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Original article

Formulation and standardization of Medhya Rasayana – A novel Ayurvedic compound nootropic drug

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ABSTRACT

Introduction: Medhya Rasayana is a poly herbal formulation widely used in Ayurvedic clinical practice with multi fold benefits, specifically to improve memory and intellect by their Prabhava (specific action) namely Medhya (Nootropic). There is no work on record on formulation and standardization aspect of a compound formulation containing nootropic herbs. This study highlights physico-chemical characterization, TLC and HPTLC densitogram profiling of Medhya Rasayana which can be applied for authentication of this poly herbal formulation.
Methods: Four Medhya Rasayana herbs namely, Mandukaparni (*Centella asiatica* Linn.), Yastimadhu (*Glycyrrhiza glabra* Linn.), Guduchi (*Tinospora cordifolia* (Wild) Miers.) and Shankhapushpi (*Evolvulus alsinoids* L.) were authenticated botanically. Tablets were prepared by combining all these four drugs and subjected for detailed physico-chemical and HPTLC analyses.
Results: Set of standardization parameters were derived for the compounded tablet containing four Medhya Rasayana herbs by physico-chemical characterisation. The tests proposed would serve as diagnostic parameters for the identity of this poly herbal formulation. HPTLC fingerprint profile which can serve as a fingerprint for the identification of the formulation has been obtained.
Conclusion: The proposed method of making tablet from four Medhya Rasayana herbs will aid in yielding concentrated medicament with the same efficacy as per the classically proposed drug dosage at lower dose. Standards for the poly herbal formulation has been developed for the quality check of the formulation.

1. Introduction

Ayurveda, the Indian system of medicine is the first recorded medical science widely practiced in India since ancient times. In recent years there is global revolution worldwide towards acceptance of this holistic science owing to its effectiveness and safety. The increasing demand at the global level has created great need to standardize herbal medicines. The earliest references of drug standardizations are mentioned in Ayurveda classics under the speciality of Bhaishajya Kalpana and Rasa Shastra which exclusively deal with drug formulation and manufacturing. Most of the tests described in ancient literature appear to be based on observations and seems to be subjective without valid scientific backing. Hence standardization and development of reliable quality protocols are important.[1]

Medhya Rasayana are group of drugs widely used in Ayurveda since antiquity with manifold benefits specifically to improve memory and intellect by their Prabhava (specific action) namely Medhya (Nootropic). Medhya Rasayana comprises group of 4 drugs namely Mandukaparni (*Centella asiatica* Linn.), Yastimadhu (*Glycyrrhiza glabra* Linn.), Guduchi (*Tinospora cordifolia* (Wild) Miers.) and Shankhapushpi (*Convolvulus pleuricaulis* Chois or *Evolvulus alsinoides*),[2] that can be used singly or in combinations. They are specially mentioned for children with wide range of applications on different systems. Considering the overall effect of the individual Medhya Rasayana, a thought was given to develop a combination of all these and to standardize the same for wide spectrum use. As the majority of the drugs used in the preparation are predominant of Tikta rasa (bitter), obviously the prepared drug will also be the same. Hence, classical dosage forms of these drugs would be difficult to be given to children owing to unacceptable palatability. Storage of drugs over a period in the classical described form is also a difficult task. Fresh preparation and administration thereon of drug to large population is also not easy. Maintaining

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uniform dosage also will be a challenge. Considering these facts, it was thought to develop tablets from the combination drug which would be most suitable mode of administration. More over the proposed method of making it into Rasakriya tablet will also aid in yielding concentrated medicament with the same efficacy as for the classically proposed drug dosage at lower dose. The drug thus prepared will also be benefited with enhanced shelf life of 1 year.[3] Development of a composite standardization protocol for Medhya Rasayana (MR) in tablet form is aimed in the current study.

2. Materials and methods

2.1. Plant materials

Required plant medicines such as whole plant of Mandookaparni, stem of Guduchi and root of Yastimadhu were collected from authorized raw drugs suppliers of SDM Ayurveda Pharmacy, Kuthpady, Udupi. Shankhapushpi was collected from M/s Dhanwantari Vana, the Garden for Medicinal plants in Bangalore, Government of Karnataka undertaking. The raw materials were first identified and authenticated by experts at SDM Ayurveda Pharmacy, Kuthpady, Udupi.

2.2. Preparation of Medhya Rasayana tablet

As per the classical description Guduchi Kashaya (decoction),[4] Shankhapushpi Kalka (macerated paste of fresh plant)[5] and Mandukaparni Swarasa (fresh juice)[6] prepared separately and were later mixed thoroughly and heated on Mandagni (mild fire). When decoction became thick, Yastimadhu Churna (powder) was added and heated till it became semi solid in consistency (method of preparation of Rasakriya).[7] Tablets of 250 mg (drug weight) were punched and packed in air tight containers.

2.3. Instrumentation and techniques

Physico-chemical determination of total ash, acid insoluble ash and water soluble ash, loss on drying at 110 °C, water soluble extractive, and alcohol soluble extractive tests were done at Bangalore Test house as per API[8] standards. Assay for bitter substances and glycyrrhizin contents were done as per the protocol in standardization of botanicals.[9] Disintegration time of the tablets was assessed as per IP.[10] HPTLC studies were done at SDM Centre for Research in Ayurveda and Allied Sciences, Kuthpady, Udupi as per standard procedure.[11,12] To develop HPTLC fingerprinting of chloroform and alcohol (successive) extract of MR, 5 g of the powdered tablets were extracted successively with chloroform and ethanol using a Soxhlet extractor. The extracts were separately distilled off and dissolved in 30 ml of respective solvents. 10, 20 and 30 μl of the above extract is applied on precoated silica gel F_{254} on aluminium plates to a band width of 7 mm at 3 concentration levels of 10, 20 and 30 μl using Linomat 5 TLC applicator. The chloroform extract was developed in toluene:ethyl acetate (6.5:2.5) and the alcohol extract in toluene:ethyl acetate:acetic acid:methanol (3:5.5: 0.8: 0.1).

HPTLC fingerprint profile MR tablet and its ingredients were obtained by extracting 3 g each of the samples in 10 ml ethanol by cold percolation for 48 hours. The filtrates were made up to 30 ml and 20 μl of the above extracts were applied on a precoated silica gel F_{254} on aluminium plates to a bandwidth of 8 mm using Linomat 5 TLC applicator. The plate was developed in toluene–ethyl acetate (7:2.5) and the developed plates were visualized and scanned under UV 254, 366, and after derivatisation in vanillin-sulphuric acid spray reagent at 620 nm. R_f, colour of the spots, densitogram were recorded.

3. Results

Physico-chemical standards for poly herbal formulation MR is presented in Table 1. R_f values of the spots and their colour by TLC photo-documentation of chloroform and alcohol extracts of MR have been developed. Chloroform extract of MR at 254 nm showed 8 spots (0.11 Dark green, 0.22 Green, 0.31 Dark green, 0.36 Green, 0.43 Green, 0.65 Green, 0.69 Green, 0.80 Dark green) whereas under 366 nm it showed 15 spots (0.02 Fluorescent (F) brown, 0.04 F blue, 0.07 F pink, 0.09 F blue, 0.11 F blue, 0.18 F blue, 0.22 F blue, 0.33 F blue, 0.43 F violet, 0.51 F light blue, 0.57 F violet, 0.65 F blue, 0.71 F pink, 0.76 F pink, 0.84 F pink) and 9 spots (0.22 Yellow, 0.33 Dark pink, 0.43 Yellow, 0.54 Green, 0.57 Green, 0.65 Pink, 0.74 Pink, 0.84 Light green, 0.92 Dark green) after derivatisation using toluene:ethyl acetate (6.5:2.5) as solvent system. Alcohol extract of MR at 254 nm showed only 3 spots (0.18 Light green, 0.35 Light green, 0.45 Green) whereas under 366 nm it showed 7 spots (0.18 F green, 0.43 F blue, 0.52 F green, 0.61 F violet, 0.66 F blue, 0.70 F yellow, 0.75 F pink) and 5 spots (0.06 Brown, 0.09 Yellow, 0.56 Orange, 0.64 Pink, 0.70 Blue) after derivatisation using toluene:ethyl acetate:acetic acid:methanol (3:5.5:0.8:0.1) as solvent system.

The product MR tablet was analysed for its fingerprint in comparison with its four ingredients by TLC photo documentation using toluene:ethyl acetate (7:2.5) as solvent system. At 366 nm, 4 spots of the MR showed same R_f value (0.03 F pink, 0.52 F pink, 0.62 F green and 0.78 F pink) as that of *E. alsinoides*. Spots with R_f 0.62 (F green) and 0.78 (F pink) being of same colour indicated the presence of *E. alsinoides* in the formulation. Out of 12 spots of MR at 366 nm, 5 spots showed same R_f values (0.03 F pink, 0.52 F pink, 0.62 F green, 0.71 F pink and 0.78 F pink) in *C. asiatica*. Spots with R_f 0.62 (F green), 0.71 (F pink) and 0.78 (F pink) being of same colour indicating the presence of *C. asiatica* in MR as one of the ingredient. 5 spots of MR showed same R_f value (0.03 F blue, 0.06 F blue, 0.14 F blue, 0.34 F blue and 0.62 F green) in *G. glabra*. Spots with R_f 0.03 (F blue), 0.06 (F blue) and 0.34 (F blue) were being of same colour indicating the occurrence of *G. glabra* in MR. None of the spots detected in MR corresponded to that in *T. cordifolia* at 366 nm which may be due to the presence of high polar of compounds which were not resolved in the solvent system used. HPTLC fingerprint profile and densitometric scan of chloroform and alcohol extract as well as MR in comparison to its ingredients at UV 254 nm, 366 nm, and post derivatisation at 620 nm were developed to help in the standardization of the phytochemicals in the formulation (Figs. 1 and 2).

4. Discussion

Despite the advent of modern technology in standardization of compound formulations, only a few Ayurvedic poly herbal medicines are standardized so far. The novel concentrated compound formulation Medhya Rasayana vati thus developed yield better

Table 1
Physico-chemical characters of Medhya Rasayana tablet.

Parameters	Results
Loss on drying at 110 °C (% w/w)	6.065
Total ash (% w/w)	10.80
Water soluble ash (% w/w)	8.13
Alcohol soluble extractive (% w/w)	15.3
Water soluble extractive (% w/w)	25.01
Average weight (g)	0.3614
Hardness (kg/cm^2)	2
Disintegration time (min)	2
Bitter content (% w/w)	4.81
Glycyrrhizin content (% w/w)	2.82

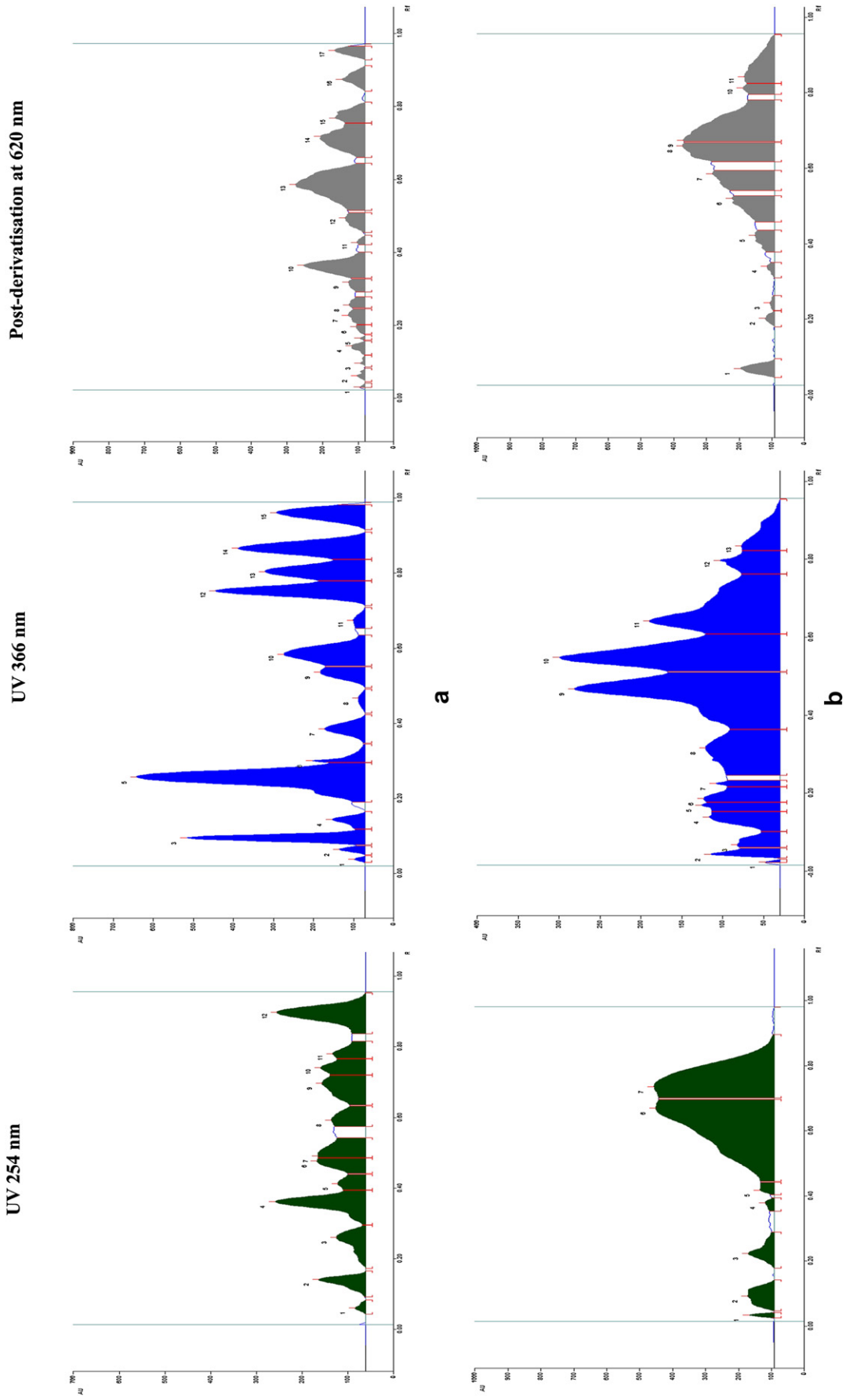

Fig. 1. HPTLC densitometric scan of chloroform and alcohol extract of Medhya Rasayana. (a): Chloroform extract using toluene:ethyl acetate (6.5:2.5), (b): Alcohol extract using toluene:ethyl acetate:acetic acid:methanol (3:5.5:0.8:0.1).

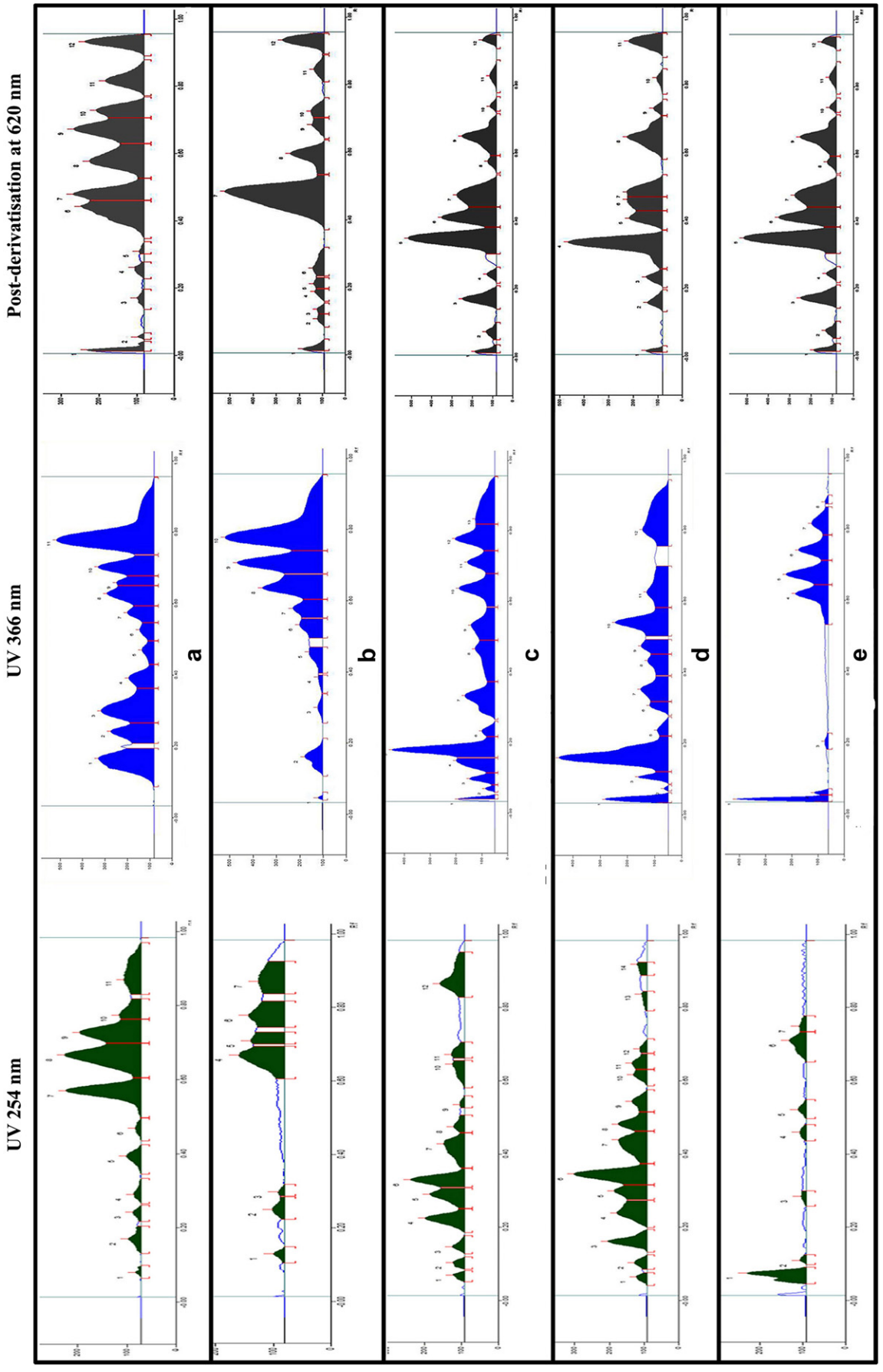

Fig. 2. HPTLC densitometric scan of Medhya Rasayana with its ingredients. (a): *E. alsinoides*, (b): *C. aciatica*, (c): Medhya Rasayana, (d): *G. glabra*, (e): *T. cordifolia*.

acceptability in terms of palatability, increased shelf life and as compared to prescribed forms in a lesser dose. The physico-chemical standards would serve as preliminary test for the standardization of the formulation. The unique R_f values, densitometric scan and densitogram obtained at different wavelengths pre- and post-derivatisation can be used as fingerprint to identify the poly herbal combination Medhya Rasayana. The current investigation can be used as standardization test for the newly developed compound formulation for Nootropic action. Further, detailed macro-microscopic examination of the raw drug as whole and powder form in comparison with the formulation would add to the standardization test of the Medhya Rasayana vati.

Conflicts of interest

All authors have none to declare.

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