



Research Article

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PHARMACOGNOSTIC AND PHARMACEUTICAL EVALUATION OF YASHTIMADHU (*GLYCYRRHIZA GLABRA* LINN.)

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ABSTRACT

Background: Yashtimadhu, botanically identified as *Glycyrrhiza glabra* L., is a well-known herb in Ayurveda. It is cultivated in India, mainly in Punjab and sub-Himalayan tracts. Root and stolon have been widely used in different formulations. Pancha Vidha Kashaya Kalpanas (Pharmaceutics) are mentioned primarily to achieve the maximum efficacy of the drug and to upgrade its palatability. Some kalpanas are also made to increase the shelf-life of a drug. In the conventional system, dosage forms are mainly preferred based on the solubility of a drug to enhance its bioavailability. Yashtimadhu, as per the literature, have been used in 22 dosage forms. Churna (powder), Kashaya (decoction), Phanta (infusion), Ksheerapaka (milk-based preparation), Taila (Oil-based preparation) and Gritha (ghee-based preparation) are mainly used to enhance its therapeutic utility. Aim: To analyse the pharmacognostic changes; this study evaluated Yashtimadhu and its pharmaceutics for its characteristic features. Method: The formulations were prepared using the classical methods and analysed based on the standard parameters. Result: The evaluation showed that the parameters were comparable to the standard references. Conclusion: The genuine authenticity and shelf-life of a drug remain an essential criterion for a drug to be fit for therapeutic consumption. Evaluation of Yashtimadhu in its different forms for various parameters revealed its significance.

Keywords: Yashtimadhu, *Glycyrrhiza glabra* Linn., Dosage forms, Pancha Vidha Kashaya Kalpana.

INTRODUCTION

Yashtimadhu, known as *Glycyrrhiza glabra* Linn., belonging to the subclass papilionaceous of Leguminosae/Fabaceae family, is a perineal herb. It typically bears nodules in the root structures and is seen in temperate regions. It is also cultivated in India, mainly in Punjab and sub-Himalayan tracts. The roots and stolon are the useful/official part of Yashtimadhu. ¹ It has been used since the ages of Rig Veda; in Ayurveda, it has been mentioned in different dosage forms, which is attributed to its versatility in different pharmacological actions.

Yashtimadhu has been mentioned in 252 formulations, among which 179 are internally used, and 69 are used for external purposes in more than 55 diseases. It is also utilised in 22 dosage forms such as Ksheerapaka (milk-based preparation), Taila (oil), Gritha (ghee), Kashaya (decoction), Kalka (paste) etc. ² In the present study, an attempt has been made to pharmacognostic and physicochemical analysis of Yashtimadhu in its different dosage forms.

MATERIALS AND METHODS

Collection, Authentication and Preparation of The Trial Drug

Yashtimadhu was collected from a GMP-certified pharmacy and was authenticated by the Taxonomist Dr Shivamanjunath MP, Senior Scientist from the Department of Dravyaguna, Sri Sri College of Ayurvedic Science and Research, Bengaluru, Karnataka, India. Then, as per the standard procedure, preparation of drug in Churna, Kashaya, Phanta, Ksheerapaka, Taila and Gritha of the drug were made and named as YMC (for Yashtimadhu Churna), YMK (for Yashtimadhu Kashaya), YMP (for Yashtimadhu Phanta), YMKp (for Yashtimadhu Ksheerapaka), YMT (for Yashtimadhu Taila) and YMG (for Yashtimadhu Gritha) respectively. ³⁻⁸

Pharmacognostic Analysis of Yashtimadhu

An organoleptic evaluation was based on sensory profiles such as colour, odour, taste, and touch. A macroscopic assessment of the drug's features, such as size, shape, and surface, was observed. Microscopic evaluation was done using the API procedure. ⁹

Physicochemical Analysis of Yashtimadhu and Its Dosage Forms

Yashtimadhu Root was accessed for foreign matter and moisture content. Yashtimadhu Churna, Kashaya, and Phanta were analysed for total ash, acid-insoluble ash, water-soluble ash and pH.^{10,11} Yashtimadhu Ksheerapaka was analysed for total solid content, pH and specific gravity.^{12,13} Yashtimadhu Gritha and Taila were assessed for Refractive index, Specific gravity, Acid value, and Peroxide value. Saponification value and Viscosity.¹⁴⁻¹⁸

RESULTS

Pharmacognostic Study

Macroscopic characters (Organoleptic characters) are cited in Table 1.

Microscopic characters

i) TS of Yashtimadhu Stolon shows

The outer layer containing cork has 8-10 reddish brown layers. The secondary cortex consists of parenchymatous cells. The vascular arrangement is arranged longitudinally, with the secondary xylem distinctly radiated with medullary rays and the secondary phloem is arranged radially and has lignified cells. The xylem and phloem are separated by 2-3 layers of cambium cells. Pith is made of parenchymatous cells arranged longitudinally in rows with intercellular spaces. (Figure 1)

Table 1: Organoleptic characters of Yashtimadhu and its different formulations.

Organoleptic character	Result							
	Root	Coarse powder	Fine powder	YMK	YMP	YMKp	YMT	YMG
Colour	Outer layer – brown Inner layer - yellow	Yellowish brown	Yellowish brown	Dark brown	Dark brown	Whitish brown	Brown	Yellow – yellowish green
Odour	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic	Pleasant	Characteristic	Pleasant
Taste	Sweetish	Sweetish	Sweetish	Bitter	Bitter	Sweet-bitter	Sweetish	Sweet
Texture	Rough	Coarse	Smooth	Liquid	Liquid	Liquid	Thick and smooth	Grainy and smooth



Figure 1a : T. S. of Yashtimadhu stolon



Figure 1b : T. S of Yashtimadhu stolon showing cork.

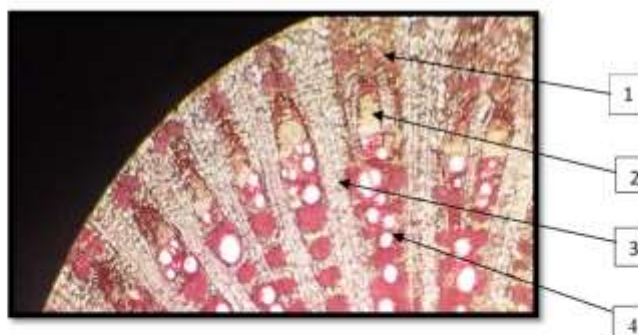


Figure 1c : Transverse section of Yashtimadhu stolon showing 1. Phloem, 2. Cambium, 3. Medullary rays, 4. Xylem.

Figure 1: Microscopic structures of Yashtimadhu Stolon.

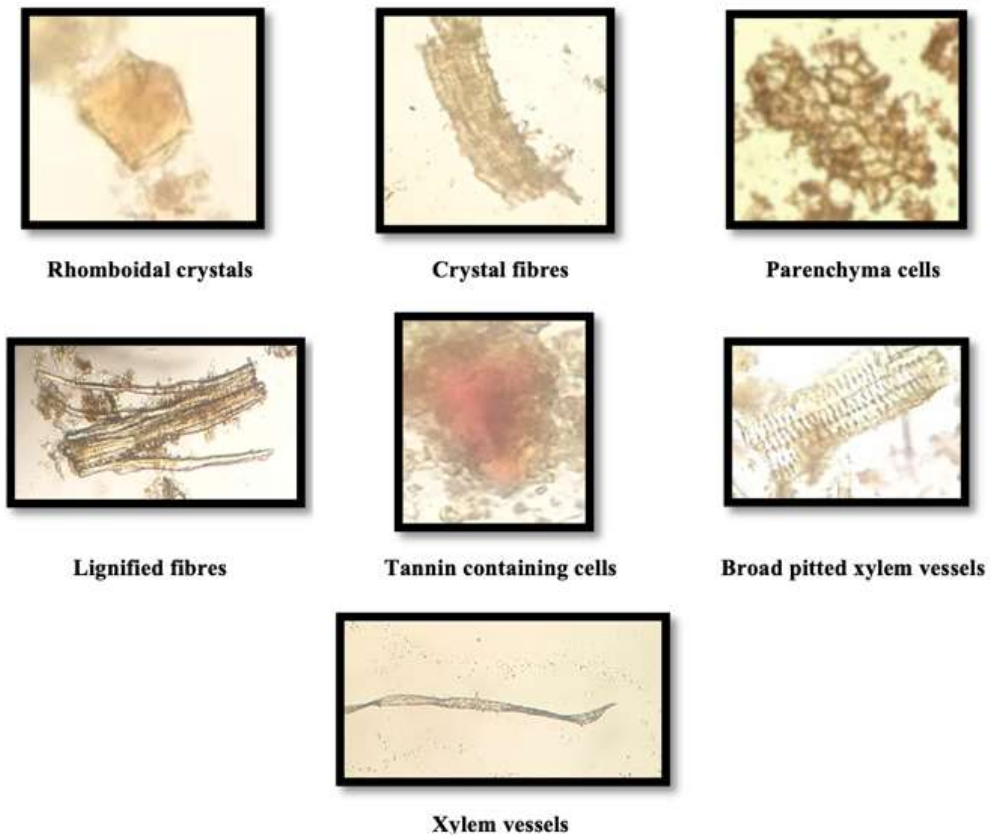


Figure 2: Powder Microscopic Structures of Yashtimadhu Stolon.



Figure 3a: Yashtimadhu herb



Figure 3b: Yashtimadhu root-bearing nodules



Figure 4a: Coarse powder of Yashtimadhu



Figure 4b: Fine powder of Yashtimadhu

Figure 4: Coarse powder and fine powder of Yashtimadhu root.



Figure 5a: Yashtimadhu Kashaya

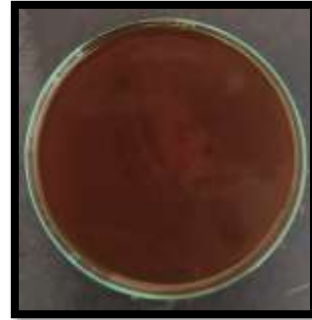


Figure 5b: Yashtimadhu Phanta



Figure 5c: Yashtimadhu Ksheerapaka



Figure 5d: Yashtimadhu Gritha



Figure 5e: Yashtimadhu Taila

Figure 5: Different dosage forms of Yashtimadhu

ii) Powder Microscopy (Figure 2)

Physicochemical Analysis

Physical constituents of Yashtimadhu churna (YMC)

Table 2: Physical constituent analysis of YMC

Parameters	values	API values
Foreign matter	9%	-
Loss on drying	4.5%	-
Total ash	5%	NMT 10%
Acid insoluble ash	1.9%	NMT 2.5%
Water soluble extractive	18%	NLT 10%
Alcohol soluble extractive	22.4%	NLT 20%

Physical constituents of Yashtimadhu Kashaya (YMK) and Yashtimadhu Phanta (YMP)

Table 3: Physical constituent analysis of YMK and YMP

Parameters	YMK values	YMP values
Total Ash content	Nil	Nil
Water soluble Ash content	Nil	Nil
Acid Insoluble Ash content	Nil	Nil
Determination of PH	5.54	5.47

Physical constituents of Yashtimadhu Ksheerapaka (YMKp)

Table 4: Physical constituent analysis of YMKp

Parameters	Values
Determination of PH –	6.08
Specific gravity	1.02
Total solid content	32.95g

Physical constituents of Yashtimadhu Taila (YMT) and Yashtimadhu Gritha (YMG)

Table 5: Physical constituent analysis of YMT and YMG

Parameters	YMT values	YMG values
Refractive index	1.472	1.465
Specific gravity	0.912	1.03
Acid value	2.289	0.70
Saponification value	197.4	148.55
Peroxide value	0.99	0.59
Viscosity	7.4	0.28

DISCUSSION

Yashtimadhu in Ayurveda is a widely used herb. The description of the plant is analysed through its pharmacognostic and pharmacological aspects. According to some Acharyas, the pharmacognostic description is of two types: one found on the land, i.e., sthalaja and the other on the water, i.e., jalaja. From the modern perspective, the Glycyrrhiza term is derived from the Grecian word Glykys, meaning sweet and rhiza, meaning root; the genus consists of around 30 species distributed worldwide, differing in their root morphology. Among the four evident varieties of Glycyrrhiza species¹⁹, *Glycyrrhiza glabra* L. and *Glycyrrhiza uralensis* L., root morphology may fit the two varieties of Yashtimadhu, respectively. The pharmacognostic approach provides a bridge to identify and authenticate our drugs and thus establish apt pharmaceuticals.

Pharmaceuticals is the processing of a drug to a dosage form. The adaptability of a drug to its different dosage forms makes it ideal as a medicine. Acharyas have explained various dosage forms to increase the potency of a drug and thus make it compatible with a particular disease. It also makes the drug palatable. In the Sutrasthana, Acharya Charaka explained Yashtimadhu in 13 Mahakashaya Vargas, which might indicate its wide pharmaceuticals. References are found throughout the Ayurvedic texts indicating the usage of Yashtimadhu in Churna, Kashaya, Phanta, Ksheerapaka, Taila and Gritha forms in different diseased conditions. However, physicochemical evaluation becomes a criterion for dealing with the manufacturing, standardisation, and control of the quality of a drug and its pharmaceuticals.

The physicochemical properties of a drug are assessed to identify the genuinity of a drug by determining the adulterants and improper handling of the drugs. In the case of Taila and Gritha, these parameters are assessed to know the shelf-life of that particular formulation. Moisture content is done to determine the amount of water content or the volatile content present in the drug, indicating its stability. Yashtimadhu was analysed for moisture content and was within the standard limit.²⁰ The remaining residue after incinerating the drug is the ash content, indicating the presence of inorganic matter, thus helping to detect the drug's purity, especially in its powder form. The acid-soluble ash is a part of total ash, which is used to determine the content of silica present in the sample.¹⁰ Different soluble extractive values indicate the presence of exhaustive material in the crude drug. It also denotes the solubility of the drug and its chemical components in different media or solvents. The water-soluble extractive value indicates the presence of acids, sugars and inorganic compounds, whereas alcohol-soluble extractive values indicate the presence of constituents like alkaloids, phenols, glycosides and other secondary metabolites. pH plays a role in the apt functioning of the drug in the human body. Formulations were analysed for pH, and it was indicated that they were suitable for human use.

Based on the fundamental principles of Aushadha Kalpana (pharmaceuticals), Yashtimadhu was prepared and analysed in different dosage forms. Organoleptically, Yashtimadhu root powder, when perceived, was sweet and slightly bitter, which has already been documented in the Ayurveda literature as madhura (sweet) and tikta (bitter) rasa. All the preparations had a sweet taste except for Kashaya and Phanta. The varied taste perception in different formulations might be due to the use of their respective media and varying ratios of their chemical constituents.

Yashtimadhu Churna, Kashaya and Phanta

The preparations were analysed for total ash, water-soluble, and acid-insoluble ash content. YMC (powder) was within the standard limits.²⁰ As YMK (decoction) and YMP (infusion) preparations were the extracts, the formulations had no ash content. The pH of YMK(decoction) and YMP (infusion) are 5.54 and 5.47, respectively, signifying the weakly acidic nature of YMP and YMK, which might be responsible for irritating the GIT and inducing vomiting.

Yashtimadhu Ksheerapaka

The pH of YMKp is 6.08; this might neutralise the acid secretions and, therefore, could be ideal in peptic disorders. Specific gravity is the measure of the density of a particular substance with reference to the standard. The specific gravity of YMKp (milk-based preparation) was 1.02, in which no significant change from the specific gravity of milk was observed, indicating the negligible role of the drug. Total solid content is done to ensure the quality of the milk, i.e., the proteins, fats, milk sugar, etc. In YMKp, it was found to be 32.95 g.

Yashtimadhu Gritha and Taila

YMT (oil-based preparation) and YMG (ghee-based preparation) were sweet due to the presence of Gritha and Taila, which are madhura in nature. YMT had the characteristic thick and smooth texture of Taila, and YMG's grainy and smooth texture was similar to Gritha's.

The acid value measures the presence of fatty acids to check their rancidity. The higher the acid value, the more rancidification there is.¹⁵ Iodine value is to check the amount of iodine present in fat, indicating the degree of unsaturation.¹⁶ Peroxide value measures the state of oxidation in fats, indicating its rancidification.¹⁷ Saponification value is the amount of base/alkali required to saponify a measured amount of fat. Long-chain fatty acids usually have short saponification values.¹⁸ YMT and YMG were analysed for Refractive index, Determination of pH, Specific gravity, Acid value, Saponification value, Peroxide value, and Viscosity and were within the standard limits compared to the previous study.²¹

CONCLUSION

The root and stolon of Yashtimadhu were analysed pharmacokinetically and were confirmed for their genuinity. Different formulations of Yashtimadhu in Churna, Kashaya, Phanta, Ksheerapaka, Taila and Gritha were prepared as per the standard procedure and were pharmaceutically analysed for their respective parameters. In Ayurveda, Yashtimadhu is given in different dosage forms. These pharmaceutics help the drug achieve its therapeutic ability. However, the genuine authenticity and the shelf-life of a drug remain a vital criterion for a drug to be fit for therapeutic consumption. The results of the present study can be taken as a reference for further research.

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