degradation of starch to decreasing glucose. Among the different classes of the enzyme, α-

amylase (α-1, 4 glucan-4-glucanohydrolase)belongs to hydrolases class and can be found in microbes, plants, and animals.

It is a metalloenzyme requiring at least one Ca^{2+} ion per enzyme molecule crucial for their activity and stability. Porcine pancreatic α-amylase shares 83% similarity with human pancreatic amylase and composed of 496 amino acid residues.[9] The α-amylase is found in saliva and pancreatic juice, that hydrolyzes alpha-linked polysaccharide's alpha bonds like in starch and glycogen, resulting in glucose and maltose that could quickly enter the bloodstream.

It is the primary amylase type present in humans and other mammals. Inhibition of α-amylase delays the digestion process by hampering the breakdown of starch in the intestine and hence can be utilized as an effective strategy for regulating hyperglycemic conditions. This can be achieved by retarding the absorption of glucose through the inhibition of the carbohydrate hydrolyzing enzymes in the digestive tract.

The a□ glucosidase enzymes such as α-amylase are responsible for the breakdown of oligo and/or disaccharide to monosaccharides.

⇩

The intestinal alpha glucosidases hydrolyze complex carbohydrates to glucose and other monosaccharides in the small intestine.[10]

⇩

DPPH (1, 1-diphenyl-2-picrylhydrazyl) radical analyze the antioxidant capacities of thepotent amylase inhibitor plants, DPPH radical which had exhibited strong α-amylase inhibitory activity. Inhibition of these enzyme systems helps to reduce the rate of digestion of carbohydrates

⇩

Hence, retardation of starch digestion by inhibition of enzymes such as a-amylase plays a key role in the control of diabetes

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Inhibitors of pancreatic a-amylase delay carbohydrate digestion causing a reduction in therate of glucose absorption and lowering the post-prandial serum glucose level

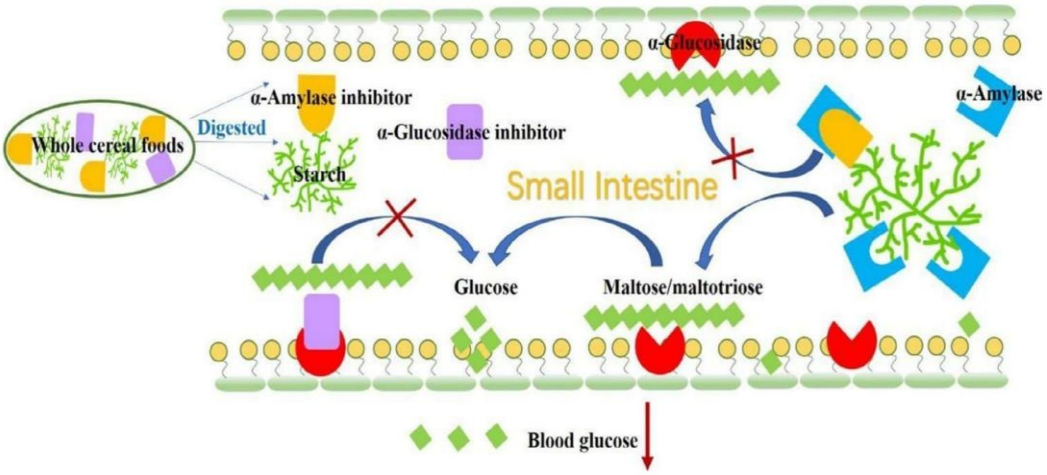

Figure. Mechanism action of a-amylase.[11]

REFERENCES

1. Rizvi SI, Mishra N. Traditional Indian medicines used for the management of diabetes mellitus. Journal of diabetes research, 2013; 5: 2013.
2. Rocha S, Sousa A, Ribeiro D, Correia CM, Silva VL, Santos CM, Silva AM, Araújo AN, Fernandes E, Freitas M. A study towards drug discovery for the management of type 2 diabetes mellitus through inhibition of the carbohydrate-hydrolyzing enzymes α- amylase and α-glucosidase by chalcone derivatives. Food & function, 2019; 10(9): 5510- 20.
3. Gupta A, Ansari S, Gupta S, Narwani M, Gupta M, Singh M. Therapeutics role of neem and its bioactive constituents in disease prevention and treatment. Journal of Pharmacognosy and Phytochemistry, 2019; 8(3): 680-91.
4. Chaturvedi U, Shrivastava A, Bhadauria S, Saxena JK, Bhatia G. A mechanism-based pharmacological evaluation of efficacy of Trigonella foenum graecum (fenugreek) seeds in regulation of dyslipidemia and oxidative stress in hyperlipidemic rats. Journal of cardiovascular pharmacology, 2013; 1, 61(6): 505-12.
5. Grover JK, Yadav SP. Pharmacological actions and potential uses of Momordica charantia: a review. Journal of ethnopharmacology, 2004; 1, 93(1): 123-32.
6. Hashmat I, Azad H, Ahmed A. Neem (Azadirachta indica A. Juss)-A nature's drugstore: an overview. Int Res J Biol Sci, 2012; 1(6): 76-9.
7. Scartezzini P, Speroni E. Review on some plants of Indian traditional medicine with antioxidant activity. Journal of ethnopharmacology, 2000; 1, 71(1-2): 23-43.
8. Obiefuna I, Young R. Concurrent administration of aqueous Azadirachta indica (neem) leaf extract with DOCA-salt prevents the development of hypertension and accompanying electrocardiogram changes in the rat. Phytotherapy Research: An International Journal

Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives, 2005; 19(9): 792-5.

9. Sathishsekar D, Subramanian S. Antioxidant properties of Momordica Charantia (bitter gourd) seeds on Streptozotocin induced diabetic rats. Asia Pacific journal of clinical nutrition, 2005; 1: 14(2).
10. Virdi J, Sivakami S, Shahani S, Suthar AC, Banavalikar MM, Biyani MK. Antihyperglycemic effects of three extracts from Momordica charantia. Journal of ethnopharmacology, 2003; 1, 88(1): 107-11.
11. Upadhyay SN, Dhawan S, Garg S, Talwar GP. Immunomodulatory effects of neem (Azadirachta indica) oil. International journal of immunopharmacology, 1992; 1, 14(7): 1187-93.