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STUDYING THE ANTIDIABETIC BASIS OF AYURVEDIC FORMULATIONS AVIPATTIKARA CHURNA AND TRIPHALA CHURNA

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ABSTRACT: Diabetes mellitus (DM), belongs to the class of metabolic diseases having the main symptom associated with this disease is high sugar levels in the blood for a long period. It can be categorized as the world's major diseases considering that it affects a high population on earth and presents two main types I and II. Diabetes complications include possible blindness, amputation of the lower limb, renal failure, and cardiac arrest or stroke. This review summarizes the two Ayurvedic formulations for both types of DM, which are mentioned in the Ayurvedic Formulary of India. Until now, various types of synthetic and herbal formulations were made, and many are more frequently used in order to achieve the desired treatment. Patients prefer oral reason researchers focus their studies in this direction. This review aimed to explore antidiabetic medications since they are easier to be administered and for this, the possibility of antidiabetic treatment from herbal sources well mentioned in the Ayurvedic Formulary of India.

INTRODUCTION: Diabetes mellitus is a group of metabolic disorders characterized by chronic hyperglycemia, hyperlipidemia, and polyurea resulting from defects in insulin secretion, insulin action, or both. Metabolic abnormalities in carbohydrates, lipids, and protein metabolism resulting from the importance of insulin as an anabolic hormone. Low levels of insulin to achieve an adequate response and / or insulin resistance of target tissues, mainly skeletal muscles, and adipose tissue, and to a lesser extent, liver, at the level of insulin receptors.

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Signal transduction system and / or effect or enzymes or genes are responsible for these metabolic abnormalities [1]. The severity of symptoms is due to the type and duration of diabetes. Some of the diabetes patients are asymptomatic, especially those with type 2 diabetes during the early years of the disease, others with marked hyperglycemia and especially in children with absolute insulin deficiency may suffer from polyuria, polydipsia, polyphagia, weight loss, and blurred vision [2].

Uncontrolled diabetes may lead to stupor, coma, and if not treated death, due to ketoacidosis or rare from nonketotic hyper-osmolarsyndrome [3]. The effect of the diabetes is world-wide, and more than 135 million people are affected in the whole world [4]. The disease diabetes having major symptoms like as, increase in blood glucose level, and in the long-

term complication, which is associated with the diabetes are cardiomyopathy, angiopathy, nephropathy *etc*. Ayurveda, Siddha, Unani, and Homeopathy drugs consist of various kinds of formulations prepared vig. *Zingiber officinale* Rosc. *Piper nigrum* Linn. *Piper longum* L. *Phyllanthus emblica* L. *Cyperus rotundus* (Scariosus) R. Br. *Ammonium chloride* from plants, minerals, metals, animal, and marine products as raw material. These formulations are prepared after various kinds of processing with the specific methods prescribed in these systems. These formulations are grouped in various dosage forms according to their method of preparation, palatability, bioavailability, and therapeutic values accordingly, their nomenclature is given in texts mentioned in the Drugs and Cosmetic Act. In the Indian ayurvedic medicine system, the role of t formulation, which is known as the triphala having their own values. The formulation of the triphala having the three major ingredients which are known as *Terminalia chebula*, *Terminalia bellerica*, and *Phyllanthus emblica* in equal quantity. The activity of the triphala in the ayurvedic medicine system is very vast it posses various activity like anti-oxidant, improves mental function, weight loss,prameh *etc* [5]. In the Indian traditional medicine system *Avipattikar churna* is used to treat gastrointestinal problems and prameh. The use of the *Avipattikar churna* is also beneficial in other diseases also like to support the digestive tract, treat urinary disorders, gastritis, loss of appetite, kidney stones, and diabetes, *etc.* because it contains varieties of active constituents, *Embelia ribes* Burmf *Ellettaria cardmomum* (L.) Maton, *Cinnamomum tamala* Nees & Eberm. *Syzygium aromaticum* (L.) Merr, *Operculina turpenthum* (Linn.) *Saccharum officinarum* [6].

Constituent Herbs of Avipattikar Churna				
S. no.	**Ayurveda Name**	**Hindi Name**	**Botanical Name**	**Part Used**
1	Sunthi	Adrak Dry	*Zingiber officinale* Rosc.	Rhizome
2	Marica	Kali Mirch	*Piper nigrum* Linn.	Fruit
3	Pippali	Long Pipper	*Piper longum* L.	Fruit
4	Haritaki	Haritaki	*Terminalia chebula* Retz.	Plant (Fr)
5	Bibhitaka	Bahera	*Terminalia bellirica (Gaertn.)* Roxb.	Plant (Fr)
6	Amalaki	Amla	*Phyllanthus emblic*a L.	Plant (Fr)
7	Musta	Nut Grass	*Cyperus rotundus* (scariosus) R.Br.	Rhizome
8	Vida(Vida Lavana)	Vida Lavana	*Ammonium chloride*	Salt
9	Vidanga	Vidanga	*Embelia ribes Burm.f*	Fruit
10	Ela(Suksmaila)	Elaichi	*Ellettaria cardmomum (L.)* Maton	Fruit (Seed)
11	Patra (Tej patra)	Tej patra	*Cinnamomum tamala* Nees & Eberm.	Leaf
12	Lavanga	Clove	*Syzygium aromaticum (L.)* Merr	Flower bud
13	Trivrit	Nishoth Kala	*Operculina turpenthum (*Linn.)	Root
14	Sarkara	Gud	*Saccharum officinarum*	Gud
Constituent Herbs of *Triphala Churna*				
1	Pathya (Haritaki)	Haritaki	*Terminalia chebula* Retz.	Plant (Fr.)
2	Bibhita (Bibhitaka)	Bahera	*Terminalia bellirica (Gaertn.)* Roxb.	Plant(Fr.)
3	Dhatri (Amalaki)	Amla	*Phyllanthus Emblica* L.	Plant(Fr.)

Description of Constituent Herbs:

***Cinnamomum tamala* (Patra):** The plant extract (water) of the leaves *Cinnamomum tamala* showed the anti-diabetic activity in Male Wister albino rats by STZ induced diabetic model at the dose of 125 and 250 mg/kg/bodyweight [7].

The oil extracted from the leaves *Cinnamomum tamala* shows the significant anti-diabetic action in male albino Wistar rats in streptozotocin-induced diabetes activity in GC-MS analysis at the concentration of 100 and 200 mg/kg. The reference drug glibenclamide (0.6 mg/kg) is used [2]. The 95% ethanol extract of the leaves *Cinnamomum tamala* shows the significant anti-diabetic action which has been proved through the streptozotocin induced diabetic rats at the concentration of 200 mg/kg. To compare the anti-diabetic activity of the test drug, the reference drug glibenclamide at the dose of 500 µg/kg is used [3]. *Alloxan induced* diabetic rat model is used to assess the anti-diabetic activity of the leaves extract *Cinnamomum tamala* extract (water) at the dose of 250 mg/kg body wt./day. Standard drug Tolbutamide (300 mg/kg/wt) in 10% ethanol solution is used [4].

***Cyperus rotundus* (Scariosus) (Musta):** The rhizome ethanolic extract of the plant *Cyperus rotundus* was evaluated for its anti-diabetic activity against the Streptozotocin-induced diabetes model at the concentration of 250 and 500 mg/kg p.o in swiss albino mice and found effective. The standard group is treated with glibenclamide at 10 mg/kg/day [5]. Its rhizome hydro-alcoholic extract (30:70) is used to evaluate for its anti-diabetic activity against Alloxan induced diabetes in rats. Where the concentration of the test extracts is 200 mg/kg, and the reference drug metformin concentration is 450 mg/kg [6]. The methanolic extract of the plant rhizome extract has shown the anti-diabetic activity. This activity to be evaluated by the α-amylase inhibition assay and α-glucosidase inhibition assay. This comparison is done with the anti-diabetic compound acarbose. The concentration of the test compound is 200 and 500 mg/kg [7].

***Elettaria cardamomum* (Suksmaila):** The aqueous extract of manomani chooramam which having one of the active ingredients *Elettaria cardamomum* shows the anti-diabetic activity at the dose of 2000 mg/kg body weight p.o. against the streptozotocin assay in female wistar albino rats. Metformin at a dose of 100 mg/kg is used as standard [8]. The ethanolic extract (96%) of the leaves *Elettaria cardamomum* is to evaluate for their anti-diabetic potential against the Alloxan-induced Sprague Dawley diabetic rats assay. The dose of the test compound 100 mg/kg shows the reduction in blood glucose level [9]. The fruit extract (water and methanol extract) of *Elettaria cardamomum* shows the reduction in blood sugar (anti-diabetic) by in-vitro assay (α-glucosidase and α-amylase assay) [10].

***Embelia ribes* (Vidanga):** The test compound which is extracted by the solvent 70% ethanol from the plant fruit *Embelia ribes* is shown the significant anti-diabetic activity by using the streptozotocin induce diabetes in rats. The test compound concentration 100 and 200 mg/kg/day used and to compare the effect of test compound reference drug metformin (180 mg/kg/day) is used [11]. The seed extract of plant *Embelia ribes* is evaluated for their anti-diabetic activity against the *in-vitro* α-amylase inhibition assay. To compare the activity of the test compound, reference drug Glibenclamide (5 mg/kg, p.o.) is used [12]. To assess the anti-diabetic activity of the plant fruit extract (90% ethanol) *Embelia ribes* used.

The Streptozotocin (40 mg/kg b.w, i.p) model is used for the induction of the diabetes and the dose of the reference compound gliclazide and the test compound is (25 mg/kg) and 100 and 200 mg/kg used respectively [13].

***Operculina turpethum* (Trivrit):** The dried fresh stem methanolic extract of *Operculina turpenthum* evaluated for their anti-diabetic potential in streptozotocin-induced diabetic rats. For the assessment of the extract anti-diabetic activity dose 50 and 100 mg/kg has been taken, and for the comparison study, the standard compound 5 mg/kg of glibenclamide was administered [14]. The plant *Operculina turpenthum* was evaluated for their anti-diabetic activity. The plant stem and root part extract (methanolic extract) was used to evaluate diabetic activity using the streptozotocin (STZ)-induced type 2 diabetic model. The dose of the compound was used 100 mg/kg, and the reference drug was Glibenclamide used [15]. The methanolic extract of the plant leaf *Operculina turpenthum* showed the anti-diabetic action through the *in-vitro* α-amylase inhibitory at the various concentration (12.5, 25, 50, 75, and 100 µg/ml) [16].

***Piper longum* (Pippali):** The plant root extract (Hexane, ethyl acetate, methanol, and aqueous extracts) of *Piper longum* evaluated for their anti-diabetic activity using the STZ-induced diabetic rats at the dose of the 200 mg/kg. b.w. The animal of the standard group is treated 0.02g glibenclamide/kg b.w. [17]. The root powder of the Piper longum aqueous extract has the anti-diabetic activity. Their activity is evaluated by the intraperitoneal administration of STZ (single dose of 50 mg/kg b.w.) model on Wistar albino rats at the concentration of 200mg/kg / b.w. To compare the results of the test compound reference drug, 0.02 g of glibenclamide kg.b.w/day was used [18]. The aqueous extract of manomani chooramam which has one of the active ingredient *Piper longum* showed the anti-diabetic activity at the dose of 2000 mg/kg body weight p.o. against the streptozotocin assay in female Wistar albino rats. Metformin at a dose of 100 mg/kg was used as standard [8]. The fresh, dried fruit of the *Piper longum* shows the significant anti-diabetic activity.

The 95% methanolic extract was used to evaluate the activity against the alloxan-induced diabetes model in the Wistar rats at the 300 mg/kg/ b.w.

The standard (glibenclamide 600 µg/kg / b.w) was used to compare the activity between the test and the standard compound, found antidiabetic potential [19].

***Piper nigrum* (Marica):** 30% ethanolic extract of the plant (leaves) *Piper nigrum* shows the anti-diabetic activity by in-vitro α-amylase assay. The various concentration was evaluated for the activity like 50, 100, 250, 500, and 1000µg [20].

The aqueous extract of manomani chooramam which has one of the active ingredient *Piper nigrum* showed the anti-diabetic activity at the dose of 2000 mg/kg body weight p.o. against the streptozotocin assay in female Wistar albino rats. Metformin at a dose of 100 mg/kg is used as standard [8]. To evaluate the anti-diabetic potential of the plant seed piper nigrum aqueous extract are used in the Alloxan induced diabetic rat model [21].

***Phyllanthus emblica* (Amalaki):** The dose of 80 mg/kg of the plant fruit extract (70% aqueous ethanol) of *Phyllanthus emblica* has been shown the anti-diabetic activity. The reference drug glimiperide 20 mg/kg/ i.p were used to compare the activity [22]. Alloxan induced diabetic rat model was used to evaluate the anti-diabetic activity of the test compound. This diabetic model is also used to evaluate the aqueous extract from the plant part (fruit) *Phyllanthus emblica* at the concentration of 150 mg/kg. Glipizide (5 mg/kg) was used as a standard antidiabetic drug [23].

***Saccharum officinarum* (Sarkara):** The 60% hydro-alcoholic (V/V) portion, which was extracted from the plant *Saccharum officinarum* have a significant anti-diabetic activity. The anti-diabetic activity is evaluated by the *in-vitro* (α-glucosidase inhibition assay) model and the cell viability assay on the cell Human hepatoma HepG2 [24].

The extract which was obtained from the plant leaves of the *Saccharum officinarum* was evaluated for their anti-diabetic activity against the Alloxan induced diabetes model in wistar rats at the concentration of 400 mg/kg/b.w. To evaluate the anti-diabetic activity of the test compound, reference drug glibenclamide (600 mg/kg. b.w) was used to compare the activity between the test and the standard [25].

***Syzygium aromaticum* (Lavanga):** The ethanolic extract, which was obtained from the flowering buds of *Syzygium aromaticum* were evaluated for their anti-diabetic activity. The flowering buds of Syzygium aromaticum showed their anti-diabetic activity by the PPAR-γ ligand-binding activity. The standard drug troglitazone, which creates the main difference between the test and the standard compound, has been used [26]. The essential oil which is obtained from the *Syzygium aromaticum* is used for its anti-diabetic activity. The *in-vitro* (α-amylase) assay is performed for the assessment of anti-diabetic activity. The concentration of the test compound was varied from the 1-100 µg/ml [27]. To evaluate the anti-diabetic activity, Streptozotocin-induced diabetic model was used. The extract from the flowering buds of *Syzygium aromaticum* using the solvents dichloromethane and ethyl acetate are evaluated for their anti-diabetic activity. Similarly, the standard drug acarbose 100 mg/kg was used [28]. The extract obtained from the buds of Syzygium aromaticum is evaluated for their anti-diabetic activity at a different doses (250, 500, 750, 1000 µg/ml) by using α -amylase inhibition (in-vitro model) [29].

***Terminalia belerica* (Bibhitaka):** *Terminalia belerica* fruits extract (75% methanolic) were used for their anti-diabetic activity against the Alloxan induced diabetic rats at the concentration of 100 mg/kg [30]. The plant *Terminalia bellirica* parts (leaves, fruits, and bark) are extracted by using the various solvents (petroleum ether, chloroform, and ethanol) to perform their anti-diabetic activity. The anti-diabetic activity was also evaluated against the In vitro glucose diffusion inhibitory assay [31].

***Terminalia chebula* (Pathya):** The fruit (*Terminalia chebula*) extracted in 80% methanolic extract to be evaluated at the various concentration (100, 200 and 400 mg/kg orally) for their anti-diabetic activity against alloxan-induced diabetes in Wistar albino rats and this activity to be compared with the reference drug metformin 100 mg/kg [32]. Alloxan induced diabetic model was used to evaluate the anti-diabetic activity of the plant *Terminalia chebula* extract (ethyl acetate and water

extract) at the concentration of 250 mg/kg and the reference drug concentration glibenclamide 5 mg/kg [33].

***Zingiber officinale* (Sunthi):** The extract of rhizome zingiber officinale at the concentration of 200-600 µg/ml against Streptozotocin (STZ)-diabetic rats is evaluated for their anti-diabetic activity [34]. The aqueous extract of the rhizome *Zingiber officinale* at the dose of 500 mg/kg, intraperitoneally are evaluated for their anti-diabetic activity against the streptozotocin (STZ)-induced diabetic rats [35].

CONCLUSION: A number of potential therapies for Diabetes are recently being investigated. The current insulin therapy includes subcutaneous injection, which regularly fails to emulate the glucose homeostasis that normal individuals eventuate. This fact generates numerous experiments in order to develop a safer and more effective non-invasive route for insulin delivery for the treatment of diabetes. It is widely reported that herbal sources are more useful, having less side effects, and convenient as far as the administration is concerned. So, the only answers can be explored form the Ayurvedic Polyherbal formulations. In this review, the authors are trying to discuss exhaustively the Avipattikar and Triphala churna constituents who have tremendous potential to cure and prevent diabetes.

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