IJPSR (2014), Vol. 5, Issue 7 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 31 January, 2014; received in revised form, 24 March, 2014; accepted, 03 May, 2014; published 01 July, 2014

A CASE STUDY ON *RUBIA CORDIFOLIA L* IN FILM COATING OF TRIPHALA GUGGLE AYURVEDIC TABLETS

N. Rani*[1], A. Goel [1] and M.K. Bhardwaj [2]

Department of Chemistry [1], KGC, Gurukul Kangri Vishvavidhyalaya, Haridwar- 249407, Uttarakhand, India
Patanjali Ayurved Limited [2], Haridwar- 249407, Uttarakhand, India

Keywords:
TGA, Alizarin, Organoleptic, manjistha dye

Correspondence to Author:

Anjali Goel

HOD, Chemistry Department, Kanya Gurukul Campus, Gurukul Kangri University, 249407, Haridwar (Uttarakhand), India

E-mail: neetu.nbd2009@gmail.com

ABSTRACT: Alizarin [1, 2 di hydroxy anthraquinone] is the major pigment, extracted from *Rubia Cordifolia L.* The aim of the present work is to extract manjith dye and alizarin pigment from *Rubia Cordifolia L.*, and use it in the film coating of triphala guggle ayurvedic (TGA) tablet. The optimum extraction conditions for manjistha dye are 60^0C and 60 minute stirring with methanol (80%) and M:L ratio(1:10) with particle size 0.50mm. Separation and purification of alizarin was carried out by column chromatography. The purified alizarin was characterized by UV-Vis, and FT-IR, techniques. Acetylation of alizarin has been carried out with acetic acid in presence of sulphuric acid. Coating offers many benefits namely, improving asthetic qualities of dosage forms, masking unpleasant odour or taste, easy ingestion, and improving product stability. In the present study core tablets of triphla guggul are coated with manjistha extract, manjistha dye, pure alizarin, and acetylated alizarin. After coating, the stability of tablets were evaluated at regular intervals. The purpose of the stability testing is to provide proof of how the quality of a finished product varies with time under the influence of a variety of environmental factors such as temperature, humidity and light. These studies are conducted at 40°C±2°C/75% ± 5% RH in a humidity chamber noted for significant changes occurs at any time during six months. Organoleptic characteristics and physico-chemical parameters were calculated to check the efficacy of tablets.

INTRODUCTION: People were using herbal dyes until the half of the 19th century for dyeing textile material [1]. But the interest in the isolation of natural dyes and colouring matters is increasing due to their applications in food, drugs and other human consumptions [2].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.5(7).2927-35

Article can be accessed online on: www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.5(7).2927-35

Rubia cordifolia L, commonly known as "manjith" is a spready shrub found in the hilly region of the country. Its roots yield dye. The traditional therapeutic and pharmaceutical use of the plant has been for skin disorders and for anticancer activity [3, 4]. Furthermore, the anthraquinones of the Rubiaceae family exhibit some interesting *in vivo* biological activities, such as antimicrobial, antifungal, hepatoprotective, analgesic, antimalarial, antioxidant, urinary disorders and anti-inflammatory [5, 6]. A part from its medicinal value, this plant has also been used as natural food, colorants and as natural hair dyes [7, 8].

The phytochemical studies revealed that the fraction isolated from *R. Cordifolia L.***,** are rich in anthraquinone which may attributed to its hydrogen donating ability [9]. From chemical point of view, alizarin is a hydroxyl derivate of anthraquinone (1, 2-*dihydroxyanthraquinone*) [10].

The application of coatings to pharmaceutical solids has been practiced for over 150 years. It offers many benefits namely, improving asthetic qualities of dosage forms, masking unpleasant odour or taste, easy ingestion, improving product stability and modifying release characteristics of the drug [11]. Besides these qualities the appearance of the coating is very important to the customers, who usually identify and evaluate the tablet according to coating quality. In other words we can say that colours are the cosmetics for solid dosages form. The side-vented, perforated pan coater is the most commonly used coating device of tablets.

In coating process different factors such as coating equipment, process conditions, composition of the core tablet, shape of tablets, coating liquid etc are important which affect the pharmaceutical quality of the final product [12, 13]. High quality film coating must be smooth, uniform and adhere satisfactorily to the tablet surface and ensure chemical stability of a drug [14]. For the success of this purpose in the present work we have used Manjith. Extract, Manjith.dye, alizarin pigment from *Rubia Cordifolia* L, and acetylated alizarin in the coating of TGA tablets. To fulfill the legal requirements with regards to quality including stability testing ICH guidelines are followed [15].

MATERIAL AND METHOD: The roots of *Rubia cordifolia* were collected from Divya Yog pharmacy, Haridwar and identified by Quality Control Department of Patanjali Ayurved Limited, Haridwar. The instacoat powder (ready mix coating powder, Ideal cure, Delhi), was obtained as free sample from Divya Yog Pharmacy, Haridwar. Insta coat powder is consists of HPMC, Polyethylene glycol(PEG), titanium dioxide (TiO_2) and talc. All chemical and reagents used were of AR grade and double distilled water was used throughout the analysis. Systronic -117, UV-vis spectrophotometer was used for the determination of λ_{max} of manjistha dye and alizarin.

The measurement of colour intensity of the extracted dye solution was made by Tintometer -F Lovibond. The coatings were applied on laboratory scale in a Pan Coating Apparatus (Hareson Pharma Pvt Ltd.). A high Shear Mixer (Remi Equipments Pvt. Ltd) is used to make the coating solution. Stability testing has been carried out in humidity chamber (TMG India MUMBAI). For coating of the Ayurvedic tablets the work has been completed into two parts as reported earlier.

Optimization of extraction conditions [16].

Coating of Ayurvedic tablets with M. extract, M. dye, alizarin, and acetylated alizarin.

Optimization of the extraction conditions:

Extraction of Manjith dye from *Rubia cordifolia* L: Root of *Rubia Cordifolia* L., were washed thoroughly with distilled water and dried with suitable temperature about. These were then crushed in the coarse powder. The crushed powder was passed through different sieves (mesh size 0.20, 0.40, 0.50, 0.60, and 0.80 mm) [17] to get desired particle size. Powdered raw material (50 gm) was soaked in (500 ml) of solvent (1:10) and kept overnight. In order to determine the optimum extraction conditions, a number of experiments were carried out with different solvent (water, methanol and ethanol) at various temperature and different stirring time [18]. After optimization of extraction conditions the colorant extracted from *Rubia cordifolia* L was evaporated to dryness under reduced pressure by rota vapour and vacuume dried to obtained manjistha dye powder.

Extraction of Alizarin: The alizarin content of the roots depends on the season and on the kind of soil, although the average content is about 1.9% w/w. Extract Rubia root with methanol (80%), three times by maceration at room temperature for 3-4 hrs each time. Collect the filtrate and distill the solvent under vacuum. Remove brown precipitated separated by filtration. Extract the aqueous phase with 200 ml ethyl acetate in separator three times. Combine ethyl acetate extract and add to it 50 gm anhydrous sodium sulphate, shake for 30 min., filter and distill solvent completely.

A sticky reddish orange color residue is obtained, dissolve in minimum ethyl acetate, methanol mixture (30:70) and load it on silica gel column prepared by using n-hexane. Elute with hexane then Concentrate the hexane soluble to achieve orange colour crystals of Alizarin, which can further be purified by recrystallization in pure methanol [19, 20].

Acetylation of Alizarin: Take 5 gm of Alizarin powder in a 100 ml round bottom flask. Add 25ml acetic acid glacial and 2-5 drops of conc. H_2SO_4. Reflux it for four hours at 40-50^{0}C. After 4 hours refluxing, treat this mixture into ice-water and filter the precipitates. After filtration wash the precipitates with distilled water and then dry in vacuum oven. These are the pure crystals of acetylated alizarin [21].

Coating of Ayurvedic tablets with M. extract, M. dye, alizarin, and acetylated alizarin

Preparation of coating solution: Required quantity (3% weight gain) of instacoat powder (ready mix powder, Ideal cure, Delhi) was added in water and IPA (60: 40) was taken into solution prepration tank or suitable vessel with high shear mixer at a speed of 250-300 rpm for 20-30 min. The use of alcohol/water solvents also allowed for relatively fast coating [22]. Stirr the mixture of solvents to form a vortex without entrapment of air in to the liquid. 2.0-2.5% pigment was added with stirring till all colorant get mixed properly. Then this solution was filtered through 100 mesh.

Coating process: Tablet coating was performed in a conventional coating pan, with one spray gun. The coating pan was previously cleaned using alcohol 95%. A batch size of 500gm of TGA core tablets was selected for coating. Before coating optimized conditions of coating process parameter were adjusted. The core tablets were loaded into the coating pan. Tablet cores were pre-heated to about 40°C utilizing a dryer and air compressor. Warm air was introduced into the coating pan (up to 35–40°C) during the entire coating process. The spray gun was filled with coating solution and operated at a proper flow rate (10 ml/min). The tablets were blow dried for 20-25minutes in the coating pan. The core tablets gained 3% weight. After coating of tablets these were evaluated for organoleptic and physico-chemical testing.

Stability study: Accelerated Stability tests were reserved at 40±2 °C and 75±5% RH, in a humidity chamber (HMG India, Mumbai). The accelerated stability samples were pulled from stability and tested 0, 1, 2, 3 and 6 months after the date of packaging. The purpose of the stability testing is to provide evidences on how the quality of a drug varies with time under the influence of a variety of factor such as temperature, humidity and light. There are no guidelines that provide sufficient details regarding parameters on which stability can be done. To check the stability of tablets, the samples were put on polythene pouches having aluminium foil covering in humidity chamber for a period of 6th month, and then sample were analyzed for every month for first three months and every three month for six months at 40˚C±75% RH [23].

Results of optimization of extraction conditions: The results show that during extraction the yield of dye depends a lot on extraction conditions i.e, particle size, temperature, solvent, stirring time and material to liquor ratio [24, 25]. **Fig-1, 2, 3, show** that 60^{0}C and 60 min stirring with methanol (80%), and M:L ratio (1:10) with particle size 0.50 mm are the best extraction conditions.

RESULTS AND DISCUSSION:

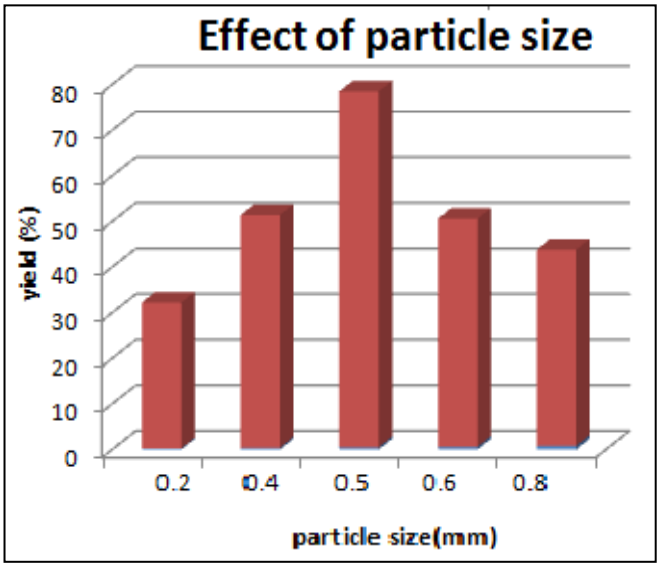

FIG. 1: EFFECT OF PARTICLE SIZE

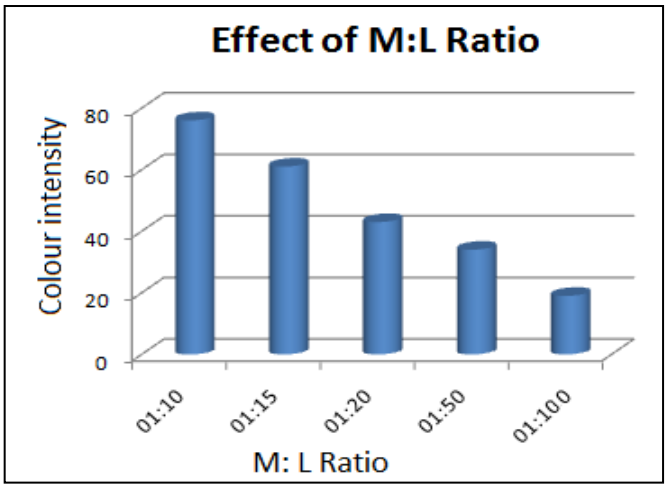

FIG. 2: EFFECT OF M: L RATIO

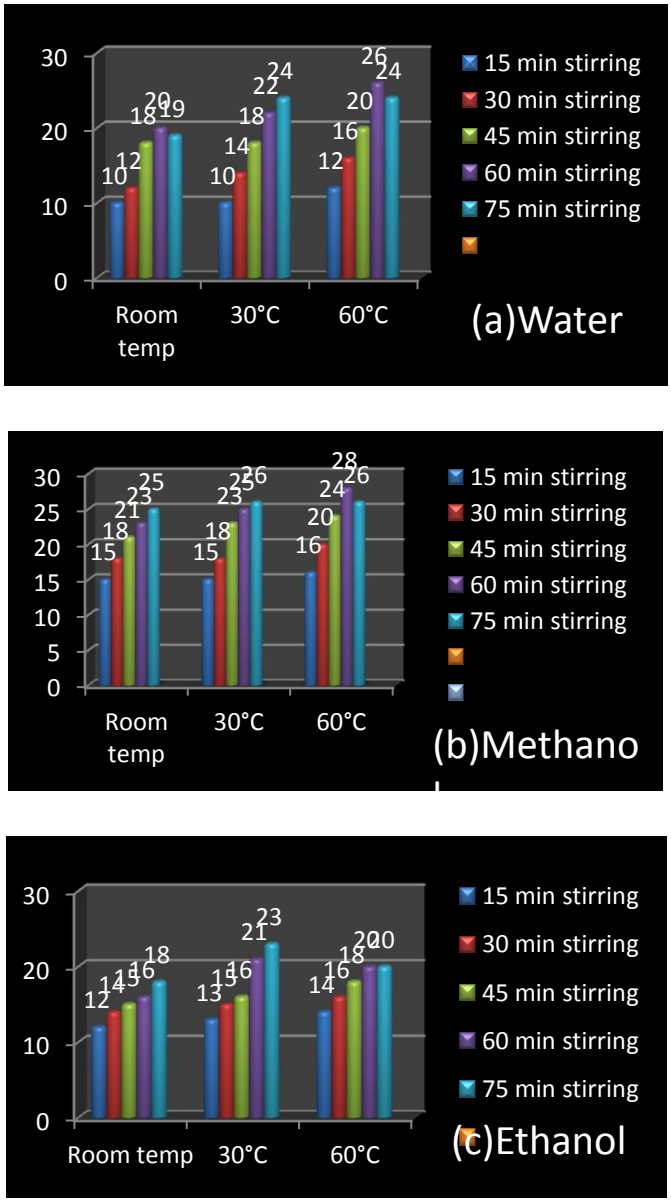

FIG. 3A, B, C: RELATIVE COLOUR INTENSITY WITH (A) WATER (B) METHANOL (C) ETHANOL

The UV- visible spectra of Manjistha dye were taken with different solvents like water, methanol, and ethanol**. Fig. 4 & 5** show absorption maxima at 410 nm with methanol, ethanol and water which corresponds to the reported value [26]. In **Fig. 6 & 7,** the λ_{max} for the extracted alizarin is at 246nm & 436nm and for acetylated alizarin is at 246nm, 280nm and 540 nm. The comparison of the two spectra shows that during acetylation the peak at 436nm shifts to 540nm and a new peak appear at 280 nm due to acetylation. Alizarin and acetylated alizarin are also characterized by their melting point which corresponds to reported value [27].

The characterization of alizarin and acetylated alizarin was carried out by FTIR (SHIMADZU, Modal no-840050). The FTIR spectra of Alizarin shows band near frequency 3330-3370 cm^{-1} due to O-H stretching and at 1580 cm^{-1} for -C=C olefienic stretching. Other significant bands were observed at 1662 cm^{-1} and 1628 being assigned to the C=O stretching and at 2903 cm^{-1} for enolic O-H stretching. In acetylated Alizarin the bands present at 2903 cm^{-1} position disappear and a new bands at 1830 cm^{-1} show the formation of new group aryl unsaturated anhydride [28, 29].

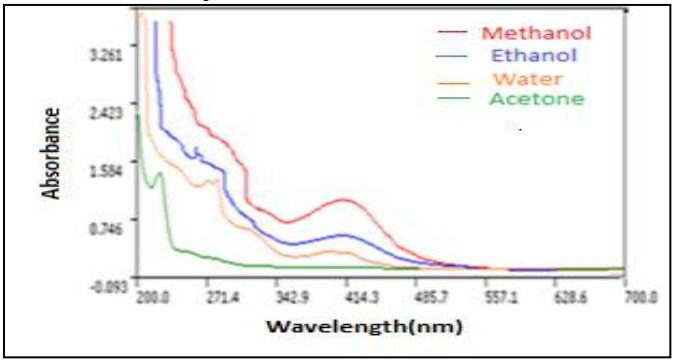

FIG. 4: ABSORPTION SPECTRA OF M.DYE EXTRACTED FROM WITH VARIOUS SOLVENTS

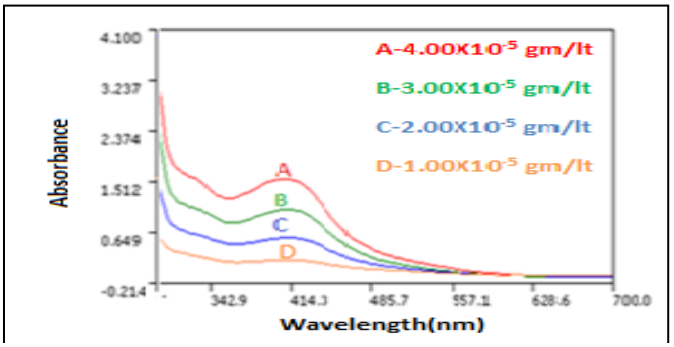

FIG. 5: ABSORPTION MAXIMA OF METHANOLIC SOLUTION OF *R.CORDIFOLIA L* AT VARIOUS CONCENTRATIONS

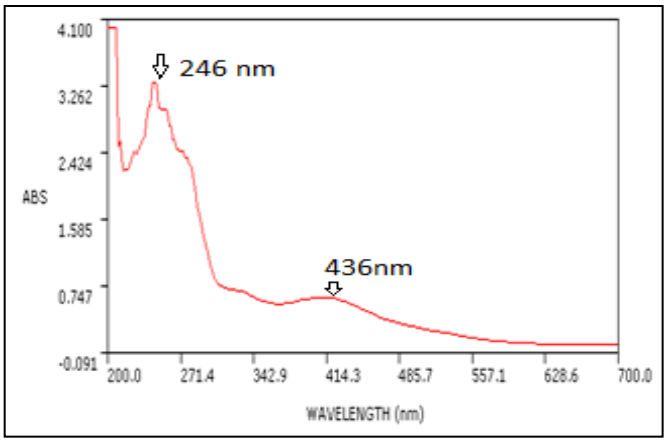

FIG. 6: UV-VISIBLE SPECTRA OF PURE ALIZARIN EXTRACTED

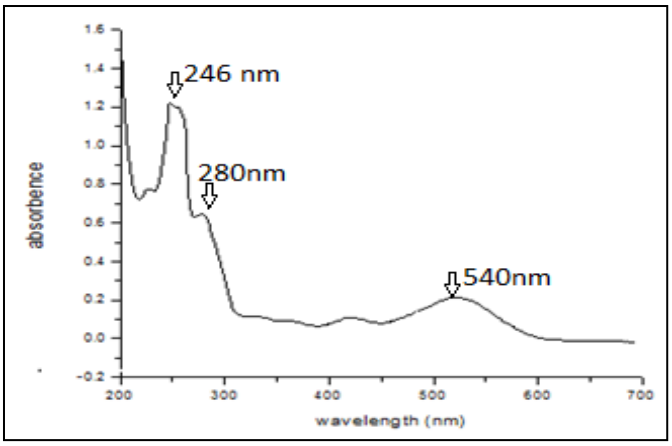

FIG. 7: UV-VISIBLE SPECTRA OF ACETYLATED ALIZARIN

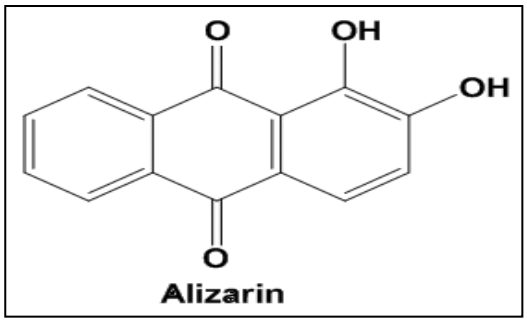

FIG. 8: CHEMICAL STRUCTURE OF ALIZARIN

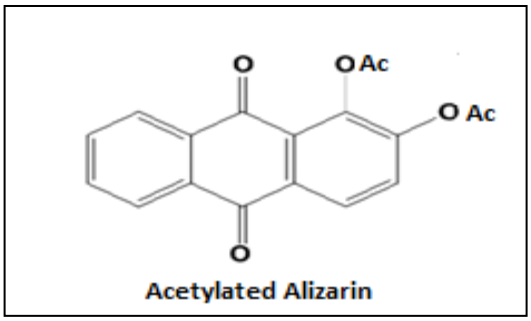

FIG. 9: CHEMICAL STRUCTURE OF ACETYLATED ALIZARIN

Coating of Ayurvedic tablets: The TGA tablets coated with M. extract, M.dye, Alizarin and Acetylated alizarin were exposed at 40±2^{0}C and 70±5% RH in a stability chamber. For stability study the coated tablets were packed in polythene pouches having aluminium foil covering subjected to storage for six months i.e May to November 2013. The results of organoleptic characteristics presented in **Tables 1, 2, 3, 4** shows that the tablets coated with M. extract and M.dye are stable up to one month only in both condition and after that fading starts, while tablet coated with alizarin and acetylated alizarin are stable up to six months.

TABLE 1: RESULTS FOR ACCELERATED STABILITY STUDY AT 40 ±2˚C, 75±5% RH OF TABLET COATED WITH M- EXTRACT

S.N	Parameters	STD Value (IP and In house of Divya Pharmacy)	Initial (25 May, 2013)	1st month	2nd month	3rd month	6th month
Organoleptic Characters							
1	**Colour**	Brown	Complies	Complies	Not Complies	Not Complies	Not Complies
2	**Odour**	Herbal	Complies	Complies	Complies	Complies	Complies
3	**Surface**	Smooth	Complies	Complies	Not Complies	Not Complies	Not Complies
Physico- Chemical Characters							
1	**20 tab. Wt**	10.0±5%mg	10.31±0.02	10.31±0.024	10.31±0.028	10.31±0.021	10.35±0.013
2	**Hardness**	Not less than 1 kg/cm^2	2.18±0.14	2.17±0.07	2.16±0.14	2.12±0.14	1.85±0.66
3	**Diameter**	10.40mm-10.80 mm	10.69±0.018	10.69±0.009	10.70±0.018	10.70±0.009	10.73±0.018
4	**Thickness**	5.60mm-6.20mm	5.79±0.015	5.78±0.009	5.81±0.015	5.81±0.009	5.82±0.018
5	**Friability**	Not more than 1%	0.78±0.021	0.86±0.015	0.87±0.009	0.87±0.015	1.06±0.15
6	**Disintegration Time**	Not more than 60 min	56.28±0.55	52.47±0.13	48.55±0.58	48.23±0.56	46.23±0.56
7	**LOD**	Not more them 8%	6.51±0.02	7.14±0.12	8.12±0.09	8.72±0.01	8.98±0.18

TABLE 2: RESULTS FOR ACCELERATED STABILITY STUDY AT 40 ±2˚C, 75±5% RH OF TABLET COATED WITH M- DYE

S. No.	Parameters	STD Value (IP and In house of Divya Pharmacy)	Initial (25 May, 2013)	1st month	2nd month	3rd month	6th month
Organoleptic Characters							
1	Colour	Brown	Complies	Complies	Not Complies	Not Complies	Not Complies
2	Odour	Herbal	Complies	Complies	Complies	Complies	Complies
3	Surface	Smooth	Complies	Complies	Not Complies	Not Complies	Not Complies
Physico- Chemical Characters							
1	20 tab. Wt	10.0±5%	10.32±0.03	10.32±0.02	10.33±0.02	10.34±0.020	10.36±0.011
2	Hardness	Not less than 1 kg/cm^2	2.56±0.65	2.56±0.23	2.54±0.23	2.11±0.25	1.37±0.25
3	Diameter	10.40mm-10.80 mm	10.69±0.02	10.69±0.01	10.70±0.02	10.70±0.009	10.73±0.018
4	Thickness	5.60 mm-6.20mm	5.79±0.015	5.78±0.009	5.81±0.015	5.81±0.009	5.82±0.018
5	Friability	Not more than 1%	0.91±0.029	0.96±0.020	0.97±0.012	0.98±0.020	1.03±0.19
6	Disintegration Time	Not more than 60 min	58.13±2.10	56.54±1.33	49.1±0.54	48.20±1.55	45.15±2.64
7.	LOD	Not more than 8%	4.26±0.02	5.07±0.018	8.13±0.019	8.34±0.035	8.62±0.015

TABLE 3: RESULTS FOR ACCELERATED STABILITY STUDY AT 40 ±2˚C, 75±5% RH OF TABLET COATED WITH ALIZARIN

S. No.	Parameters	STD Value (IP and In house of Divya Pharmacy)	Initial (25 May, 2013)	1st month	2nd month	3rd month	6th month
Organoleptic Characters							
1	Colour	Brown	Complies	Complies	Complies	Complies	Complies
2	Odor	Herbal	Complies	Complies	Complies	Complies	Complies
3	Surface	Smooth	Complies	Complies	Complies	Complies	Complies
Physico- Chemical Characters							
1	20 tab. Wt (mg)	10.0±5%	10.32±0.02	10.32±0.02	10.33±0.02	10.33±0.025	10.33±0.01
2	Hardness (kg/cm^2)	Not less than 1	3.25±0.65	3.31±0.23	3.37±0.35	3.37±0.14	3.50±0.20
3	Diameter (mm)	10.40-10.80	10.70±0.03	10.70±0.01	10.71±0.01	10.71±0.01	10.71±0.005
4	Thickness (mm)	5.60-6.20	5.80±0.012	5.80±0.014	5.81±0.012	5.81±0.014	5.81±0.005
5	Friability (%)	Not more than 1%	0.29±0.046	0.30±0.035	0.31±0.02	0.29±0.035	0.29±0.035
6	Disintegration Time (min)	Not more than 60min	59.07±0.56	59.05±1.15	58.08±0.86	58.43±1.34	58.18±1.68
7.	LOD	Not more than 8%	2.23±0.012	2.52±0.018	3.58±0.02	3.68±0.01	4.27±0.015

TABLE 4: RESULTS FOR ACCELERATED STABILITY STUDY AT 40 ±2˚C, 75±5% RH OF TABLET COATED WITH ACETYLATED ALIZARIN

S.N	Parameters	STD Value (IP and In house of Divya Pharmacy)	Initial (25 May, 2013)	1st month	2nd month	3rd month	6th month
Organoleptic Characters							
1	**Colour**	Brown	Complies	Complies	Complies	Complies	Complies
2	**Odor**	Herbal	Complies	Complies	Complies	Complies	Complies
3	**Surface**	Smooth	Complies	Complies	Complies	Complies	Complies
Physico- Chemical Characters							
1	**20 tab. Wt**	10.0±5%	10.34±0.035	10.34±0.02	10.34±0.016	10.34±0.012	10.34±0.016
2	**Hardness**	Not less than 1 kg/cm^2	3.31±0.23	3.37± 0.20	3.37±0.12	3.37±0.12	3.62±0.27
3	**Diameter**	10.40mm-10.80 mm	10.71±0.014	10.71±0.05	10.71±0.009	10.71±0.018	10.71±0.005
4	**Thickness**	5.60 mm-6.20mm	5.81±0.018	5.82±0.005	5.82±0.018	5.82±0.005	5.82±0.018
5	**Friability**	Not more than 1%	0.29±0.034	0.30±0.025	0.31±0.04	0.32±0.025	0.33±0.018
6	**Disintegration Time**	Not more than 60 min	59.03±0.54	59.04±0.93	58.45±0.50	58.15±0.125	58.05±0.59
7	**LOD**	Not more them 8%	2.71±0.018	3.29±0.018	3.59±0.018	3.78±0.018	4.25±0.018

Fig. 10, show the visual inspection of coated tablet. Further the suitability of coating was checked by studying different physico- chemical parameters. The important properties of the core tablets such as hardness, friability, must be of particular attention for preventing tablets fragmentation during coating process [30]. The results of physico-chemical parameters of all coated tablets show that wt. variation, diameter, thickness, hardness, and friability of all type coated tablets remain within permissiable limits prescribed by Divya Yog Pharmacy, Haridwar. But the friability results during six months of M-extract and M-dye coated tablets show slight higher values of 1.06 & 1.03 % respectively from the prescribed value of 1% [31,32].

The results of disintegration time of all the four type of coating remains under limits up to the six months but LOD of M- ext and M-dye increases beyond limits of 8% after two months due to moisture gain by the dye, while in alizarin and acetylated alizarin coated remain in limits. This may be due to the fact that pigments have been reduced moisture diffusion through the film and improve light stability as compared with dye 33 and the tablets coated with acetylated alizarin found very stable due to acetylation moisture does not affect the tablet and tablet remain very stable. Thus the tablets coated with alizarin and acetylated alizarin found very suitable for six months.

FIG. 10: THE VISUAL INSPECTION OF TABLET COATED WITH M.EXTRACT, M.DYE, ALIZARIN AND ACETYLATED ALIZARIN AT 0 (INITIAL), 1ST, 2ND, 3RD AND 6TH MONTH

CONCLUSION: Thus, from the above results and discussion it can be concluded that for the extraction of M-dye the most favorable experimental conditions are at 60^0C, 60 min stirring time with methanol(80%) to M:L ratio (1:10)with particle size 0.50 mm. Alizarin was isolated by column chromatography and further purified by recrystallization with methanol.

The TGA tablet coated with M-extract, M-dye are not very stable but the TGA tablet coated alizarin and acetylated alizarin is stable beyond six months. Thus acetylated alizarin can be recommended for coating of TGA tablets.

ACKNOWLEDGEMENTS: Authors are thankful to Patanjali Ayurved Limited, Haridwar for providing practical support and to use their laboratories and instruments facilities.

ABBREVIATIONS:

TGA tablets -Triphala Gugglu Ayurvedic tablets

M- Ex - Manjistha extract
M. dye - Manjistha Dye
ICH - International conference of Harmony

REFERENCES:

1. Patel. AR, Pink shade developed on cotton yarn from *Rubia cordifolia* Linn, Life sciences Leaflets, 2011; 19: 780 –784.
2. Kaur P, Singh B, Kumar S, Kaur S, In vitro evaluation of free radical scavenging activity of Rubia cordifolia, L, Journal of Chinese clinical medicine, 2008; 3(5), 278-284.
3. Archana M. Gorle, Swati S. Patil, Evaluation of antioxidant and anticancer property of *Rubia cordifolia*, Pelagia Research Library , Der Pharmacia Sinica, 2010; 1 (3), 59-63.
4. Patel Parag R, Ngar Akhil A, Patel Rikin C , Rathode Dhara K. , Patel Vishal R., *In-vitro* anticancer activity of *Rubia Cordifolia* against Hela and Hep-2 cell lines, International Journal of Pharmacy and Pharmaceutical Science, 2011; 3 (2), 70-71.
5. Singh R and Geetanjali. Isolation and synthesis of anthraquinones and related compounds of *Rubia cordifolia*. J. Serb. Chem. Soc. (2005); 70 (7), 937–942.
6. Taiailor C S, Bahuguna YM, Singh Vijendra, Tailor C.S et al, An ant-inflammatory activity of ethanolic stem extracts of *Rubia cordifolia* Linn in Rats, IJRAP 2010; 1(1), 126-130.
7. Itokawah, Takeyak, Morin et al, Studies on antitumor cyclic hexa peptides RA obtained from Rubia Radix, Rubiaceaeon derivatives of RA V and their in vivo activities. Chemical and pharmaceutical Bulletin, 1984; 32: 3216-3226.
8. Gokhale SB, Tatiya AU, Bakliwal SR and Fursule RA, Natural dye yielding plants in India, Natural Product Radiance, 2004; 3(4): 228-234.
9. Dabiri M, Salimi S, Ghassempour. A, Rassouli A, Talebi M, Optimization of microwave-assisted extraction for alizarin and purpurin in Rubiaceae plants and its comparison with conventional extraction methods, J. Sep. Sci. 2005; 28: 387–396.
10. Onal, A, Extraction of dyestuff from madder plant (*Rubia cordifolia* L,) and dyeing of wool, feathered- leather and cotton, Tr. J of chemistry, 1996; 20: 204-213.
11. Porter SC, Verseput RP, and Cunningham CR, Process optimization using design of experiments, Pharm. Technol, 1997; 21: 60-70.
12. Zaid A.N, and Qaddomi A, Development and stability evaluation of enteric coated Diclofenac sodium tablets using Sureteric , Pak. J. Pharm. Sci., 2012; 25(1), 59-64.
13. Deepa P & and Kannappan N, Comparative stability study of formulated Ayurvedic health supplement and marketed product , Der Pharma Chemica, 2012; 4(5), 2068-2072,

14. Felton LA, McGinity JW. Adhesion of polymeric films to pharmaceutical solids. Eur J Pharm Biopharm. 1999; 47: 1-14.
15. Stability testing for new dosage forms-Q1C. (ICH), International Conference on Harmonization, 1996.
16. Goel. A, Bhardwaj MK, and Rani. N, Application of turmeric dye in the coating of *Triphala guggle* Ayurvedic tablet, JANS Journal of Applied and Natural Science, 2011; 3 (2), 307-311.
17. Guillaume Cuocoa, Carole Mathea, Paul Archiera, Farid Chematb, Cathy Vieillescazesa, A multivariate study of the performance of an ultrasound-assisted madder dyes extraction and characterization by liquid 2 chromatography-photodiode array detection, , Ultrasonic sonochemistry, 2008; 16(1): 75-82.
18. Saima Umbreen, Shaukat Ali, Tanveer Hussain and Rakhshanda Nawaz, Dyeing Properties of Natural Dyes Extracted from Turmeric and their Comparison with Reactive Dyeing, RJTA, 2008; 12 (4), 1-8.
19. Kaura Prabhjit , Kaura Satwinderjeet , Kumarb Subodh and Singhb Palwinder, *Rubia cordifolia* L. and Glycyrrhiza glabra L. Medicinal Plants as Potential Source of COX-2 Inhibitors, Am. J. Biomed. Sci. 2010; 2(2), 108-120.
20. Kaura P, Singh. B, Kumar. S, Kaur. S, *In vivo* evaluation of free radical scavenging activity of *Rubia cordifolia* L, Journal of Chinese Clinical Medicine, 2008; 3(5), 278-284.
21. Goel. A, Bhardwaj MK, and Rani. N, Suitability of curcumin pigment in the coating of Triphla Guggul Ayurvedic tablets, Biotech book publication, 2013; 67-77.
22. Kanakal MM, Sakeena MHF, Azmin M N, and Yusrida D, Effect of Coating Solvent Ratio on the Drug Release Lag Time of Coated Theophylline Osmotic Tablets, Tropical Journal of Pharmaceutical Research, June 2009; 8 (3), 239-245.
23. Gupta Ankit, Jaiswal Mudeep and Prajapati Pradeep K, Shelf life of Ayurvedic dosage forms- Traditional view, current status and prospective, Indian Journal of traditional Knowledge, 2011: 10(14): 672-677.
24. Ashish Kumar Samanta & Priti Agrawal, application of natural dye on textile, Indian journal of Fibre & textile Research, 2009; 34: 384-399.
25. D.De. Santis, M.Moresi, Production of Alizarin extract form *Rubia tincttorium* as assessment of their dyeing properties, Industrial crops and products, Science direct, 2007; 26: 151-162.
26. Ekrami E, Goodarzian H, and Okazi M. Determination of madder dye concentration via derivative spectrophotometry and peak to peak technique. World Applied Science Journal, 2010, 11(2): 165-169.
27. Manmeeta, Saxena D, Sharma, G.D. and Roy M.S., Improved performance of oxidized Alizarin based Quasi solid state Dye Sensitized solar cell by Surface Treatment International Science Congress Association, Res.J.Chem.Sci, 61, 2012; 2(2), 61-71.
28. Bhuyan Ranjana, Saika CN, Isolation of colour component from native dye bearing plants in northestrn India. Bioresources technology, 2005; 96: 363-372.
29. John A Dean, LANGS, Handbook of Chemistry, Fifteenth edition.
30. Porter SC, Coating of pharmaceutical solid-dosage forms, Pharm. Tech., 1980; 4(3): 66-69.
31. Anwar E, Arsyadi, and Kardono LBS, Study of coating tablet extract noni fruit (*Morinda citrifolia* L.) with maltodextrin as a subcoating material. J. Med. Sci., 2007; 7(5): 762-768.
32. Bhopale N.M, Aswar PB, Banarase NB and Khadabadi SS, Design, Development and In-vitro Evaluation of Sustain Release *Rubia cordifolia* Matrix Tablet. Research J. Pharm. and Tech. 2008; 1(4), 475-477.
33. Allam K.V, Kumar G.P, Colorants - The cosmetics for the Pharmaceutical dosage forms International J. Pharm. Pharmac. Sci. 2011; 3(3): 13-21.

How to cite this article:
Rani N, Goel A and Bhardwaj MK: A case study on *Rubia cordifolia l* in film coating of Triphala Guggle Ayurvedic tablets. *Int J Pharm Sci Res* 2014; 5(7): 2927-35.doi: 10.13040/IJPSR.0975-8232.5 (7).2927-35.