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PHARMACOLOGICAL ACTIVITY OF YOGENDRA RASA IN DIABETES MELLITUS -A CRITICAL REVIEW

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ABSTRACT

Diabetes mellitus is one of the non-communicable disease throughout the world which affects 5-6% of global adult population. It is a metabolic condition brought on by an insufficient or resistant amount of insulin. Polydypsia, Polyurea, and Polyphagia are symptoms of diabetes mellitus that are similar to *Madhumeha, a Vataja Prameha* type. "*Prayo Madhuriva Meha*," or "Honey like Urine," is one of the Cardinal Symptoms of *Madhumeha*. According to Ayurveda, a sedentary lifestyle is the cause of *Prameha*. Thus, Yogendra Rasa, which includes *Rasa Sindura, Swarna Bhasma, Kantalouha Bhasma, Abhraka Bhasma, Mauktika Bhasma, Vanga Bhasma, Kumari Swarasa*—which is mentioned in Bhaisajya Ratnavali—and Rasa Yoga Sagara—was chosen as a herbomineral preparation. The drug's formulation contains properties of *tridoshahara, ojovardhaka, and lekhana* Properties. Due to these Properties, Drug exhibit Anti-diabetic action.

KEYWORDS: Diabetes Mellitus, *Madhumeha, Prameha, tridosha hara.*

INTRODUCTION

Diabetes mellitus is a major health challenge of the twenty-first century and one of the non-communicable diseases with a global prevalence. It is one of the lifestyle disorders whose prevalence is growing rapidly throughout the world.

This category of metabolic disorders is characterized by elevated blood glucose levels, which are brought on by an absolute or relative insulin insufficiency.[1]

(Monika Sharma et al.). There are two types of Diabetes Mellitus - Type 1 DM/Insulin Dependent diabetes mellitus or juvenile Diabetes Mellitus (IDDM) which is due to complete or total insulin deficiency and Type 2/Non-Insulin Dependent Diabetes Mellitus(NIDDM) which is due to impaired insulin Secretion, Peripheral insulin resistance and excessive hepative glucose production. In Ayurvedic texts, Type 1 Diabetes Mellitus is correlated with *Jataja Prameha* (Charaka) or *Sahaj Pramehi* (Sushruta) and Type 2 Diabetes Mellitus is correlated with *Sthula Prameha* (Charaka) and *Apathya-nimittaja* Pramehi(Sushruta). The Classical Symptoms of Diabetes Mellitus are Polydypsia (increased thirst), polyuria (increased urination) and polyphagia (increased hunger). It is a leading cause of heart attacks, kidney failure, retinopathy, strokes, and lower-limb problems. Diabetes mellitus is classified as Vataja Prameha in Ayurvedic texts, which is one of the Mahagadas and Anushangi vyadhi, and it is related with Ojus (Immunity) dysfunction.

According to Acharya Charaka, all substances that produce excessive Meda (fat tissue), Mamsa, Kleda, and Kapha cause *Prameha*.[2] (NeelaKanta Sajjanar et al.). *Prameha*'s prodromal symptoms include increased Mala in the teeth, palate, and tongue, burning sensations in the hands and feet, oiliness in the body, excessive thirst, and a sweet sensation in the mouth. In Ayurveda, the symptoms of *Madhumeha* are "*Prayo Madhuriva Meha*" (honey-like urine) and "*Samanya Lakshanam Tesham Prabhuta Avila Mutrata*" (polyurea and turbid urine production). In Ayurveda, *Madhumeha* is caused by *Vata* Pradhana *tridoshaja*, which is related with *Meda* and other *dhatus*, as well as *Ojas* as *Dushya*, and exits the body via *Mutravaha Strotas*.

Ayurvedic Classical literature such as Bhaisajya Ratnavali and Rasa Yoga Sagara mention herbomineral formulations like *Yogendra rasa*, which contains *Rasa Sindura, Swarna Bhasma, Kantalouha Bhasma, Abhraka Bhasma, Mauktika Bhasma, Vanga Bhasma*, and *Kumari Swarasa*. This is Indicated in *Prameha, Bahumutrata, Mutraaghata, apasmara,*

Bhagandara, Timira. The objective of this article is to assess the anti-diabetic activity of each ingredient of *Yogendra Rasa*.

DRUG REVIEW

Rasasindura

It is Shadrasa yukta, Ushna in Veerya, Madhura in Vipaka, and possesses Guru, Snigdha, Vajeekarana, Sarvarogahara, and Saptadhatuposhaka properties.[3]

It was determined that the finished RasSindura product had significant levels of magnesium, calcium, iron, zinc, sodium, and potassium.

In this formulation, magnesium is a cofactor essential for glucose transport into the cell and carbohydrate metabolism. It contributes to insulin's cellular action. Low magnesium consumption increases the risk of diabetes. Magnesium deficiency impairs cellular defenses against oxidative damage, resulting in a reduced resilience to the oxidative stress induced by diabetes, hastening the progression of diabetes-related problems. As a result, hypomagnesemia may increase T2DM; nevertheless, studies have indicated that magnesium intake lowers the risk of T2DM and metabolic syndrome by reducing insulin resistance.

Rasa Sindura also contains iron, which impacts glucose metabolism. Serum ferritin levels in T2DM patients may impact insulin sensitivity, vascular resistance, viscosity, and oxidative damage.

Furthermore, zinc is a crucial micronutrient for metabolism since it controls over 100 enzymes involved in gene expression, protein folding, ROS generation, and neutralization. Zinc is essential for both cell division and apoptosis, and diabetes and insulin resistance are linked to abnormalities in zinc homeostasis. Zinc decreases the production of cytokines, and a zinc deficiency may impair immune responses.[4] (Pallavi Dubey et al.)

Swarna Bhasma

Diabetes mellitus prevalence is largely influenced by oxidative stress, which is a significant factor. Significant antioxidant activity is possessed by the *Bhasma* of gold, an essential ingredient in *Vasant Kusumakar Rasa*.

Lauha, Abhraka, Swarna, Rajat Bhasma have *Dhatusanjanan Karma* is helpful in preventing loss of *Dhatuposhaka* Part passes through urine[5] (Manish Kumar Patel et al).

Abhraka Bhasma

Iron, calcium, magnesium, aluminum, and silica are among the elements found in *Abhraka Bhasma*. To a small extent, each of these components facilitates the efficient use of glucose by muscles. Because of its *rasayana* action, *abhraka* is valued, which lowers the *Vyadhi.*[6] *(Divya P et al.).*

A mineral medicine called biotite ash, or Abhraka Bhasma, is used. It enhances Dhatu Sarata and Nadi Balya and has been shown to have antihyperglycemic, hepatoprotective, and immunomodulatory properties. It can also function as a Rasayana. It has been demonstrated that in an in vivo anti-hyperglycemic activity, pancreatic beta cells secrete insulin, which lowers free radicals produced by oxidative stress. Because of its nanosize, these molecules are primarily acid-modified and can pass through the GI tract's lining to ensure bioavailability in addition to acting as a nerve tonic.[7] (Krishna G.S et al).

Abhraka Bhasma, Nisa amalaki, and zinc chelate were tested for their anti- diabetic and antioxidant qualities in streptozocin-induced Type 2 diabetic rats. According to a study, Abhraka Bhasma significantly improved the glucose tolerance test in rats that were given glucose loads but did not significantly affect hypoglycemia in normal animals. Also, by increasing the degree of lipid peroxidation, the experiment demonstrates Abhraka's strength as an antioxidant[8] (Divya P et al.).

Kantalouha Bhasma

Iron oxide nanoparticles that are super paramagnetic make up *Kanta Louha Bhasma*. Strong glucose-lowering agents like SPIONS are crucial to the management of diabetes. Histological examination revealed that the administration of QC-Fe3O4 to diabetic rats resulted in an increase in the number and area of islets as well as the shape of beta islands. The *triphala* extract and *Kanta Louha Bhasma* both had the same effect in human samples.[9] (Bineesh E P).

Mauktika Bhasma

As we all know, *Mukta Bhasma* is a CaCO3 preparation. *Mukta Bhasma* contains calcium, which plays an important role in insulin resistance and secretion. Diabetes disrupts calcium homeostasis, which leads to abnormal cell regulation in erythrocytes, cardiac muscles, platelets, and skeletal muscles.

Impaired homeostasis is problematic since it interferes with appropriate insulin secretion and activity, as well as causing different vascular problems on its own. Pittas et al. discovered in 2007 that alterations in calcium and vitamin D levels may have a role in the development of T2DM. The study found a somewhat consistent relationship between low vitamin D status, calcium or daily consumption, and the prevalence of T2DM or metabolic syndrome.

Decreased beta cell function was associated with aberrant calcium regulation, which could be linked to impaired glucose homeostasis and oxidative stress.[10] (Pallavi Dubey et al. 2020).

Vanga Bhasma

According to several Rasashastra literature, Vanga Bhasma is an effective treatment for *Madhumeha. Madhumehahara Yogas* with *Vanga* as a component include *Indra Vati, Harishankara Rasa, Vangeshwara Rasa, Bhrit Vangeshwara Rasa, Loha Garbha Pottali*, and *Ashwagandha Paka*. *Vanga* is indicated in *Sarva Prameha*, therefore it has a broad range of therapeutic efficacy. *Vanga* is an excellent medicine for *Madhumeha* due to its *Mehagna, Medogna, Chakshushya, Rasayana*, and *Vrisha* characteristics.[11] (Divya P. et al 2017).

Site of action	Probable mode of action
Pancreas	Improves insulin action at cellular level and increases beta cells
Organs of urinary system	Gives strength to the organ as it avoids Neurogenic and stress incontinence
Liver	Improves glucose metabolism or glucose homeostasis.

Hypoglycemia was detected 120 minutes after the glucose-loaded animals were treated with Vanga Bhasma. This demonstrates the effectiveness of Vanga Bhasma in lowering increased blood glucose levels.

A therapeutic dose of Vanga Bhasma averaging 188 mg, combined with Guduchi Satwa, resulted in a considerable drop in blood glucose levels in Wister rats. Histopathological research demonstrated improvement in the number of beta cells within the islet of Langerhans, as evidenced by an increased number of strongly stained cells in the center of the islets[11] (Divya P et al.)

At a dosage of 25-50 mg/Kg, *Vanga Bhasma* demonstrated a reduction in glucose levels that was dependent on the dosage in hyperglycemic rats induced with alloxan. There was no effect on the blood glucose levels in normal rats.

Metformin was utilized as the standard of reference.[12]

Kumari Swarasa

Aloe vera contains anthraquinones which provide various health advantages, such as anti-diabetic, anti-microbial, and hepatoprotective properties.

Anthraquinone has been observed to enhance glucose tolerance and insulin sensitivity by boosting the expression of insulin receptor substrates -1 (IRS-1) and phosphoinositide-3-Kinase (P13Ks) while also impacting genes related to metabolism. Researchers have discovered that Aloe vera plants with polysaccharides offer remarkable health benefits, as these polysaccharides are capable of regulating blood sugar levels and stimulating the production of antioxidants.[14] (Hussen Elaibi et al.)

Table showing ingredients of *Yogendra Rasa* and their ratio[15]

Ingredients	Ratio
Rassindura	1 Part
Swarna Bhasma	1 Part
Kantalouha Bhasma	1 Part
Abhraka Bhasma	1 Part
Mauktika Bhasma	1 Part
Vanga Bhasma	1 Part
Kumari Swarasa	Quantity Sufficient

Rasayogsara mentioned *Rasasindura* is 1 Part and other ingredients such as *Swarna Bhasma*, *Kantalouha Bhasma*, *Abhraka Bhasma*, *Mauktika Bhasma*, *Vanga Bhasma* is ½ Part and triturated with Sufficient quantity of *Kumari Swarasa*.

Methods of Preparation

Prepare Rasasindoora using Shuddha Parada and Shuddha Gandhaka. Add the other ingredients to Rasasindura in a clean khalva yantra (mortar and pestle) and stir well. After adding the required amount of Kumari swarasa and completing Bhavana, prepare a bolus of the combination. This bolus is covered with Eranda patra and stored in Dhanya Rashi for three days. On the fourth day, it is removed and the bhavana of Kumari Swarasa is repeated until subhavitha lakshana is obtained. Then produce 125-250 mg pills, dried in the shade, and kept.[16]

Table Showing Rasa-Guna-Virya-Vipaka of individual ingredients of *Yogendra Rasa.*[17]

Drugs	Rasa	Guna	Virya	Vipaka
Parada	*Shadrasa*	*Snigdha, Guru*	*Ushna*	*Madhura*
Gandhaka	*Katu, Tikta*	*Snigdha*	*Ushna*	*Katu*
Swarna Bhasma	*Madhura, Kashaya, Tikta*	*Guru, Snigdha, Picchila*	*Sheeta*	*Madhura*
Kanthaloha Bhasma	*Tikta*	*Ruksha*	*Sheeta*	*Madhura*
Abhraka Bhasma	*Madhura*	*Sheeta*	*Snigdha*	*Madhura*
Mukta Bhasma	*Madhura*	*Laghu, Snigdha*	*Sheeta*	*Madhura*
Vanga Bhasma	*Tikta,Amla, Katu, Kshara*	*Laghu, Ruksha*	*Ushna*	*Katu*
Kumari Swarasa	*Tikta*	*Snigdha, Pichila*	*Sheeta*	*Madhura*

Table showing properties of each ingredients of Yogendra rasa

Drugs	Properties
Parada	*Rasayana, Yogvahi, Sarvarogahara*
Gandhaka	*Rasayana, Samastha Vyadhi Nashaka*
Swarna Bhasma	*Meha Nashaka, Ojovardhaka Rasayana, Vrishya, Brihana*
Kantha Loha Bhasma	*Medoroga, Prameha*
Abhraka Bhasma	*Prameha, Rasayana,Yogvahi*
Mukta Bhasma	*Pramehahara*
Vanga Bhasma	*Medohara, Pramehahara, Rasayana*
Kumari Swarasa	*Brihana, Balya*

DISCUSSION

Diabetes mellitus is a serious condition with symptoms such as polyurea, polyphagia, and polydypsia. *Yogendra rasa* is a herbomineral formulation that contains *Rasasindura (Parada and Gandhaka), Swarnabhasma, Kantalauha Bhasma, Abhraka Bhasma, Mukta Bhasma, Vanga Bhasma, and Kumari Swarasa.*

Parada having *Shadrasa*. *Shadrasa* contains *Madhura, Amla, Lavana, Katu,Tikta* and *Kashaya*. Due to *Tikta Rasa* present in *Parada* plays role in *Kleda Upashoshaka* and also, it may be due to improved blood sugar level brought about by the anti-diabetic action of the drug which reduces osmotic diuresis. *Tikta Rasa* is *Akash* and *Vayu* dominant which leads to *Srotoshodhana* by which insulin resistance is corrected. *Tikta Rasa* also helps in eliminating excessive *Mukh Madhurta* which is due to aggravated *Kapha*; which leads to *Shoshana* of *Kapha* (*Mala*) and causing *Srotomukh Shodhana* by which it cleanses mouth that increases mucus secretion of both mouth and throat; hence overcoming dryness of mouth and hence acting on Mula of *Udakavaha Srotas* i.e., *Talu* and *Kloma*. *Tikta Rasa* possess *Trishnanighrahana* (*Mala Rupa Kapha*) property which reduces thirst. *Tikta* and *Kashaya Rasa of Parada* are *Mutra Sangrahaniya.*[18]

Gandhaka having *Katu, Tikta Rasa* and possess *Rasayana* property. This medication enhances metabolism and helps control the metabolic disorder known as diabetes mellitus because of its *Rasayana* properties.[19]

Swarna Bhasma having *Madhur rasa, Guru Snigdha guna, Sheeta Virya, Madhur Vipaka, Tridoshnashaka, Rasayana* and *Vajikarana* properties. These Properties benefit *Prameha* because they aid in *Dhatuposhana Karma*, which supplies nourishment to all tissues.

Kantalauha Bhasma

Loha Bhasma corrects Dushit Kleda from Jataragni to Dhatwagnis by addressing KPR Doshas. It is *balya rasayana to Dasavidha Dhatus* in *Prameha*.

Abhraka Bhasma

Abhraka Bhasma has growth reparative and regenerative properties at the dhatus level [*Dhatuvivardhana*]. It is merely *Mehahara*, but it reverses the loss of *Dhatu Saramsha* caused by *Ayana Daurbalya* at *Mutradhara Kala*.

Mukta Bhasma

Mukta is $CaCO_3$ Preparation and Calcium plays an important role in insulin resistance and secretion.

Vanga Bhasma

Vanga Bhasmas by its *Ruksha Laghu Guna* is *Kp Dosha Hara.* Its target areas are of *Mutraroga* and *Kapha Medo Dusti* in *Prameha.*

Kumari Swarasa *have Tikta Rasa*. Due to *Tikta Rasa,* it possess *Prameha nashaka* activity.

CONCLUSION

The ingredients of *Yogendra Rasa* include *Rasasindoora, Swarna Bhasma, Kantalouha Bhasma, Abhraka Bhasma, Mukta Bhasma, Vanga Bhasma, Kumari Swarasa*. This formulation is indicated in *Prameha.*

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