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PHARMACOGNOSTICAL AND PHARMACEUTICAL EVALUATION OF *MADHUMEHARI VATI*: AN EFFECTIVE FORMULATION FOR *MADHUMEHA* (TYPE 2 DIABETES)

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ABSTRACT

Madhumeha (Type 2 Diabetes) is included in the *Ashtamahagadas* caused by the involvement of all three *Doshas* and ten *Dushya*. Lots of single and compound drugs have been described in *Ayurveda* for the management of *Madhumeha* (Type 2 Diabetes). From such mentioned medicines a compound formulation has been made named *Madhumehari Vati* which is found to be very effective in the management of *Madhumeha* (Type 2 Diabetes). In this formulation whole plant extract of *Mamajjak* (*Enicostemma littorale*), leaves extract of *Meshashringi* (*Gymnema sylvestre*), nut extract of *Latakaranja* (*Caesalpinia bonducella*), root extract of *Katuki* (*Picrorhiza kurroa*), fruit extract of *Pippali* (*Piper* longum), fruit extract of *Rakta-maricha* (*Capsicum frutescens*), fruit extract of *Indravaruni* (*Citrullus colocynthis*) were taken. For the clinical trial *Madhumehari Vati* was provided by Dr Vasishth's AyuRemedies, named as Glycie tablet. To overcome the problems of palatability, feasibility, shelf life with the powder form of drug, *Vati* were formed. Till date no scientific work has been reported on *Madhumehari Vati*. This paper is made to standardize the formulation through Pharmacognostical and Pharmaceutical measures. The compound was analyzed and standardized scientifically through qualitative and quantitative analysis by physico-chemical parameters and High Performance Thin Layer Chromatography (HPTLC) and pharmacognostical measures. Pharmacognostical analysis showed characteristics of all the

ingredient drugs in the tablet. In Pharmaceuticals analysis, HPTLC was done in appropriate solvent system in which 5 and 3 spots were distinguished at 254 nm and 366 nm respectively. This study may be used as reference standard in the further researches.

KEYWORDS: *Ayurveda*, Type 2 Diabetes, *Madhumeha*, *Madhumehari Vati*, Pharmaceuticals.

INTRODUCTION

Madhumeha (Type 2 Diabetes) is included in the *Ashtamahagadas* caused by the involvement of all three *Doshas* and ten *Dushya*. *Charak* has mentioned that luxurious life style, overuse of milk and milk products and sugar products, lack of physical work and *kapha dosha* enhancing factors etc are the major causative factors *(nidana)* of *Madhumeha* In *Ayurveda* disease diabetes mellitus can be correlated with *Madhumeha***.** Diabetes mellitus is a clinical syndrome characterised by hyperglycaemia caused by absolute or relative deficiency of insulin. Hyperglycaemia is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels.[1]

According to the World Health Organization report, the number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014.[2] Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease.[3][4]

The ingredient of *Madhumehari Vati* are *Mamajjak* (*Enicostemma littorale*), *Meshashringi* (*Gymnema sylvestre*), *Latakaranja* (*Caesalpinia bonducella*), *Katuki* (*Picrorhiza kurroa*), *Pippali* (*Piper longum*), *Rakta-maricha* (*Capsicum frutescens*), *Indravaruni* (*Citrullus colocynthis*). Most of the content of *Madhumehari Vati* are *Tikta* in *Rasa*, *Ruksha-Lagu* in *Guna*, *Katu* in *Vipaka*, *Ushna* in *Virya* and *Kapha-Pitta Shamaka.* Till date no scientific work has been reported on *Madhumehari Vati*. The present research paper is made to standardize the formulation through Pharmacognostical and Pharmaceuticals measures.

MATERIALS AND METHODS

Plant material

All the raw drug materials were identified and authenticated by the Pharmacognosy department, IPGT & RA, GAU, Jamnagar. The identification were carried out on the basis of

organoleptic features, morphological features and powder microscopy of individual drugs. The ingredients are mentioned in table 1.

Table 1: Ingredients of *Madhumehari Vati* (*Anubhut Yoga*).

Drug	**Botanical name**	**Parts used** (Dry)	**Quantity**
Mamajjak	*Enicostemma littorale* Blume	*Panchanga*	300mg
Meshashringi	*Gymnema sylvestre* R.Br	Leaves	250mg
Latakaranja	*Caesalpinia bonducella* (Linn.) Roxb.	Nut	150mg
Katuki	*Picrorhiza kurroa* Royle ex Benth.	Root	50mg
Pippali	*Piper longam* Linn.	Fruit	40mg
Rakta maricha	*Capsicum frutescens* Linn.	Fruit	8mg
Indravaruni	*Citrullus colocynthis* Linn.	Fruit	2mg

Method of preparation of *Madhumehari Vati*

1. Material Receipt - Take all raw materials mentioned above in powder form. Check weight and note in MFG log sheet
2. Shifting process - All the powder or raw material shifting through 120 mesh sieve by shifter.
3. Paste Preparation Process - All raw materials powder mix properly through mass mixer for 30 minute and add prepared paste and D.M. water as per batch size requirement and blend for 30 minutes.
4. *Kharal* & Blinder process - Add wetted the material properly in *kharal*. For sufficient time and suitable capacity of *kharal* as per material volume and make it of sufficient thickness for granules using D.M. water / *Bhavana's Dravya*
5. Drying - Dry the wetted material in tray drier at required temperature until the water content each below 2 % w/w
6. Dry screening - Pass the lubricant through 40 mesh screen and mix with granules in mixer machine for 20 minutes.
7. Lubrication - Pass the lubricant through 40 mesh screen and mix granules in mixer machine for 20 minutes.
8. Compression - Compress the granules on tablet rotary machine using required punches and dies. Deducts the tablets by shifting through 20 mesh. Inspect the deducted tablets and sort out the rejected tablets.
9. For this clinical trial *Madhumehari Vati* was prepared and provided by Dr Vasishth's AyuRemedies (named as Glycie tablet).

Pharmacognostical study

All the raw drugs were identified and authenticated by the Pharmacognosy department, IPGT & RA, GAU, Jamnagar. The identification was carried out on the basis of Organoleptic features, morphological features and powder microscopy of individual drugs. Pharmacognostical evaluation of prepared *Vati* was not carried out because of extracts were used in *Vati* formulation. The microphotographs were also taken under the microscope.[5]

PHARMACEUTICAL EVALUATION

Physiocochemical parameter

Madhumehari Vati was analysed by using qualitative and quantitative parameters at Pharmaceutical Laboratory, IPGT & RA, GAU, Jamnagar. The common parameters mentioned for compressed tablets in Ayurvedic Pharmacopia of India[6] and CCRAS[7] guidelines are total ash, pH value and water and alcohol soluble extractives. On this basis these parameters were taken. Presence of more moisture content in a sample can create preser*vati*on problem. Hence loss on drying was also selected as one of the parameters.[8]

High Performance Thin Layer Chromatography Study (HPTLC)

Methanol extract of *Madhumehari Vati* were spotted on precoated silica gel GF 60_{254} aluminium plate as 5mm bands, 5mm apart and 1 cm from the edge of the plates, by means of a Camag Linomate V sample applicator fitted with a 100 µL Hamilton syringe. Toluene (7 ml), Ethyl acetate (2 ml), Acetic acid (1 ml) was used as mobile phase. After Development, Densitometric scanning was performed with a Camag TLC scanner III in reflectance absorbance mode at 254 nm and 366 nm under control of win CATS software (V 1.2.1 Camag).[9][10] The slit dimensions were 6 mm x 0.45 mm and the scanning speed was 20 mm s-1.

RESULTS AND DISCUSSION

Pharmacognostic study

The initial purpose of the study was to confirm the authenticity of the drugs used in the preparation of *Madhumehari Vati* For that coarse powder of all the ingredients were subjected to organoleptic and microscopic evaluation separately

Organoleptic evaluation

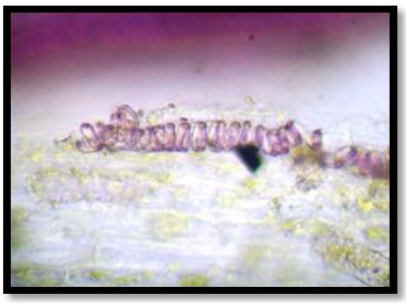
Organolptic features like colour, odour and taste of *Madhumehari Vati* were recorded and are placed at table 2.

Table-2: Organoleptic features of *Madhumehari Vati*

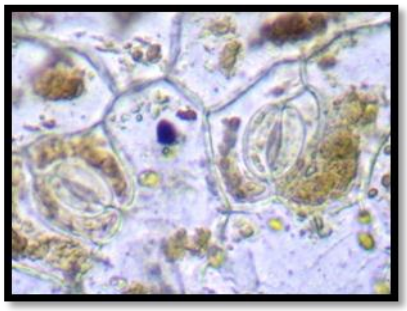
SI. No.	Characters	Observed
1.	Colour	Chocolate brown with white spot
2.	Odour	Bitter
3.	Taste	*Katu-Tikta*
4.	Touch	Hard

Microscopic evaluation

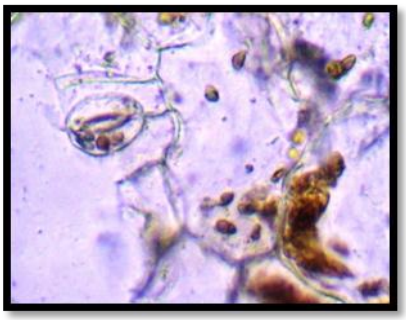
Microscopic evaluation of raw drugs was conducted under microscope for the presence of the characteristics of the drug. The microphotographs were taken by using Carl Zeiss trinocular microscope. Characteristics of all the raw drugs were identified. Microscopic characters of *Madhumehari Vati* are annular vessels of *Mamajjak*, paracytic stomata of *Mamajjak*, stomata with parenchymal cells of *Mamajjak*, cluster crystal of *Meshsrigngi*, multicellular warty trichome of *Meshsrigngi*, spiral vessels of *Meshsrigngi*, oil globule of *Lathakaranj*, simple fibre of *Lathakaranj*, simple starch with tannin content of *Lathakaranj*, fragments of fibre of *Katuki*, trichome & spiral pitted vessels of *Katuki*, yellowish brown oleoresins of *Katuki*, bottle neck shaped stone cells of *Pippali*, mesocarp with tannin of *Pippali*, oil content of *Pippali*, epicarp cells of *Rakta-maricha*, oil globule of *Rakta-maricha*, simple trichome of *Rakta-maricha*, lignified fibre of *Indravaruni*, simple trichome of *Indravaruni*, spiral vessels of *Indravaruni* (Fig. 1).



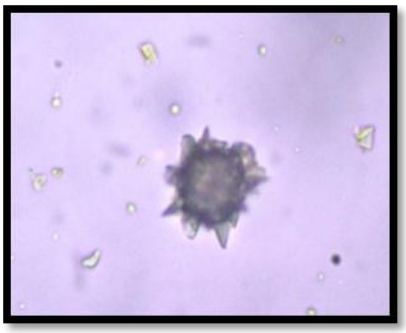
Annular vessels of *Mamajjak*



Paracytic stomata of *Mamajjak*



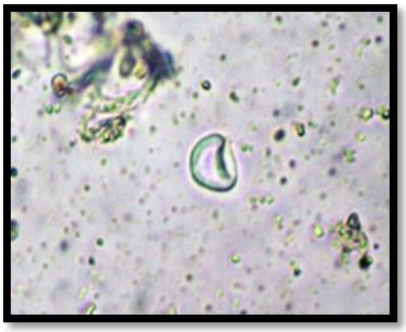
Stomata with parenchymal cells of *Mamajjak*



Cluster crystal of *Meshsrigngi*

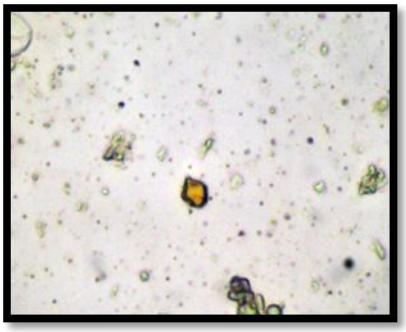
Multicellular warty trichome of *Meshsrigngi*

Spiral vessels of *Meshsrigngi*

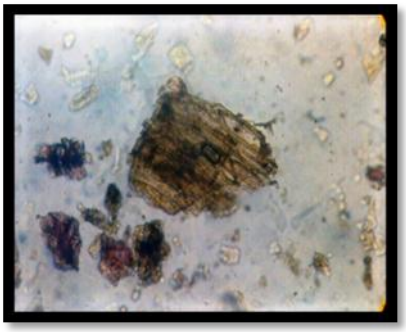


Oil globule of *Lathakaranj*

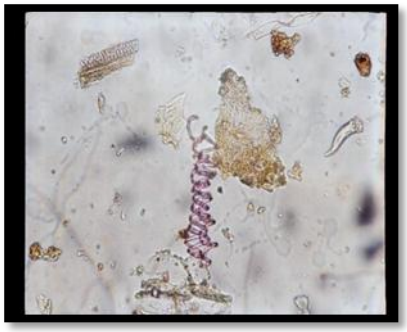
Simple fibre of *Lathakaranj*



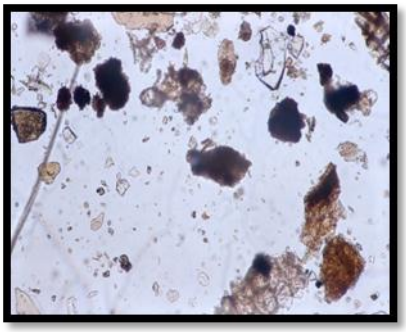
Simple starch with tannin contant of *Lathakaranj*



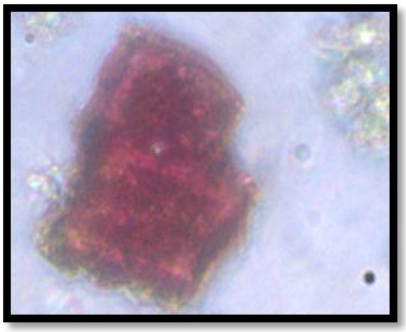
Fragments of fibre of *Katuki*



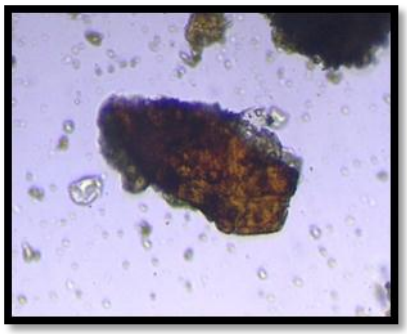
Trichome & spiral pitted vessels of *Katuki*



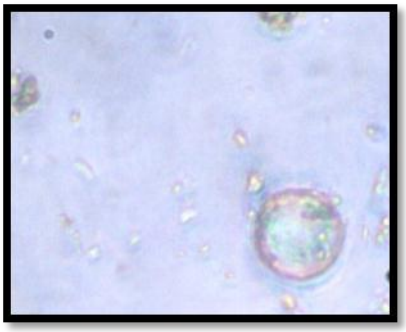
Yellowish brown oleoresins of *Katuki*



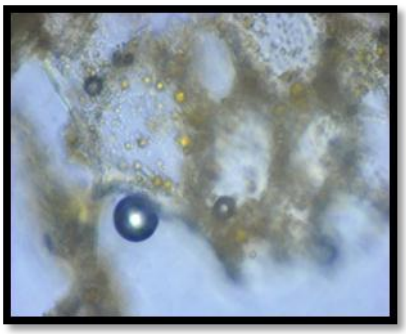
Stone cells of *Pippali*



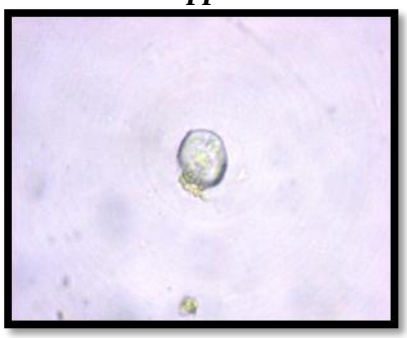
Mesocarp with tannin of *Pippali*



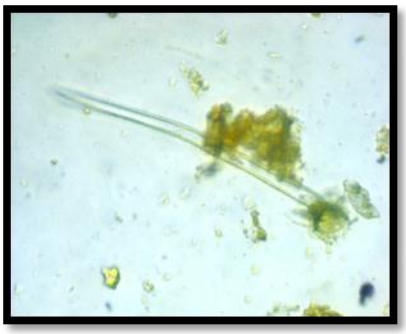
Oil contant of *Pippali*



Epicarp cells of *Rakta-maricha*



Oil globule of *Rakta-maricha*



Simple trichome of *Rakta-maricha*

Lignified fibre of *Indravaruni*

Simple trichome of *Indravaruni*

Spiral vessels of *Indravaruni*

Figure -1: Microscopic characters of *Madhumehari Vati.*

Pharmaceutical study

Physicochemical parameters

Physicochemical Parameters of the tablet like Uniformity, Disintegration time, Hardness, Loss on Drying were all found to be within the normal range. The water soluble extractive and methanol soluble extractive values were found to be 71.6 %w/w and 24.80 %w/w respectively. Details are placed at table 3.

Table-3: Physicochemical parameters of *Madhumehari Vati.*

Test		**Results**
Uniformity of Tablet	Average	1040 mg
	Highest	1045 mg
	Lowest	1034 mg
Hardness		NA
Loss on Drying		12.68 % w/w
Ash value		12.38 % w/w
Water soluble extract		71.6 % w/w
Methanol soluble extract		24.80 % w/w
pH value (5% aqueous solution)		4.5

High Performance Thin Layer Chromatography Study

On performing HPTLC, the chromatogram of *Madhumehari Vati* showed 5 spots corresponding to hR_f values 0.03, 0.59, 0.71, 0.75, 0.95 in short wave UV 254 nm and 3 spot corresponding to hR_f values 0.03, 0.71, 0.75 obtained in long wave UV 366nm (Table 4, Figure 2 & 3).

Table 4: HPTLC of *Madhumehari Vati.*

254 nm		366 nm	
Peak	**Rf**	**Peak**	**Rf**
1	0.03	1	0.03
2	0.59	2	0.71
3	0.71	3	0.75
4	0.75		
5	0.95		

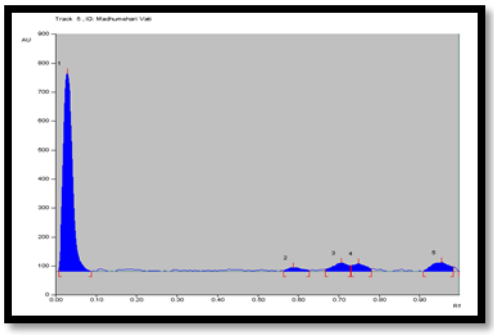


Figure 2-A

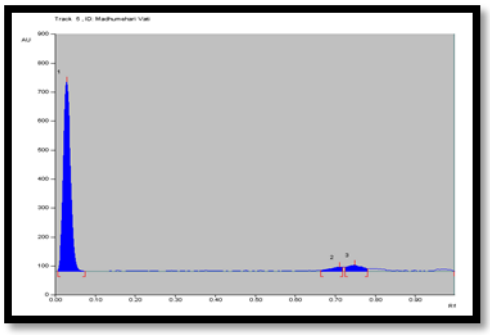


Figure 2-B

Figure-2: Densitogram curve of Methanol extract of *Madhumehari Vati* at. 254 nm (2-A) and 366 nm (2-B)

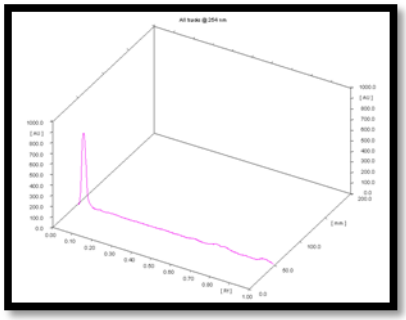


Figure 3-A (at 254 nm**)**

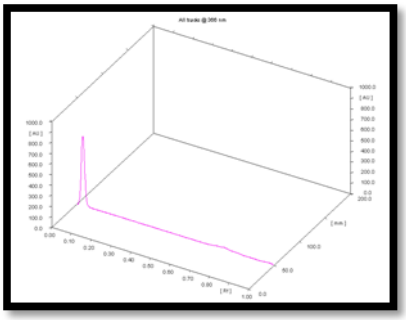


Figure 3-B (at 366 nm)

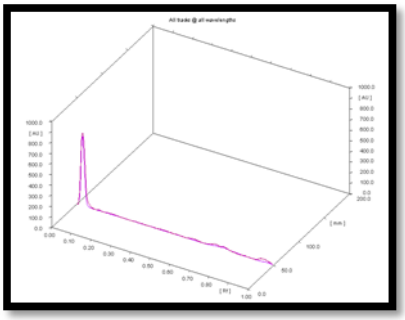


Figure 3-C (MWL)

Figure - 3: 3 Dimensional graph of Methanol extract of *Madhumehari Vati.*

CONCLUSION

Ayurvedic system of medicine is being relied upon more and more for the various health issues particularly lifestyle diseases. To overcome the problems of palatability, feasibility and to increase the self life, powder form is converted in to *Vati* form. The ingredients were identified and authenticated pharmacognostically and were used for the preparation. The formulation was subjected to pharmacognostical, organoleptic, physicochemical, HPTLC studies. It is inferred that the formulation meets the minimum qualitative standards as reported in the API at a preliminary level. Clinical evaluation of this compound shows

significant results in management of *Madhumeha*. The inference from this study may be used as reference standard in the further quality control researches.

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