International Journal of Applied Ayurved Research ISSN: 2347- 6362

ANALYTICAL STANDARDIZATION OF *KUKKUTNAKI GUGGULU*

[1*]Khan Mujahid B., [2]Sathe Ninad, [3]Deshmukh Ashwini, [4]Rajput Dhirajsingh
[1]Assistant Professor Dept of Rasashastra & Bhaishajya Kalpana , Mahatma Gandhi Ayurved College, Hospital and Research center Salod, Wardha
[2]Professor, Dept .of Rasashastra & Bhaishajya kalpana, Dr. G.D. Pol foundations Y.M.T Ayurvedic medical college and hospital, Kharghar, Navi Mumbai
[3]Associate Professor, Dept .of Rasashastra & Bhaishajya kalpana Dr. G.D. Pol foundations Y.M.T Ayurvedic medical college and hospital, Kharghar, Navi Mumbai.
[4]Assistant Professor, Dept .of Rasashastra & Bhaishajya kalpana, Mahatma Gandhi Ayurved College, Hospital and Research center Salod, Wardha.

ABSTRACT

Herbs are natural resources for a variety on biochemical products and are used medicinally in different countries; they are the source of many potent and effective drugs. According to retrospective literary review, the combination of *Kukkutnaki* (*Aspidium cicutarium* Sw.) and purified *Guggulu* (*Commiphora mukul* Hook. Ex Stocks) was first mentioned in book *Chikitsa pradeep* named as *Kukkutnaki Guggulu. This Anubhut* herbal formulation *Kukkutnaki Guggulu* was prepared according to text "*Guggulu kalpana".* It was documented as a herbal drug which is used for goiter, cysts, tumors, tonsilitis, abscess. The quality test for the finished product were performed in which total ash% 6.49 ±0.553, acid insoluble ash% 1.323± 0.547, water soluble extract% 35.64±0.590, alcohol soluble extract% 20.45±0.822, pH 3.81±0.041, moisture content% 9.63±0.851, were estimated. The tablets or *vati* of the study drug were analysed for hardness, uniformity of weight, friability and disintegration time(DT) in which hardness(Kg/cm^2) 1.42±0.080, uniformity of weight % 4.267±0.163, friability% 0.566±0.232, disintegration time (min) 9.35±0.229 were estimated. HPTLC analysis of *Kukkutnaki Guggulu* using toluene: ethyl acetate: formic acid(7:3:1) as mobile phase showed 14 peaks for all three batches. The coinciding max Rf values were 0.10, 0.18,0.33,0.42 and 0.80. Hence, the standard parameters were developed for current formulation. So, in the current study, the analytical standard of *Kukkutnaki Guggulu* was developed which will be ready reference for the next researcher.

Keywords: *Kukkutnaki, Guggulu,* HPTLC, Physico-chemical analysis, *Guggulu Kalpana*

INTRODUCTION: In the plant kingdom, there are number of plants that yield medicines useful to mankind. The world population relies mainly on plant and plant extract for health care. Tribal as well as folk sources were utilized by Acharyas of Ayurveda while documenting Ayurvedic materia medica.[1] *Kukkutnaki,* (*Aspidium cicutarium* Sw.) is a herb belong to family dryopteridaceae,[2-6] grown around the monsoon and rainy seasons. It is generally found in *sahyadri* foot hill region. It is also called *Nirvishi., Bichava or Kombadnakhi* [7-8]. It is first mentioned in the book named "*Gharguti Aushadhe"*[9] for the treatment of various types of cysts. .As per Charakacharya, different safe combinations can be formulated as medicinal product based on physicians logic, condition of patient and type of disease.[10] *Kukkutnaki Guggulu* was selected as a study drug according to retrospective literary review from various texts and scientific magazines. The single available reference from *Chikitsa pradeep*[11] was found to be appealing and used by senior *Vaidyas* in clinical practice hence was selected for study. The proprietary drug i.e. *Kukkutnaki Guggulu* can be formulated by using authenticated *Kukkutnaki (Aspidium cicutarium Sw.)* and *Guggulu (Commiphora mukul Hook. Ex Stocks)* [12-18] in the same proportion for oral administration and it was prepared as per a text *" Guggulu kalpana".*[19] (Formulations develops from exudates of *Commiphora*

mukul Hook. ExStocks). Since last 3 decades, it was documented as a herbal drug which is used for diseases of *Mansvaha strosas*, tonsillitis, goiter, cysts, tumors,, abscess.[20] This combination is not mentioned in classical texts of Ayurveda, however considering potency of ingredients of this combinations its standardization on analytical ground is needed

MATERIAL AND METHODS:

Material: Dry Rhizomes of *Kukkutnaki* were collected from *Bhimashankar, Tal-aambegaon*, district- Pune and the sample was authenticated from Agharkar research institute, Pune. Raw *Guggulu* and *triphala* purchased from local market of Masjid bunder, Mumbai and authenticated from Gurunanak khalsa college, Matunga, Mumbai. pH meter, Hot air oven, Muffle furnace, Dessicator, Citizen Electronic balance, Fractional weighing, Hot plate, Viscometer, Pycnometer, Disintegration time apparatus, Monsanto tablet hardness Tester, Digital friability test apparatus, Magnetic stirrer, Glassware's-Petri dishes of capacity 50mL, Silica Gooch Crucibles(capacity of 1000^{o}C, Conical flask of capacity 500mL, Glass measuring cylinder of capacity 25mL, 50mL and 100mL, Glass beaker of capacity 50mL and 100mL, Chemicals-Diluted HCL, 10% Ethanol solution, NaOH solution, Buffer solution of pH 4 and pH 7 , CAMAG TLC Scanner 3_131215, HPTLC machine, UV chamber were used for analytical study.

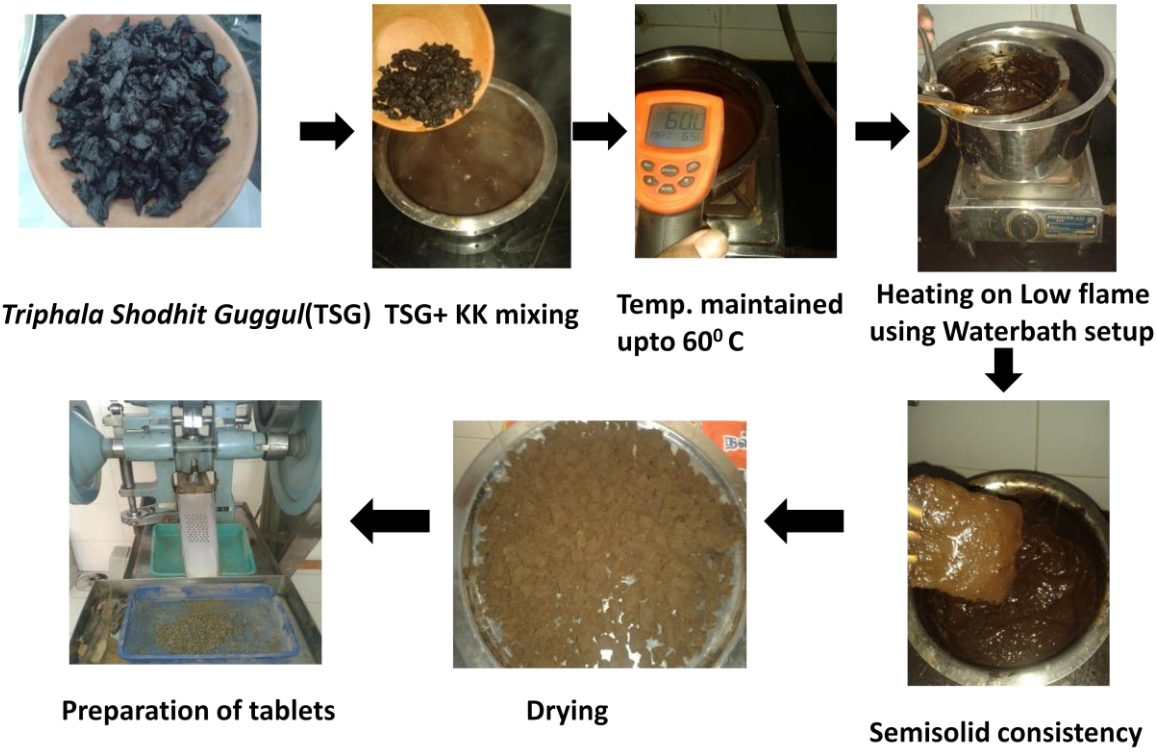
Method:

Preparation of *Kukkutnakhi Guggulu* : In *Kukkutnaki Kwath*(KK), 300gm of purified *Guggulu (triphala shodhit)*[21-24] was mixed properly & kept overnight. Next day, the mixture was heated on low flame with constant stirring with wooden spatula. Then the mixture was kept on water bath to avoid the charring and the temperature was maintained upto 60^{0}C, till the mixture attains consistency of *Gudapaka* i.e. semisolid thickness. Then the mixture was removed from the gas burner. Then 1 part (300gm) of *Kukkutnaki churna* was added immediately into the mixture. The mixture was triturated well in *Khalva yantra* for two days to get a homogeneous mixture in soft solid form. The mixture was spread over the drying tray of the dryer and kept at 40^{0}c for 48 hrs. After mixture was well dried then it was subjected for granulation in pulverizer at 40 mesh, then sieved. The dry powdered mixture was then transferred to the tablet punching machine & the obtained granules were further compressed by 8mm 7 punch. Tablets of weight 250 mg was prepared and the final product was kept in sunlight to dry. The dried tablets were preserved in glass bottles. The 3 separate batches were prepared & subjected for physicochemical analysis.

Table no. 1: Contents of *Kukkutnakhi Guggulu* for each batch (Total 3 batches)

Sr. no.	Contents	Proportion	Quantity
1	***Kukkutnakhi Bharad***	1part	300 gm
2	**Distilled water**	16 parts	4.8L
3	**Purified *Guggulu***	1 parts	300 gm
4	***Kukkutnakhi Churna***	1 parts	300 gm

Fig. No. 1: Preparation of *Kukkutnakhi Guggulu* and its tablets



Analytical study: The three batches of *Kukkutnaki Guggulu* were subjected for Organoleptic and physico-chemical analysis in order to develop its standard. The following parameters were carried out in this phase- Organoleptic characteristics: Colour, odour, touch and taste and Physicochemical analysis:[25-26]Loss on drying at 110°, pH value, Total Ash%, Acid Insoluble Ash%, Water soluble extract%, Alcohol Soluble Extract%, Moisture content%, Hardness(Kg/cm^2), Uniformity of weight%, Friability%, Disintegration time(min). HPTLC profile:[27-30] HPTLC analysis of was carried out using stationary phase, 10X10 cm sized silica gel plates and Toluene: Ethyl acetate: Formic acid- 7:3:1 as solvent system(mobile phase) through trial and error method. The TLC developed was scanned by CAMAG TLC Scanner 3_131215. The developed plate was visualized under visible day light, short UV (254 nm), long UV (366 nm) and the Rf values were recorded.

OBSERVATIONS AND RESULTS:

Mass balance of *Kukkutnakhi Guggulu* and tablet: Weight of *Kukkutnakhi Guggulu* observed after *gudpak*, drying, granulation and tableting process of three batches was noted.Loss in weight were observed during each of these process. The average loss % of three batches after drying process in dryer was found 40.93%. The average % loss observed after granulation process of three batches was found 10.40% and average % loss observed after tableting process of three batches was 3.75%.

Table No. 2: Loss % of *Kukkutanakhi Guggulu*:

Step	Batch-1	Batch-2	Batch-3	Mean
Loss % after drying (in dryer)	38.05	40.24	44.50	40.93
% Loss after granulation	9.61	12.24	9.37	10.40
% Loss after tableting	3.19	3.48	4.58	3.75

Physico-chemical analysis of *Kukkutnaki Guggulu*: In organoleptic analysis the colour of the product was found dark brown, *Rasa*(taste) was *Tikta, Katu, Kashaya* and *odor(gandha)* was specific *Guggulu gandhi*. (Table no.1)The quality

test for the finished product were performed in which total ash% 6.49 ±0.553, acid insoluble ash% 1.323± 0.547, water soluble extract% 35.64±0.590, alcohol soluble extract% 20.45±0.822, pH 3.81±0.041, moisture content% 9.63±0.851, were estimated. The *tablets* or *vati* of the study drug were analyzed for hardness, uniformity of weight, friability and disintegration time(DT) in which hardness(Kg/cm^2) 1.42±0.080, uniformity of weight % 4.267±0.163, friability% 0.566±0.232, disintegration time (min) 9.35±0.229 were estimated.(Table no. 2)

Table No. 3: Organoleptic analysis of *Kukkutnaki Guggulu*:

Sr.no	Batches	*Shabda*	*Sparsha*	*Roopa*	*Rasa*	*Gandha*
1	Batch-1	Not significant	*Shlakshana*	Dark Brown	*Katu, tikta, kashay*	Specific *Guggulu gandhi*
2	Batch-2	Not significant	*Shlakshana*	Dark Brown	*Katu, tikta, kashay*	Specific *Guggulu gandhi*
3	Batch-3	Not significant	*Shlakshana*	Dark Brown	*Katu, tikta, kashay*	Specific *Guggulu gandhi*

Table no.4 Physico-chemical analysis of *Kukkutnaki Guggulu:*

Parameters	Results			Mean	S.D
	Batch-1	Batch-2	Batch-3		
Total Ash%	7.12	6.08	6.27	6.49	0.553
Acid Insoluble Ash%	1.08	1.95	0.94	1.323	0.547
Water soluble extract%	35.82	34.98	36.12	35.64	0.590
Alcohol Soluble Extract%	20.23	19.76	21.36	20.45	0.822
PH	3.78	3.86	3.80	3.81	0.041
Moisture content%	8.94	10.58	9.38	9.63	0.851
Hardness(Kg/cm^2)	1.41	1.35	1.51	1.42	0.080
Uniformity of weight%	4.241	4.442	4.118	4.267	0.163
Friability%	0.48	0.83	0.39	0.566	0.232
Disintegration time(min)	9.40	9.10	9.55	9.35	0.229

HPTLC analysis of *Kukkutnaki Guggulu*: There is no standard reference data of HPTLC available for *Kukkutanakhi Guggulu*, hence this analysis was done**.** Chromatogram of Raw *Guggulu*, purified *Guggulu*, Raw *Kukkutnaki*, three batches *Kukkutnaki Guggulu* (KG) in Figure no. 2 and tracks of three batches of *Kukkutnaki Guggulu* has been shown in figure no. 3, 4 and 5 respectively.(Fig. 3-5)

Figure no. 2. Chromatogram-

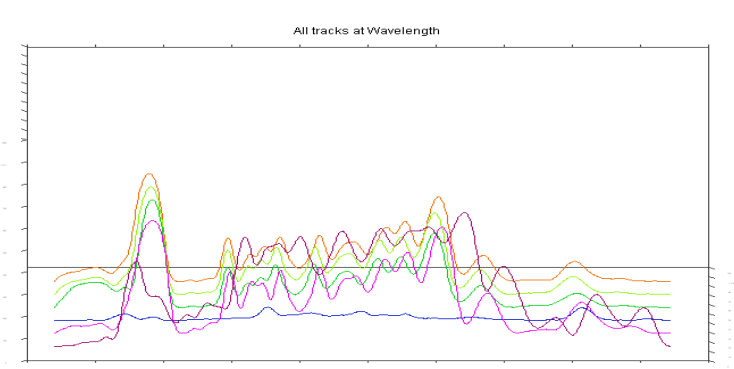


Figure no.3 : Batch 1-KG1

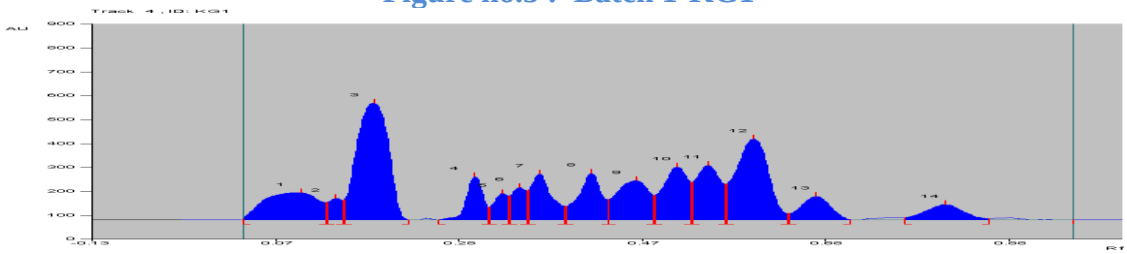


Figure no.4 Batch 2- KG 2

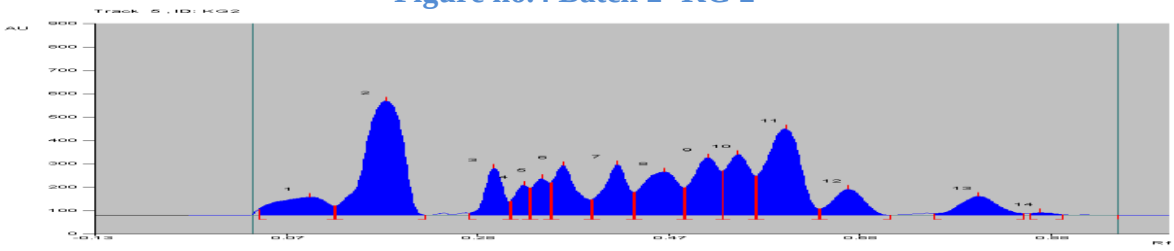


Figure no.5 Batch 3-KG 3

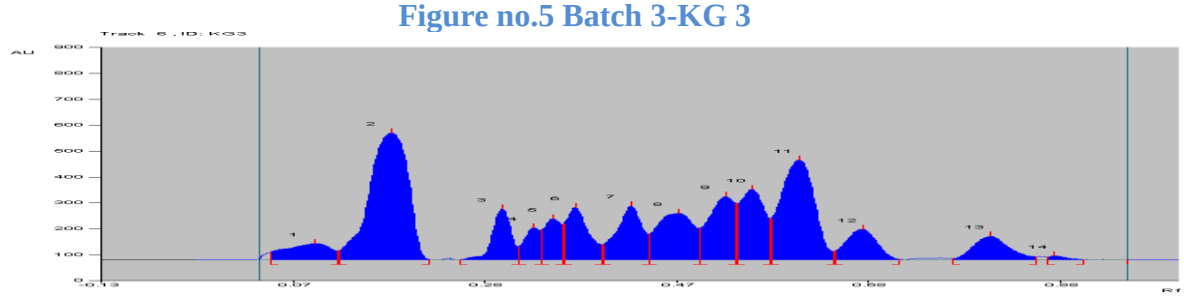
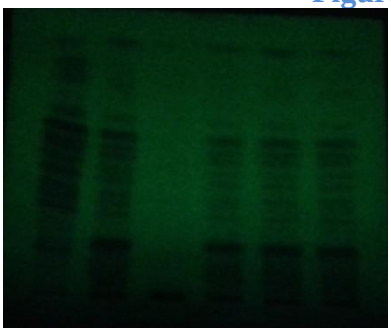


Table no. 5 Estimated max Rf values of three batches of *Kukkutanakhi Guggulu* and its contents:

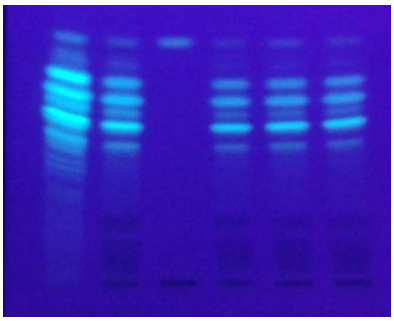
Sr. no.	Purified *Guggulu*	Raw *Kukkutnaki*	Batch-1	Batch-2	Batch-3
1	0.11	-	0.10	0.10	0.10
2	0.18	0.18	0.18	0.18	0.18
3	0.33	-	0.32	0.33	0.33
4	0.43	0.42	0.42	0.42	0.43
5	0.81	0.81	0.81	0.80	0.80

Figure of HPTLC plate under UV:



At 254 nm

Figure no. 6



At 366 nm

Figure no. 7

DISCUSSION: Plants are natural resources for a variety of biochemical products and can be used for medicinal purpose. Some herbal products are a source of many traditional medicines. According to retrospective literary review, the combination of *Kukkutnaki* (*Aspidium cicutarium* Sw.) and purified *Guggulu*

(*Commiphora mukul* Hook. Ex Stocks) was mentioned in "*Chikitsa pradeep"* named as *Kukkutnaki Guggulu*[11].But the proportions of ingredient and preparation method was not mentioned. The therapeutic use of this drug was mentioned in *gandamala, galganda, apchee* and *arbuda*. In the text of "*Guggulu kalpana",* the traditional method and proportion of its ingredients is clearly mentioned.[19] So for the current study the same formulations was selected to develop its analytical standard.To develop the analytical standard of *Kukkutnaki Guggulu*, the three batches of product prepared were tested for physical and chemical parameters. The organoleptic parameters form the basic criteria for selecting a raw drug and also to confirm the finished product. In organoleptic analysis the colour of the product was found dark brown, rasa(taste) was *Tikta, Katu, Kashay* and odour was specific representing smell similar to *Guggulu.* This is due to presence of *Guggulu* as a major ingredients which contain few volatile phyto-constitutes having its specific odor. [Table No. 3]

The quality tests for the finished product were performed. Total ash is inclusive of presence of heat stable materials such as metals/minerals particles, sand, soil content etc which either are adhering to the herbal drug or presence as constitute of that herb. Thus it is utilized as criteria for identifying the purity of the drugs based on created standards. Ash value of final product was found % 6.49 ±0.553. Acid insoluble ash represents matter which is not soluble in acid, in other word this test is indicator of inorganic material present in a sample. Such inorganic entities are not expected in herbal formulation. The obtained value of Acid insoluble ash in all the batches is negligible and it was found % 1.323± 0.547. Less extractive value indicates addition of exhausted material, adulteration or incorrect processing during drying, or storage or formulating. The water soluble extract % 35.64±0.590 w/w of water soluble and alcohol soluble extract% 20.45±0.822w/w were present in *Kukkutnakhi Guggulu* indicating that the drug is having good solubility in water. The pH conventionally represents the acidity and alkalinity. The finished product has pH 3.81±0.041 which indicates that *Kukkutnaki Guggulu* is acidic in nature. Loss on drying at 105^0C indicates presence of moisture content. If moisture content % is more than permissible limit then the formulation is more likely to get infected by fungal growth. In the prepared batches moisture content % were 9.63±0.851 which is much less i.e. this formulation has sufficient stability is estimated.

The tablets or *vati* of the study drug were analysed for hardness, uniformity of weight, friability and disintegration time(DT). The average hardness of tablets was 1.42±0.080kg/cm^2 which indicates that *Kukkutnakhi Guggulu* tablets were not brittle in nature. Weight variation of tablet causes variation of active medicament which changes the bioavailability after administration. Uniformity of weight is determined to eliminate variation in dose. All the tablets were within acceptable range of weight variation as for natural herbal products.[31] Friability test is a method to determine physical strength of uncoated tablets upon exposure to mechanical shock and attrition. It is used to test the durability of tablets during transit. The friability % 0.566±0.232 was observed of this formulation is within acceptable range.[32] The disintegration time of tablets plays an important role in quality assessment. Rate of drug dissolution depends upon the time of disintegration which affects the absorption rate of drug. Both hardness and disintegration time interfere with the bioavailability of drug. *Kukktnakhi Guggulu* was found to have 1.42±0.080kg/cm^2 hardness and 9.35±0.229 min disintegration time which was noticed with in accepted limits. [Table No. 4] As there are no pharmacopoeial standards available for *Kukkutanakhi Guggulu*, hence the values estimated in present study are compared with previous

reported work on *Guggulu* formulations as well as with API. Such comparison is not completely applicable to *Kukkutanakhi Guggulu*, however it helps to judge the quality of the product upto expected level.

In HPTLC analysis of *Kukkutnaki Guggulu*, total 14 peaks for each of the three batches of *Kukkutnaki Guggulu* were observed and highest peak were seen at Rf value 0.18 and as per table no. 3 the coinciding max Rf values were 0.10, 0.18, 0.33, 0.42 and 0.80. Hence, it can be said that standard parameters were developed for current formulation since all the ingredients used in the preparation has shown equal distribution in all three batches. [Figure no. 2 to 7, Table no. 5]

CONCLUSION: Standardized *Kukkutnaki Guggulu* was having total ash% 6.49 ±0.553, acid insoluble ash% 1.323± 0.547, water soluble extract% 35.64±0.590, alcohol soluble extract% 20.45±0.822, pH 3.81±0.041, moisture content% 9.63±0.851, hardness(Kg/cm^2) 1.42±0.080, uniformity of weight %4.267±0.163, friability% 0.566±0.232, disintegration time (min) 9.35±0.229. HPTLC analysis of *Kukkutnaki Guggulu* using toluene: ethyl acetate: formic acid(7:3:1) as mobile phase showed 14 peaks for all three batches. According to the properties of the contents of *Kukkutnaki Guggulu*, the probable *Rasa*, *Virya* and *Vipaka* are *Tikta*, *Katu*, *Kashaya Rasa; Ushna Virya* and *Katu Vipaka*. So in the current analytical study, the analytical standard of *Kukkutnaki Guggulu* was developed which will be ready reference for the next researcher.

Scope for further research:

Kukkutanakhi Guggulu is not mentioned in classical texts however it is mostly utilized formulation by Ayurveda physicians for the management of manifestations which are similar to cancer. This study provides analytical standards for *Kukkutanakhi Guggulu* which are needed to prepare effective formulation. Hence the current study will be pioneer research source for the further anticancer research on plant originated products, to study its effect on targeted cancers, specific in vivo scientific studies and human clinical trials which are needed to be carried out by further researchers.

Acknowledgement: Dr. Sanjeev Yadav(Dean), Dr. Shrikant Kashikar(P.G. Director), Dr Minakshi Amritkar and Dr Vaishali Khobragade,

REFERENCES:

1. Sushruta, Sushruta Samhita, Acharya YT (editor), reprint edi., Sutrasthana; 36/10, Chaukhambha Orientalia, Varanasi, 2009; p.159
2. Ghoghari, M. S. Bagul, S. Anadjiwala, M.G. Chauhan and M. Rajani, Free radical scavenging activity of *Aspidium cicutarium* rhizome" Published in - Journal of National Remedies,2,6,131-134, (2006).
3. Dr. Ankush Mahajan, Thesis entitled "Pharmacognostical and experimental evaluation of *Kukkutnaki* (*Aspidium cicutarium*) with special emphasis on anti-inflammatory, anti-oxidant and cytotoxic activity", Bharati Vidyapeeth, 2011-12
4. Hardik M, Nishteswar K, Patel B R, Harisha C R, Detailed Pharmacognostical Evaluation On Rhizome Of Tectaria Coadunata(Wall. Ex Hook & Grev.) C. Chr. - A FOLKLORE HERB. Global J Res. Med. Plants & Indigen. Med., Volume 2(8): 582–588, (2013).
5. Dubal KN, Ghorpade PN, Kale MV. Studies On Bioactive Compounds Of Tectaria Coadunata (Wall. Ex Hook. & Grev.) C.CHR. Asian J Pharm Clin Res; 2013;6(2):186-187
6. Maushumi Kulkarni, Rashmi Tambe, Kiran Preliminary Phytochemical screening and HPTLC Studies of Extracts of Dried Rhizomes of Aspidium cicutarium , Journal of Pharmacognosy and Phytochemistry, 2 (3): 50-54, (2013).
7. Desai VG, Aushadhi Sangrah, Rajesh prakashan, Kothrud, Pune: 2nd edi., 1975; p.281
8. Pade SS, Vanoushadhi Gunadarsh, Raghuvanshi prakashan, 2nd edi., Ghatkpoar Mumbai: 1982; p.306
9. Sathe AP, Gharguti aushadhe,

Ayurved bhavan, Girgaon, Mumbai,1922;p.65
10. Charaka, Charaka Samhita of Agnivesha; Tripathi RD (editor), Reprint edi., Sutra Sthana, Aatreya bhadra kappiya Adhyaya; 26/12. Chaukhamba orientalia Varanasi:2007; p.358. Reprint-(2009).
11. Vd. B.V. Gokhale, Chikitsa pradeep, Vaidyamitra prakashan 701, Sadashiv peth pune, 1989;pp.74
12. Chaudhary *et al*., Pharmacological Properties of Commiphora Wightii Arn. Bhandari – An Overview. Int J Pharm Pharm Sci 2012;4(3):73-75
13. Om Prakash Rout *et al.* Oleogum Resin *Guggulu*u: A Review of The Medicinal Evidence For Its Therapeutic Properties. IJRAP 2012;3(1).
14. Jain A, Gupta VB. Chemistry and Pharmacological profile of *Guggulu*u-a review. Indian journal of traditional knowledge, 5(4):478-483 (2006).
15. Sharma S *et al*. Traditional Uses Of Herbal Medicinal Plants Of Rajashthan: Guggal. IJLPR 2012;2(4):2250-0480
16. Poonia Priyanka, Mittal Sanjeev K., Gupta Vivek Kumar, Singh Jitender, Sweety, Gum *Guggulu*: An Ayurvedic Boom, International Journal of Pharmacognosy and Phytochemical Research; 2014:6(2);347-354
17. Sukumar E, Balakrishna K, Medicinal Gum Resin – *Guggulu*u a review. *Ancient Science of Life* 1985;2:104 -112
18. Khan MB, Sathe N, Chavan R. Commiphora mukul Engl. – " *Divya*" : A Review. Ayurlog: National Journal of Research in Ayurved Science-2015; 3(2): 1-12
19. Prabhu N. *Guggulu* kalpana. Karyavaha, Maharashtra Ayurved Sammelan, Dombivali-Mumbai.1999;p-86
20. Gordiya RH, Katemulee or Kombadnakhi , Ayurved patrika, 1967;p.115.
21. Karan, Prerna Sarup, Vandana Suneja, Karan Vasisht, Effect of Traditional Ayurvedic Purification Processes (Sodhanvidhi) of *Guggulu*u on Carrageenan-Induced Paw Oedema in Rats JPBMS, 21 (05), (2012).
22. Vyas Kruti Y, Kinnari Dhruve, Prajapati PK Methods of *Guggulu*u Shodhana in Ayurveda – A Review, International Journal of Ayurvedic Medicine, 5(2), 154-160 (2014).
23. Pimpale Swapnil Ashokrao *et. al*, Comparative Analytical Study Of *Guggulu*u (Commiphora Mukul) Shodhana done In Different Media IAMJ: Volume 2; Issue; (2014).
24. A Rajput, De Subrata, AK Chaudhary, Effect Of Different Media For Shodhana On Physico-Chemical Properties Of *Guggulu*u,, http://www. MEDIA FOR SHODHANA _ Techno Ayurveda.htm, Posted on October 24, 2011
25. Anonymous, The Ayurvedic Pharmacopoeia of India, Reprinted 1st edition, Govt. of India: Ministry of Health and Family Welfare; Part 1, Vol. I, 2001: Appendix 2-pp 142-143, appendix 3-pp 156.
26. Dr. D.R. Lohar, Protocol for testing of Ayurveda, Siddha and Unani medicine, Government of India, Department of AYUSH, Ministry of Health & Family Welfare Pharmacopoeial Laboratory For Indian Medicines, Ghaziabad
27. Eike Reich, Anne Schibli, HPTLC for analysis of medicinal plants, China, Page no. 99-229, 2007,
28. Quality standards of Indian Medicinal Plants, Medicinal Plants Unit, Indian council of medical research, Vol. 3, New Delhi, (2011).
29. Shivangi Bhardwaj *et al*., Optimization Of Mobile Phase By Simplex Method With Special Reference To *Guggulu*u (Commiphora Wightii), International Journal of Pharmacy, 4(3), 129-134. (2014).
30. Mujahid Khan, Ninad Sathe, Post graduate dissertation entitled "Standardization of *Kukkutnaki Guggulu* and in vitro study to evaluate its anticancer activity", Dr. G.D. Pol foundations Y.M.T Ayurvedic medical college and hospital, Kharghar, Navi Mumbai, (2015).

31. Anonymous, "Ayurvedic Pharmacopoea of India", Govt of India, Ministry of Health and family welfare, Publication department, New Delhi, Part II, Vol III, 1st edition, appendix, 3, page no. 203,205.
32. http://www.pharmacopeia.cn/v29240/usp29nf24s0_ c1216.html, Method of testing Friability of tablets, US Pharmacopoea, downloaded on 18/05/2017, 8.40 pm.
33. Vinay. S etal, "Comparative Study of In-process and Finished Products Quality Control Tests of IP, BP & USP for Tablets". IJPTP, 2011,2(4), 176-183.

Corresponding Author: Mujahid B. Khan, Assistant Professor, Rasashastra and Bhaishajya kalpana Department, Mahatma Gandhi Ayurved College, Hospital and Research center, Salod, Wardha
Email: mujahidkhan706@gmail.com,

Source of support: Nil
Conflict of interest: None Declared

Cite this Article as : [Khan Mujahid B et al : Analytical Standardization of Kukkutnaki *Guggulu*: IJAAR VOLUME III ISSUE III JUL-AUG 2017: Page No:705-713