WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 7.523
Volume 6, Issue 7, 1713-1722. Research Article ISSN 2277–7105

PHARMACOGNOSTICAL AND PHARMACEUTICAL EVALUATION OF *VIJAYSARADI GHANVATI:* AN EFFECTIVE FORMULATION FOR THE MANAGEMENT OF TYPE 2 DIABETES *(MADHUMEHA*)

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Article Received on
15 May 2017,
Revised on 06 June 2017,
Accepted on 30 June 2017
DOI: 10.20959/wjpr20177-8909

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ABSTRACT

Diabetes Type 2 (*Madhumeha*) is one of the most serious health problem in the 21st century. According to the World Health Organization (WHO) report, India today heads the world with over 32 million diabetic patients and this number is projected to increase to 79.4 million by the year 2030.[1] Diabetes is likely to continue to be a leading cause of morbidity and mortality in the near future. Lots of single and compound drugs have been described in *Ayurveda* for the management of *Madhumeha*. *Vijaysaradi Kwath* is one of them and it is very effective in the *Madhumeha*. *Kwath* is bitter in taste and patients have to prepare *kwath* each time which takes lot of time. To overcome these above problems along with the problems of palatability, feasibility, shelf life with the *kwath* form of drug, an effort is made to convert it into *vati* form i.e. *Vijaysaradi Ghanvati*. This paper is made to standardize the formulation through Pharmacognostical and Pharmaceuticals 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 6 and 5 spots were distinguished at 254 nm

and 366 nm respectively. This study may be used as reference standard in the further researches.

KEYWORDS: Diabetes Type 2 (*MADHUMEHA*), Pharmaceuticals, Pharmacognostical, *Vijaysaradi Ghanvati*.

INTRODUCTION

Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar.[2] Hyperglycaemia, or raised blood sugar, 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.[3] Hyperglycaemia has many causes but is most commonly due to type 1 or type 2 diabetes. Lack of insulin affects the metabolism of carbohydrate, protein and fat and can cause significant disturbance of water and electrolyte homeostasis, death may result from acute metabolic decompensation. Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease.[4],[5] According to the World Health Organization (WHO) report, the number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014.[6] The global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014.[7] Recent surveys indicate that diabetes now affects a staggering 10-16% of urban population[8] and 5-8% of rural population in India.[9] Diabetes is likely to continue to be a leading cause of morbidity and mortality in the near future.

In *Ayurveda* disease diabetes mellitus can be correlated with *Madhumeha*. It is *tridoshaj* in origin with predominance of *kapha***.** *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*. *Sushrata* has mentioned *sahaj* and *apathya nimattaja* varieties of *MADHUMEHA*. All these factors described in different texts of *Ayurveda* implies that life style plays important role in progression of *Madhumeha*.

MATERIALS AND METHODS

Plant material

All the raw drug materials were collected from the pharmacy of IPGT & RA, Gujarat Ayurved University, Jamnagar. The ingredients are mentioned in table 1.

Table 1: Ingredients of *Vijaysaradi Ghanvati* (*Anubhut Yoga*).

Drug	Botanical name	Parts used	Quantity
Vijaysar	*Pterocarpus marsupium* Roxb.	Heart wood (dry)	11 part
Haritaki	*Terminalia chebula* Retz.	Fruit (dry)	1 part
Amlaki	*Emblica officinale* Gaertn.	Fruit (dry)	1 part
Vibhitaki	*Terminalia belerica* Roxb.	Fruit (dry)	1 part
Kiratatikta	*Swertia chirata* (Wall) C.B.Cl	Panchang (dry)	1 part
Patolpatra	*Trichosanthes dioica* Roxb.	Leaves (dry)	1 part
Katuki	*Picrorizha kurrooa* Royle ex Benth.	Rhizome (dry)	1 part
Gokshur	*Tribulus terrestris* Linn.	Fruit (dry)	1 part
Musta	*Cyperus rotandus* Linn.	Root (dry)	1 part
Swet candan	*Santalum albam* Linn.	Heart woo(dry)	1 part
Daruharidra	*Berberis aristata* DC.	Stem & Root(dry)	1 part
Usira	*Vetiveria zizanioides* (Linn.) Nash	Root(dry)	1 part

Pharmacognostical study

All the raw drugs were identified and authenticated by the Pharmacognosy department, IPGT & RA, Gujarat Ayurved University, Jamnagar. The identification were carried out on the basis of organoleptic features, morphological features and powder microscopy of individual drugs. Pharmacognostical evaluation of prepared *vati* was also carried out. *Vati* dissolved in small quantity of distilled water, filtered through filter paper, filtrate studied under the microscope attached with camera, with and without stain. The microphotographs were also taken under the microscope.[10]

Method of preparation of *Vijaysaradi Ghanvati*

Vijaysaradi kwath was prepared after mixing of raw drugs mentioned in table 1. Then *Ghan* was obtained after heating. After mixing of *choorna* of above mentioned drugs in *Ghana*, *Vati* was formed.

PHARMACEUTICAL EVALUATION

Physiocochemical parameter

Vijaysardi Ghanvati was analysed by using qualitative and quantitative parameters at Pharmaceutical Laboratory, IPGT & RA, Gujarat Ayurved University, Jamnagar. The common parameters mentioned for compressed tablets in Ayurvedic Pharmacopia of India[11] and CCRAS[12] 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.[13]

High Performance Thin Layer Chromatography Study (HPTLC)

Methanol extract of *Vijaysaradi Ghanvati* 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).[14],[15] 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 *Vijaysaradi Ghanvati*. 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 *Vijaysaradi Ghanvati* were recorded and are placed at table 2.

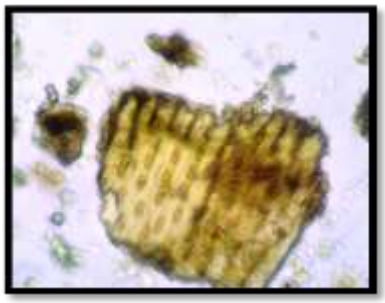
Table-2: Organoleptic features of *Vijaysaradi Ghanvati*

SI. No.	Characters	Observed
1.	Colour	Black
2.	Odour	Slightly Aromatic
3.	Taste	Astringent
4.	Touch	Rough, Coarse

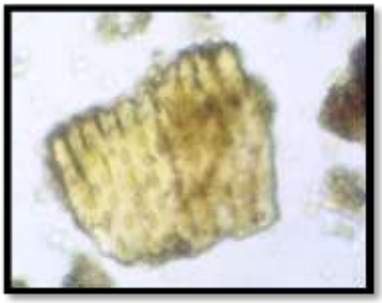
Microscopic evaluation

Microscopic evaluation was conducted by powdering the tablet and dissolving it in the distilled water and studied under microscope for the presence of the characteristics of the ingredient drug and for the probable changes in the features if any. The microphotographs were taken by using Carl Zeiss trinocular microscope. Characteristics of all the ingredient drugs were identified in *Vati* also. Microscopic characters of *Vijaysaradi Ghanvati* are border pitted vessels of *Swet candan*, border pitted vessles of *Vijaysar*, epicarpal cells of *Haritaki*, fibres of *Daruharidra*, fibres of *Swet candan*, fibres of *Vijaysar*, fibres passing through medullary rays of *Vijaysar*, lignified Sclereids of *Vibhitaki*, oil globules of *Swet candan*,

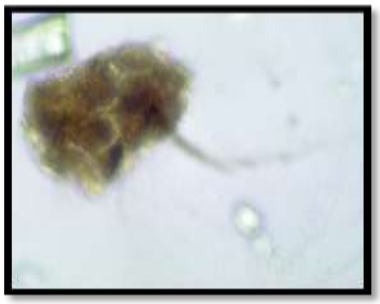
parenchymal cells of *Usira*, prismatic crystals of *Daruharidra*, sclereids of *Haritaki*, sclereids of *Vibhitaki*, silica deposition of *Amlaki*, silica deposition of *Musta*, simple trichome of *Gokshur*, stone cells of *Haritaki*, stone cells of *Vijaysar*, tannin content of *Vijaysar*, trichome of *Daruharidra*, yelllow content of *Daruharidra*. (Figure 1).



1. Border pitted vessels of *Swet candan*

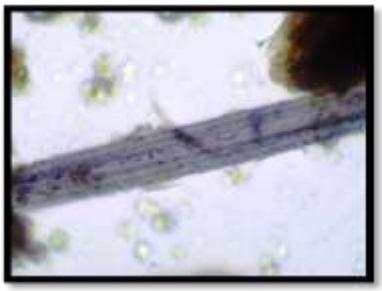


2. Border pitted vessles of *Vijaysar*

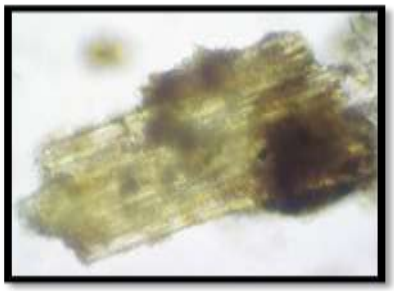


3. Epicarpal cells of *Haritaki*

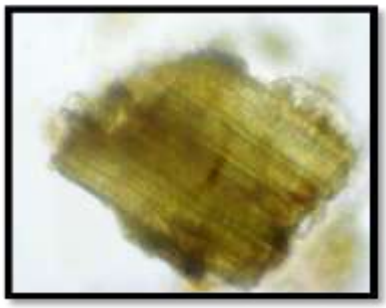
4. Fibres of *Daruharidra*



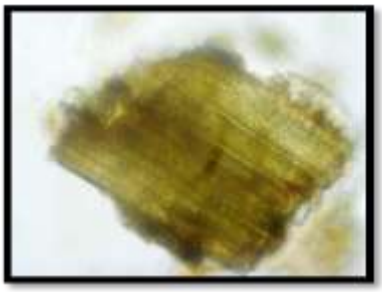
5. Fibres of *Swet candan*



6. Fibres of *Vijaysar*



7.* Fibres passing through medullary rays of *Vijaysar



8. Lignified Sclereids of *Vibhitaki*

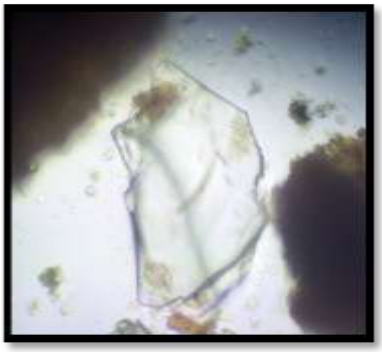
9. Oil globules of *Swet candan*

10. Parenchymal cells of *Usira*

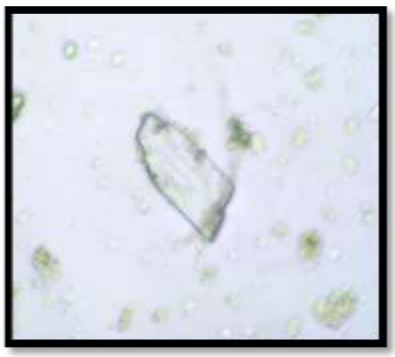
11. Prismatic crystals of *Daruharidra*

12. Sclereids of *Haritaki*

13. Sclereids of *Vibhitaki*

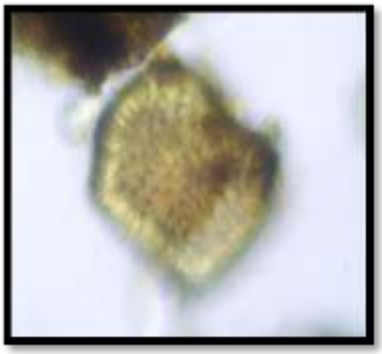


14. Silica deposition of *Amlaki*



15. Silica deposition of *Musta*

16. Simple trichome of *Gokshur*

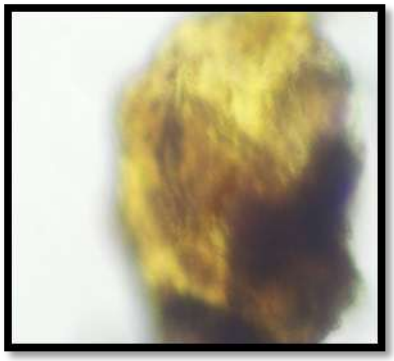


17. Stone cells of *Haritaki*

18. Stone cells of *Vijaysar*

19. Tannin content of *Vijaysar.*

20. Trichome of *Daruharidra.*



21. Yelllow content of *Daruharidra.*

Figure -1: Microscopic characters of *Vijaysaradi Ghanvati* (Final Drug)

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 39.8 % w/w and 17.04 % w/w respectively. Details are placed at table 3.

Table 3: Physicochemical parameters of *Vijaysaradi Ghanvati.*

Test		Results
Uniformity of Tablet	Average	502.3 mg
	Highest	565 mg
	Lowest	408 mg
Hardness		1.4 kg/ cm^2
Loss on Drying		10.16 % w/w
Ash value		25.546 % w/w
Water soluble extract		39.8 % w/w
Methanol soluble extract		17.04 % w/w
pH value (5% aqueous solution)		6.5

High Performance Thin Layer Chromatography Study

Densitometric scanning of the HPTLC pattern showed 6 spots corresponding to hRf values 03, 15, 36, 72, 80, 96 in short wave UV 254 nm and 5 spot corresponding to hRf values 03, 17, 36, 72, 80 obtained in long wave UV 366nm (Table 4, Figure 2 & 3).

Though it may not be able to identify particular chemical constituent from the spots obtained, the pattern may be used as a reference standard for further quality control researches.

Table 4: HPTLC of *Vijaysaradi Ghanvati.*

254 nm		366 nm	
Peak	**Rf**	**Peak**	**Rf**
1	0.03	1	0.03
2	0.15	2	0.17
3	0.36	3	0.36
4	0.72	4	0.72
5	0.80	5	0.80
6	0.96		

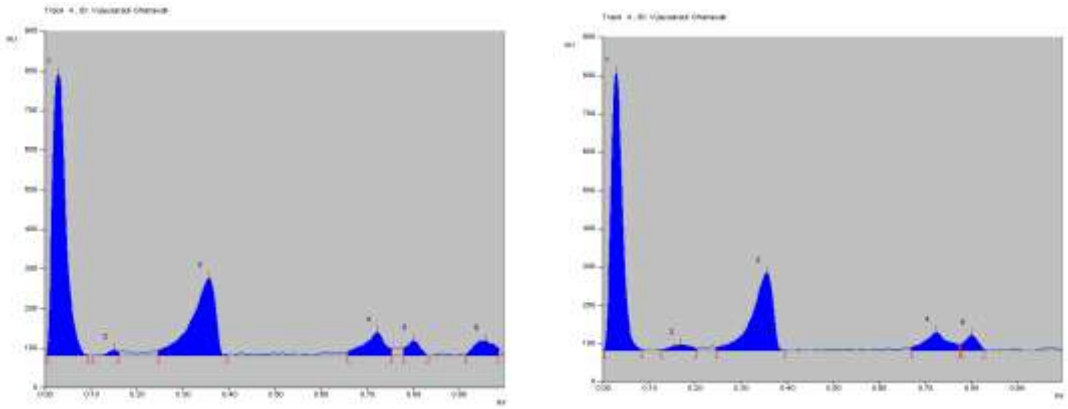


Figure 2-A **Figure 2-B**

Figure-2: Densitogram curve of Methanol extract of *Vijaysaradi Ghanvati* at 254 nm(2-A) and 366 nm(2-B)

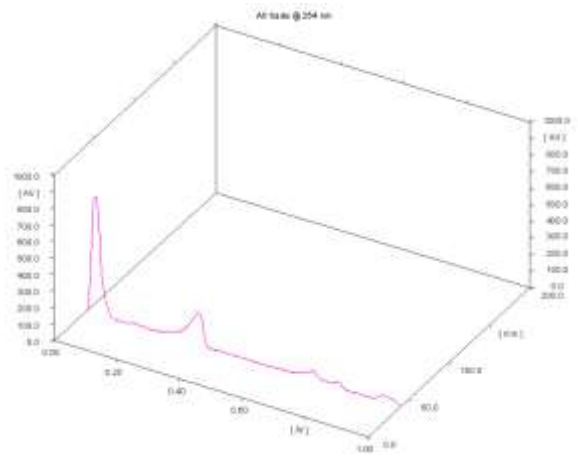


Figure 3-A (at 254 nm**)**

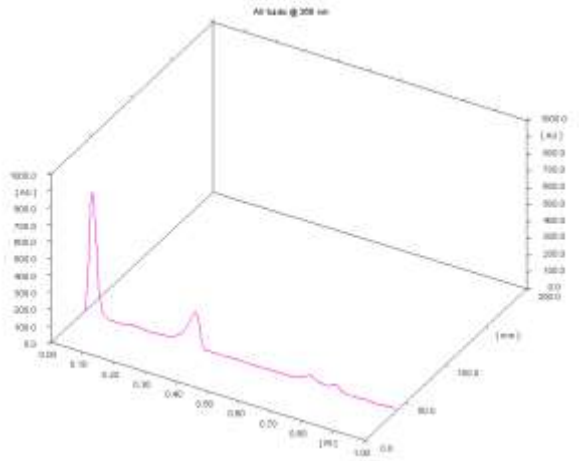


Figure 3-B (at 366 nm)

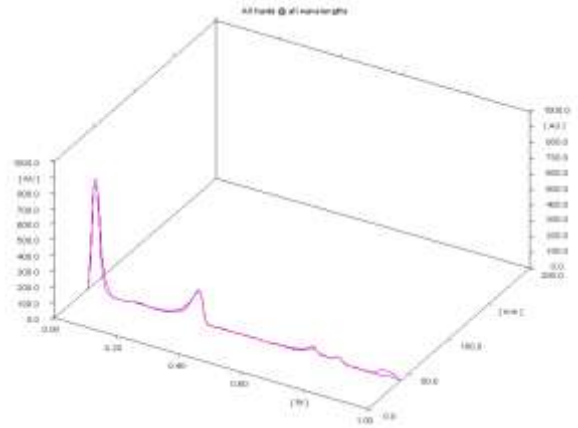


Figure 3-C (MWL)

Figure 3: 3 Dimensional graph of Methanol extract of *Vijaysaradi Ghanvati.*

CONCLUSION

Ayurvedic system of medicine is being relied upon more and more for the various health issues particularly lifestyle diseases. *Vijaysaradi Kwath* is used for Diabetes Type 2 (*Madhumeha*) in *Ayurveda*. Since *Kwath* is bitter in taste and patient has to prepare *kwath* each time, which is very time taking and inconvenient too. Also it is tough to maintain the dose of *kwath* due to mode of preparation. So to overcome these problems along with the problems of palatability, feasibility and to increase the self life, *kwath* 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, physicochemical, HPTLC studies. It is inferred that the formulation meets the minimum qualitative standards as reported in the API at a preliminary level. The inference from this study may be used as

reference standard in the further quality control researches. Further clinical evaluation of the compound is in progress.

ACKNOWLEDGEMENT

The authors are thankful to the authorities of IPGT & RA, Gujarat Ayurved University, Jamnagar for providing facilities to carry out research work.

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