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Original Article

Studies on an *in-vitro* Investigation of Anti Diabetic Property of a Hemiparasitic Taxa *Dendrophthoe falcata* (L.f.) Ettingsh (Loranthaceae)

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ABSTRACT

Dendrophthoe falcata (L.f.) Ettingsh, belong to the family Loranthaceae an unique hemiparasitic taxon, spreads almost all the entire forest in South West Bengal. It is generally stem hemi parasitic taxa and habitat mostly on aerial part of host plant having strong in spite of common root system. It is depend on the host plant for mainly water and to some extend carbon. It synthesizes its own food. The haustoria have penetrated to the vascular bundle mainly in the xylem tissue of the host plants. It has numerous medicinal values with a long history of its use in Chinese traditional medicines. **Objectives:** The present work deals with the anti-diabetic property medicinal aspect. **Methods:** The leaves extract mixed with the amylase enzyme then add the starch solution and allow the reaction for few minutes after that the reaction mixture interrupted with DNS. **Results:** The responsible enzyme i.e. Alpha-amylase breaks the large starch molecules which produces free glucose and simultaneously increases the blood sugar level and as a result hyperglycemia occurs. In this experiment increase the concentration of leaves extract which has decreased the activity of this potent enzyme. **Conclusions:** This study also reveals that, the plant's leaves extracts have inhibitory activity on this key enzyme viz. alpha amylase which is very crucial data for drug preparation and other research purposes.
Key words: *Dendrophthoe falcata,* Loranthaceae, Alpha-amylase, Medicinal value.

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INTRODUCTION

There are just 1% hemiparasitic taxa present in world vegetations. Among them the taxon *Dendrophthoe falcata* (L.f.) Ettingsh holds the major portion. This plant taxa is distributed throughout the natural forest vegetation of South West Bengal, mainly on the aged plants. As per our investigation, it was observed that, it is a rare plant in the forest. As this plant born on the rough surface bark of the host trees, dispersal of this seeds mainly occurred by sunbirds, as a result less than 50% successful rate of germination take place. Their abundance is very less in nature for this reason they shows camouflage for survival. The recognition or finding out of this plant is very laborious work because they look like a branch of the host trees. The leaf of this plant is green in color, wavy, thick, exstipulate, margin of the leaf reddish in color. The bark of stem is brown in color, uniformly distributed lenticels; slightly rough in texture, types of fruit is berry, zygomorphic flower (Figures 1a-d.).

There are many different types of human diseases found in our social life; Diabetes mellitus is one of them. This disease is chronic, severe characterized by hyperglycemia, due to improper regulation of insulin hormone.[1] To prevent hyperglycemia or diabetes there is one way, to keep glucose level near to normal as much as possible in the blood. The non-pharmacological and pharmacological both approaches can manage diabetes. The non-pharmacological approaches to resist diabetes are exercise; diet control, surgery etc. alongside pharmacological approaches includes the use of drugs (insulin) or oral hypoglycemic agents. These remarkable anti diabetic drugs are not only costly but also associated with lots of side effects.[1,2] Therefore, devoid of side effect and low-cost drugs are searched by the scientist from a long while. Interestingly, some plants are now identified to cure this lifelong disorder. One of them is *Dendrophthoe falcata*, hemi-parasitic taxa (Figure 1) which is available in the natural forest vegetation of South west-Bengal on a different host plants (Table 1). However, the responsible active molecules to cure diabetes from this plant have not been isolated till now. Many works had also been reported on the pharmacological activities such as antihypertensive, anti-epileptic and effects of immune stimulants.[3,4]

Alpha-amylase is the major form of amylase found in humans and other mammals. This enzyme cuts off alpha-bonds of large sugar molecules (Figure 2). This enzyme is found in plants (barley), Ascomycotina or Basidiomycotina fungus and bacteria (*Bacillus* sp.). Our human saliva also contains amylase enzyme which is digests the food initially. Foods that contain high amount of starch (rice, potato), or slightly sweet in test, when they are chewed in the mouth, amylase secretion is started and breaks down some of starch into sugar in our mouth. The pancreas also synthesizes alpha amylase to hydrolyze starch from dietary materials into mono, di and tri-saccharides

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Figure 1: Habitat of *Dendrphate falcata.*

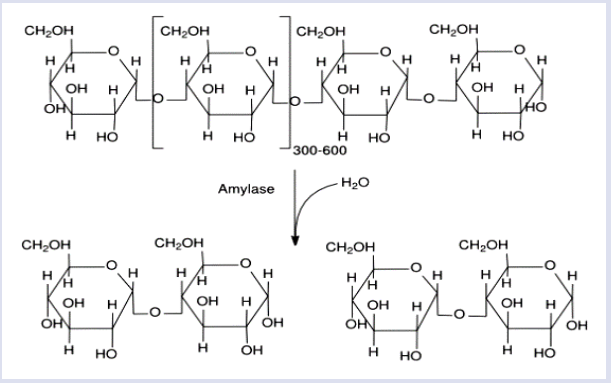

Figure 2: Mechanism of Alpha-amylase.

Table 1: **Host plants of *Dendrophthoe falcata.***

Sr. No.	Botanical name	Common name	Family
1.	*Careya arborea* Roxb.	Wild guava	Lacythidaceae
2.	*Bombax ceiba* L	Cotton tree	Malvaceae
3.	*Shorea robusta* Roth.	Sal	Dipterocarpaceae
4.	*Terminalia catappa* Linn.	Indian Almond	Combretaceae
5.	*Lagerstroemia speciosa* (L.) Pers.	Jarul	Lythraceae
6.	*Toona serrata* M. Roem.	Chinese Mahogany	Meliaceae
7.	*Swietenia macrophylla* king.	Mahagoni	Meliaceae
8.	*Tectona grandis* L.f.	Teak	Lamiaceae
9.	*Swietenia mahagoni* (L.) Jacq.	Bara Mahagoni	Meliaceae
10.	*Aegle marmelosa* Linn.	Beal, golden apple	Rutaceae
11.	*Madhuca longifolia* (Konig) J.F.Macbr.	Mahua	Sapotaceae
12.	*Ficus religion* L.	Bo-tree. Peepal	Moraceae
13.	*Albizia lebbeck* (L.) Benth.	Siris	Leguminaceae
14.	*Terminalia arjuna* (Roxb.) Wight and Arn.	Aurjun	Cmbretaceae
15.	*Ficus hispida* L.	Dumur	Moraceae
16.	*Limonia acidissima* L.	Wood apple	Rutaceae
17.	*Magnifera indica* L.	Mango	Anacardiaceae
18.	*Melia azedarach* L.	Mahaneem	Meliaceae

which supply the body energy. The objectives of my study is therefore determining the Inhibitory effect of *Dendrophthoe falcata* on α-amylase enzyme.

Distribution of these Taxa

Dendrophthoe falcata is also known as "Vanda" in the Indian Ayurvedic System of Medicine. *D. falcata* is a perennial woody parasitic plant. This plant is widespread throughout India (Figure 3), including Andaman and Nicobar Islands, Srilanka, Nepal, Bhutan, Indi-china, Thailand, tropical Australia, Bangladesh, Malaysia and Myanmar.[5]

MATERIALS AND METHODS

Dendrophthoe falcata leaves are selected for present study. The sample were collected from the difference natural, undisturbed forests area or rural area of south west Bengal like Mednapore (Salboni forest, Arabari forest, Hoomgarh forest), Purulia (Ajodhya hills), Bankura (Sarenga jungle) etc. during January to March 2017.

Plant fresh material was dried under sunlight up to 4-5days then grind with the help of motor and pestel to make fine powder and after that homogenized with water and boiled for 10 min. The extract was filtered and then centrifuged. The supernatant was used for determination of enzyme inhibitory property. Assay of α-amylase inhibitory property: Plant extract (0.1 ml) was incubated with 0.2 ml of properly diluted enzyme for 20 min at 37°C temperature. Then 0.1 ml of starch solution was added to the reaction mixture and incubated for 3 min at 37°C temperature. The enzyme reaction mixture was interrupted by the addition of 0.2 ml Dinitrosalicylic (DNS) acid and heated for 5 min in boiling water. Then the tube containing the mixture was cooled under running tap water. Then 4 ml water was added and optical density of the solution was determined by spectrophotometer at 540 nm. A blank mixture was prepared in same manner without adding enzyme in the mixture, percentage inhibition of enzyme activity was measured.

RESULTS

The plant extract showing Anti-diabetic activity has an important role in inhibiting the glucose level thus providing protection to human against hyperglycemia. This study is carried out to evaluate the anti-diabetic activity of aqueous extract of the leaves of *D. falcata*.[6] In our experiment different conc. of plant extracts are applied on the solution mixture which contain alpha-amylase enzyme, starch and DNS. Measure the Optical Density of the mixture by UV Spectrophotometer (UV-1800 Shimadzu) and a significant result we found (Table 2).

The result of the experiment is given in following tabulated form and graphical representation of the data present in Figure 4.

The data presented here indicate that aqueous extract of *D. falcate* possesses significant amylase inhibition activity in *in-vitro* condition. DNS or dinitrisalisilic acid is a chemical compound that binds to the glucose (Reducing sugar), it cannot bind with the non-reducing sugar.[7,8]

In my experiment, when plant extract, enzyme and starch solution were incubated for 3 min at 37°C, enzyme break down the starch and produced glucose and side by side DNS react with this free glucose and give ANS which shows maximum absorbance at 540 nm.[9] But when we increase the plant extract concentration, the enzyme amylase inhibited slowly as a result production of free glucose is decreased and ANS production is also decreased slowly in the reaction mixture that's why the OD value decreased slowly. It represents that the plant extract having a alpha amylase inhibitory properties.

Table 2: O.D values of the DNS in respect to different plant concentration.

Concentration of plant extract (mg/ml)	OD value
100	1.895
200	1.621
300	1.425
400	1.329
500	1.286

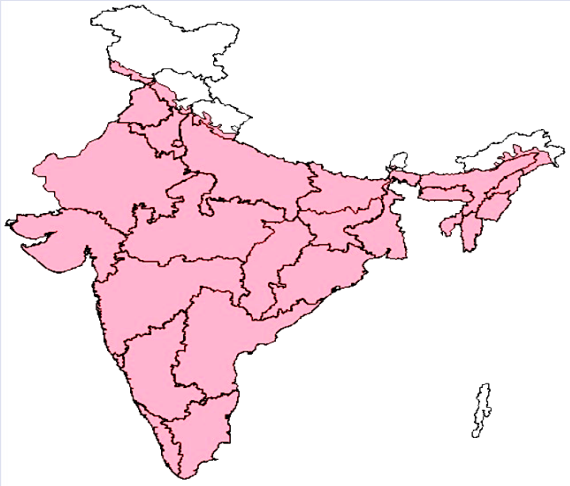

Figure 3: Distribution of *D. falcata* in India. (Source: envis.frlht.org/maps).

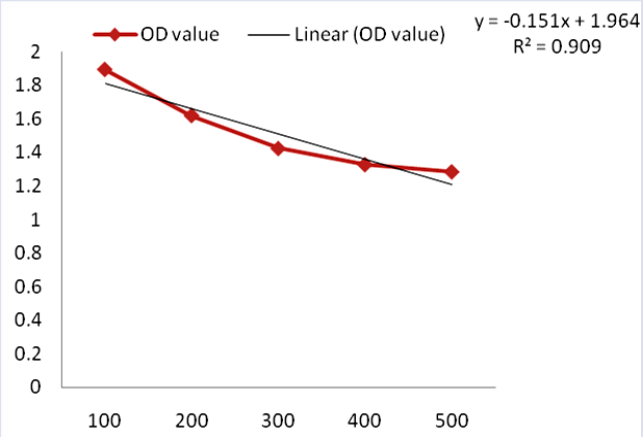

Figure 4: Amylase inhibitory activity of different concentration of plant extract.

CONCLUSION

For complementary or synergistic effects of herbal products, it may be prepare with the help of a single herb or combination of multiple herbs. Sometime animal's product and minerals are included to the herbal products for formulating the traditional medicine. It will be sold in market either in raw plants or extraction of the plant's part. Although raw extraction of the various plant's parts have medicinal importance but modern drugs come in market after comprehensive investigation on bioactivity, pharmaco-therapeutics, mechanism of action and toxicity and after proper standardization and clinical trials. Present study shows that the plants *Dendrophthoe falcata* have inhibitory activity of alpha amylase. Since alpha amylase is the one of the most important enzyme which mainly is responsible for hyperglycemia, by inhibiting its enzymatic activity with the above mentioned plant are having anti diabetic properties. From above plants, the drug-development programmer may be take response to develop modern drugs with the help of mastered chemical compound for that disease. Now time has to be changing, the use of that non-toxic plant that's having traditional

medicinal value, development of modern drugs from these plants should be emphasized for the control of various diseases. In fact, time has come to make good use of centuries- old knowledge on plants through modern approaches of drug development. An extensive research and development work should be undertaken on these plants and its products for their better economic and therapeutic utilization.

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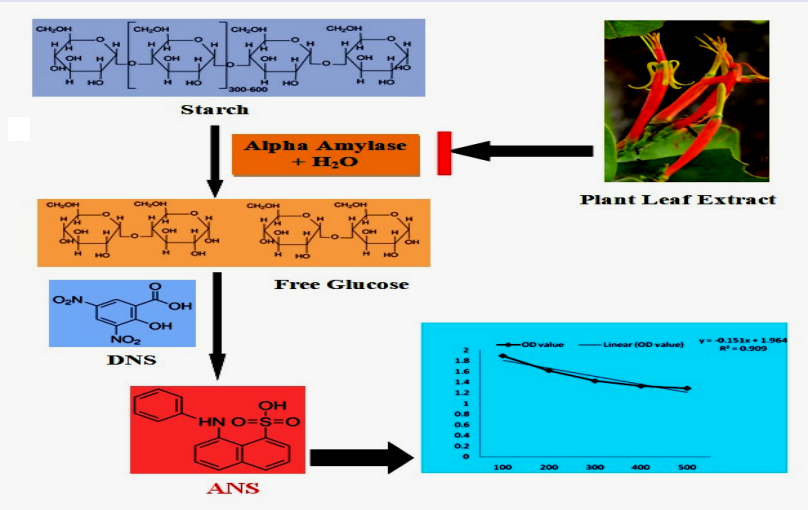
CONFLICTS OF INTEREST

None.

REFERENCES

1. Aguwa CN. Therapeutic basis for clinical pharmacy in the tropics, (3rd ed.). Enugu. 2004.
2. Adeneye AA, Agbaje EO. Pharmacological evaluation of oral hypoglycemic and antidiabetic effects of fresh leaves of ethanol extract of *Morinda lucida* benth in normal and alloxan-induce diabetic rats. African Journal of Biomedic. 2008;11(1):65-71.
3. Pernossian A, Kocharan A. Pharmacological activities of phenyl propanoids of mistletoe (*Loranthus parasiticus*) sourced from different host trees. Bioresearch Journal. 2004;2(1):18-23.
4. Imafidon KE, Igbinaduwa P. Effects of dried powdered leaves of *Loranthus bengwensis* L. (African mistletoe) on blood pressure and electrolyte leves of normal and hypertensive rats. Global Journal Biotechnology Biochemistry. 2007;2(2):51-3.
5. Balakrishnan NP, Chakrabarty T, Sanjappa M, Lakshminarsimhan P, Singh P. Flora of India: BSI Kolkata. 2012;23:3.
6. Allekutty NA, Sriniwasan KK, Gundu RP, Udupa AC, Keshawamurthy KR. Diuretic and antilithiatic activity of *Dendrophthoe falcata*. Fitotherapia. 1993;64(5):325-31.
7. Moshrafuddin A. Medicinal Plants. MJP Publishers, Chennai. 2010.
8. Nadkarni's KM. Indian Materia Medica. Bomby Popular Prakashan. 1976.
9. Pattanayak SP, Mazumder PM. Effect of *Dendrophthoe falcata* (L.f.) Ettingsh on female reproductive system in Wistar rats: a focus on antifertility efficacy. Contraception: An International Reproductive Health Journal. 2009;80(3):314-20.

GRAPHICAL ABSTRACT



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