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Pharmaceutical Preparation and Standardization of Swarna Vanga and Its Clinical Efficacy as Adjuvant to Reduce Adverse Effects of Chemotherapy with Special Reference to Its Rasayana Property

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Abstract: ***Cancer is most dreadful disease affecting mankind. Many innovative healing modalities and hundreds of cancer treatments have resulted from extensive research. With chemotherapy and radiotherapy, surgical excision is the oldest and most tested method. This leads to therapy problems, poor health, and a decline in quality of life, all of which necessitate treatment discontinuation. Anorexia, diarrhoea, nausea, vomiting, and mucositis can all be caused by psychological causes. The anorexia-cachexia syndrome is the most common cause of death among cancer patients. Cancer cachexia is characterised by metabolic, hormonal, and cytokine abnormalities that lead to progressive wasting. Swarna Vanga is a Kupipakwa Rasayana mentioned in Rasatarangini. Chemically it is stannous sulphide containing Shuddha Parad, Shuddha Vanga, Shuddha Gandhak, Shuddha Navasadar. Till today, no study has been carried out using Swarna Vanga for its Rasayana and Balya properties. Hence an attempt was given to study the pharmaceutical preparation, standardization and clinical efficacy of the drug in reducing adverse effects of chemotherapy with special reference to its Rasayana property through this dissertation. Thus the present study entitled "Pharmaceutical preparation and standardization of Swarna Vanga and its clinical efficacy as adjuvant to reduce adverse effects of chemotherapy with special reference to its Rasayana property" was carried out.***
Keywords: Swarna Vanga, adjuvant, Rasayana, cancer, chemotherapy, adverse effects, standardization.

I. MATERIALS AND METHODS

historical review, pharmaceutical review and disease review were thoroughly discussed under different headings in above said thesis. Here more focus is given to preparation, standardization and clinical trial part. So these points are highlighted as follows

A. Phearmaceutical Study

1) Samanya And Vishesh Shodhan

सूवेध्यानि पत्राणि धातूनान्तु समाहरेत् यावद्वहिप्रभाणि स्युस्तावद्रहौ प्रतापयेत् ॥४॥
स्नपयेत्तप्ततप्तानि कालिके तु त्रिधा त्रिधा । तक्रे कुलत्थक्कथिते गोमूत्रतिलतैलयोः ॥५॥
एवं विशुद्धिमायान्ति स्वर्गाद्याः सप्तधातवः । समासतः समाख्यातमिदं सामान्यशोधनम् ॥६॥

Table no 1 Samanya and Vishesh Shodhana of Vanga

Dhalana into	Quantity (before)	Quantity (After)	Loss	pH (Before)	pH(After)
Kanji	600gms	598gms	2 gms	4	3
Takra	598gms	595gms	3 gms	5	5
Kulattha Kwath	595gms	591gms	4 gms	6.5	7.5
Gomutra	591gms	590gms	4 gms	8	9
Til Tail	590gms	585gms	6 gms	6	6
Choornodaka	585gms	580gms	5gms	12	10.6

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2) Gandhak Shodhan

Table No.2Different Trials of *Gandhaka Shodhana by Damaru Yantra* with Yield

Trials	Time taken	Quantity (before)	Quantity (before)	Loss
I	8 hours	800 gms	200 gms	600 gms
II	4 hours	500 gms	277 gms	223 gms

3) Jaran of Vanga Into Parad

Shodita Vanga was taken in an iron ladle and heated till it melts. After complete melting of *Vanga* the *Hinguloththa Parada* was added to it. Immediately it was poured into *Khalva Yantra.* Continuous trituration was carried out using a little pressure over the *Peshi*. After being into fine powder, the mixture was added with *Nimbu Swarasa* (80ml) triturated well for about one hour. This was then washed with hot water repeatedly, until the water stopped turning into black colour. Then this *Parada Vanga* mixture was kept for drying.

Table no. 3 Result of amalgamation

Qty of *Parada* 300 gms	Qty of *Vanga* 600 gms	Loss 25 gms

4) Preparation Of Kajjali

400gm *Shodhita Gandhaka* was added to the fine mixture of tin and mercury. Trituration was done, until the qualities of *Kajjali* were obtained. One day before making *Kupipaka*, 300 gm. Of *Navasadar* was added to *Kajjali*. Change in color was observed. Whole *Kajjali* was divided into 4 parts and packed in polythene and weighed.

Table no 4 Results of *Kajjali* preparation

Date of Commencement	Date of Completion	Duration of trituration	Intial Quantity	Final Quantity
03/07/2020	24/07/2020	90 hours	1600gm.	1490 gm.

5) Preparation Of Swarna Vanga In Valuka Yantra Using Kupipakwa Method

वंग सूर्यमितं द्रुतं रसमितं सूत□ सम्पेषयेत् प्रज्ञाल्याम्लेरसैः क्षिपेद् बुधवरो नागोन्मितं गन्धकम् ।
बंगाशं नवसादर□ विमलं सम्पे□य यत्नात्पचेत् कूपीस्थं सिकताख्ययन्त्रविधिना कूपीं ततस्त्वाहरेत् ॥७७॥
कूप□ विभिद्य यत्नेन रसतन्त्रविचक्षणः । स्वर्णरम्यं स्वर्णवर्ण स्वर्णवंग समाहरेत् ॥ ७८ ॥

The prepared *Kajjali* was measured and divided into four parts. This was slowly filled inside the bottles covered with cloth smeared with *Multani* mud upto 1/3 rd of the height of bottle.

Qty of *Kajjali* filled	1st *Kupi*	2nd *Kupi*	3rd *Kupi*	4th *Kupi*
	366gms	374gms	369 gms	385 gms

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Table no. 5 Common Milestones

Milestones	Time taken
White fumes started at Temp: 290	2hrs 45min
Dense white fumes Temp: 300	3hrs 50min
Stoppage of white fumes Temp: 380	4hrs 10min
Yellow fumes started Temp: 392	5hrs 20min
Appearance of *Parada* globules at the base Temp: 520	12hrs20min
Appearance of brown fumes Temp: 550	13hrs 30min
Stoppage of fumes Temp: 580	16 hrs 30min
Appearance of golden colored material when *shalaka* was introduced. Temp: 620	19hrs 40min
Stoppage of Agni Temp: 630	20 hrs.

Total wt of *Kajjali*	1490gm
Wt. of *Swarna Vanga* obtained	700gm
Loss	790gm
Yield in %	46.97%
Colour of product	Golden yellow
Duration of *Paka*	20 hours

B. Analytical Study

Table No.6 Physical Analysis of Swarna Vanga[1]Organoleptic Evaluation

Sr. No	Properties	Result
1.	Colour	Golden yellow
2.	Touch	Soft
3.	Odour	Odourless
4.	Luster	Lustrous
5.	Nature	Fragile
6.	Taste	Alkaline

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Table no 7 Chemical Analysis

Sr. no.	Test name	Value
1	pH value	5.43
2	Total ash	80.34%
3	Acid insoluble ash	78.94%
4	Loss on ignition at 110℃	1.15%
5	Estimation of Hg by mercury analyser	Nil
6	Estimation of Sulphur	26.70%
7	Estimation of Tin by ICP-MS	64.10%

Table No 8.XRF of *Swarna Vanga*
Element Mean Composition (% by wt)

Calcium (20Ca)	Nil	Tin (Sn)	63.87%
Silicon (14Si)	Nil	Nitrogen (N)	0.01%
Sulfur (16S)	26.36%	Cromium (Cr)	Nil
Manganese (25Mn)	Nil	Carbon (C)	5.56%
Strontium (38Sr)	Nil	Oxygen (O)	0.7%
Rubidium (37Rb)	Nil	Germenium (Ge)	Nil
Zinc (30Zn)	Nil	Zirconium (Zr)	Nil
Titanium (22Ti)	Nil	Argentum (Ag)	Nil
Copper (29Cu)	Nil	Renium (Re)	Nil
Vanadium (23V)	Nil	Mercury (Hg)	Nil
Tungsten (74W)	Nil	Gold (Au)	Nil
Lead (Pb)	3.5%	Here “Nil” stands for ‘not detected’	

Table no 9 Particle Size Analysis (By Laser Diffraction Method)

S. no.	Sample name	Average Particle Size (nm)	Particle Size distribution (nm)	% intensity
1.	Swarna Vanga 1	549.1	729.2	100.0
2.	Swarna Vanga 2	509.7	536.0	95.6
3.	Swarna Vang 3	564.9	727.1	98.2
	Average	541.23		97.93

Particle size distribution of Swarna Vanga provides development of very much stable and uniform size formulation. Maximum particles size possesses much close to similar size. Means Average size of particles found 541.23 nm and distribution of 97.93% particles are in between 536.0 to 729.2 nm. Swarna Vanga possesses nano particles.

Namburi Phased Spot Test
Swarna vanga matched the colour standards

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C. Clinical Study

1) Study Design: A prospective randomized single blind study

SYMPTOMS	Mean B.T.	Mean A.T	Mean Diff.	%	'W'	'N'	'P'	Signify
Nausea and Vomiting	1.069	0.3448	0.7241	67.74194	171.00	18	< 0.0001	extremely significant
Mucociotis	1.069	0.4483	0.6207	55.88235	105.00	14	0.0001	extremely significant
Fatigue	2.621	1.552	1.069	42.30769	276.00	23	< 0.0001	extremely significant
Alopacia	1.207	0.5862	0.6207	51.42857	136.00	16	< 0.0001	extremely significant
Xerostomia	1.000	0.3448	0.6552	63.33333	153.00	17	< 0.0001	extremely significant
Tastelessness	1.138	0.3793	0.7586	66.66667	210.00	20	< 0.0001	extremely significant
Skin Reaction	0.7931	0.2414	0.5517	72	105.00	14	< 0.0001	extremely significant

II. DISCUSSION

It is a qualitative study performed on patients of chemotherapy to check the effects of *Rasayana* property of *Swarna Vanga*. Total 30 patients were administered for study out of which only 25 patients were able to complete the course. Drug was administered after taking written consent of patient for two months. Follow up was taken every 15 days. Data was filled in case history sheet. Assessment was done using grading from National Cancer Institute. A non-parametric test that is Wilcoxon signed rank test was applied to data for evaluating the difference between BT and AT scores of subjective parameters.

It was found that maximum 72. % relief was found in the symptom skin reaction, 67.74% relief was found in nausea and vomiting.66.66% relief was found in tastelessness.63.33% relief was in xerostomia while 55.88% relief was noticed in mucositis 51.42% in alopecia and 42.30% relief was in symptom fatigue.

The selected drug *Swarna Vanga* was found to be highly significant in each and every symptom but more specifically in reducing skin reactions. *Swarna Vanga* is said to be having *Tikta, Lavan* and *Amla Rasa* which are *Mukhashuddhikara* and *Rochaka*. Further it is *Ruksha, Sara, Vahnivivardhaka* and *Shleshmamayaghna*.This explains work of *Swarna Vanga* in reducing nausea and vomiting, tastelessness symptom. Balya and Rasayana property of *Swarna Vanga* helped in reducing fatigue as an adverse effect of chemotherapy. *Swarna Vanga* is *Lavanyakara* and also presence of *Gandhaka* explained its role in reducing skin reactions. *Veerya* of *Swarna Vanga* is *Sheeta* which was effective in reducing mucositis, alopecia and xerostomia which can be correlated with vitiated *Pitta Dosha* and *Visha Guna* of Chemotherapeutic agents. The pharmacokinetic of *Swarna Vanga* can also be understood by properties of its main ingredients as *Vanga* is the main component of *Swarna Vanga* which caries the properties of *Laghu, Sheeta, Bhrumhana, Vrushya, Rasayana, Deepana* and *Pachana.* Because of these properties it directly acts on *Kapha Dosha* and normalizes the excess secretion. *Gandhaka* is having *Madhura Rasa* and is said to be a *Rasayana* drug. It is having *Katu – Madhura – Tikta Rasa, Snigdha – Laghu Guna, Ushna Veerya, Katu Vipaka* acts as *Kaphavatahara.* Though *Parad* and *Navasadar* were in the preparation part they are not tracable in final compound so action of *Parad* is not discussed here. The combination of all the above drugs and properties possess by *Swarna Vanga* itself helped to reduce adverse effects of chemotherapy which was the objective of this study.

III. SUMMARY

Swarna Vanga can be traced only in the recent Rasagrantha like Bhaishajya Ratnavali, Rasatarangini, Rasa Chandamshu, Rasamrita etc and has been described in *Prameha Rogadhikara.* In order to enhance colour recent *Vaidya* advised *Kalmishora* besides other ingredients. The weight of the final product depends on quantity of *Vanga* and the duration of *Agni* depends upon the amount of *Gandhaka* used proportionately.

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The preparation does not require corking of the *Kupi* and requires *Mridu* and *Madhyamagni* only unlike *Rasasindhura* where three types of *Agni* is given. Yield of this specific combination is 46.97%. The main chemical constituents of all prepared *Swarna Vanga* samples are tin and sulphur; mercury is found only in traces. Among the references of Bhaishajya Ratnavali, Rasatarangini and Rasamrita the product of *Swarna Vanga* following the reference of Rasatarangini wherein the drugs used in proportion 3:6:4:3(Hg: Sn: S: NH_4Cl) is found superior as far as yield, duration of heating, color and amount of tin are concerned. Analytical results showed good quality of product. Clinical study showed good efficacy as *Rasayana* but results are influenced by allopathic medicines which cannot be quitted in disease like cancer

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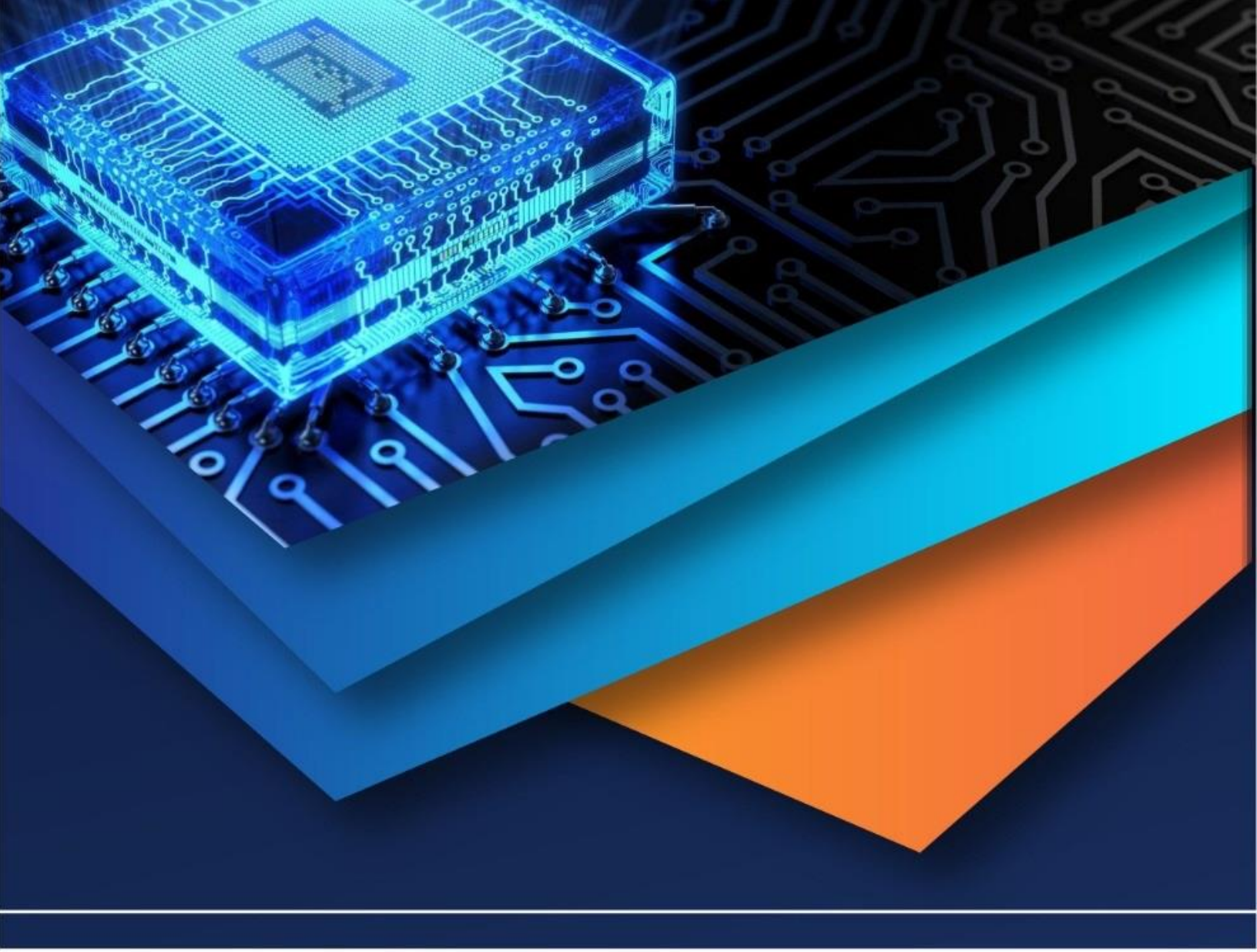

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