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COMPARATIVE PHYTOCHEMICAL STUDY ON AARDRAK AND SHUNTHI PREPARED BY DIFFERENT DRYING PROCEDURES.

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ABSTRACT

Plants have been source of medicine since the beginning of human civilization as they are reservoirs of chemical agents having therapeutic properties. *Aardrak* and *Shunthi* refer to the different state of rhizome of *Zingiber officinale* Roscoe. Ancient *Ayurveda* texts write about the difference in properties and hence difference in use of both forms. *Shunthi* can be made from the raw by using various drying technique and procedures. These different processing methods of *Shunthi* may also cause variations in its properties. **Objective:** The main objective of the present study is to evaluate the quality of differently processed *Shunthi* with *Aardrak*. **Method:** Comparative phytochemical study and chromatographic study of the fresh *Aardraka* and 12 differently processed sample of *Shunthi* and compare with the standards as per API. **Observation and Results:** As per the data of comparative phytochemical study of all the 13 samples slight variations were noticed in each but were within the limits as per API. **Conclusion:** After the analysis of the results obtained, the Lemon juice treated oven dried sample of *Shunthi* was found to be the best for therapeutic as well as commercial purposes.

KEYWORDS: *Aardrak, Shunthi, Zingiber officinale,* Phytochemical study, Chromatographic study, *Ayurveda*.

INTRODUCTION

Since the beginning of human civilization, medicinal plants have been used by mankind for its therapeutic value. Traditional medicine system continues to play an essential role in health care, with about 80% of the world's inhabitants relying mainly on traditional medicines for their primary health care. Plants have been source of medicine as they are reservoirs of chemical agents having therapeutic properties.

Ginger is an herbaceous perennial plant known as *Zingiber officinale* Roscoe, which belong to the order *Scitaminae* and family *Zingiberaceae.* It is one of the well-known species and has been used since the past 20 centuries. The *Zingiberaceae* plants are characterized by their tuberous or non-tuberous rhizomes, which have strong aromatic and medicinal properties. The family *Zingiberaceae* contain approximately 1,300 species in 50 genera. India has rich diversity of ginger with about 200 species belonging to 21 genera.[1]

Its importance as a medicine can be accessed by the synonyms *Mahaushadha, Vishvabheshaja, Shrungvera* and *Nagaram.*[2] It is used in raw form called *Aardraka* and dried form called *Shunthi* as spice and as food condiment. *Ayurveda* advocates the use of ginger in both forms for medicinal purpose as well as for its use in *Aahara kalpana*. Properties of *aardrak* and *shunthi* differs in respect to their *vipaka.*

Elements responsible for ginger spicy flavor and for its numerous health beneficial actions have been identified as Gingerol and Shogaol groups. Shogaol is produced from dehydration of Gingerol and is more pungent than Gingerol but present in lower concentration in fresh rhizome, whose concentration increases during the drying process (*Shunthi*) and storing for long time.[3] Gingerol & Shogaol possess a wide range of pharmacological and physiological effects, which includes cardiovascular, gastrointestinal (Antipyretic, antiemetic, antiulcer), antioxidant, anti-inflammatory, antimicrobial, analgesic as well as thermogenic activities and shown to be effective against tumor growth, rheumatism and migraine. Ginger has low toxicity and its broad spectrum of biological and pharmacological applications.[4]

The chemical composition of *Aardrak* varies with variety, region and agro climatic conditions under which it is grown. *Shunthi* available in market is prepared from *Aardrak* using various drying methods. This difference in processing changes the qualities of processed *Shunthi* and this change in quality can be attributed to change in *Sanskara*. The comparative study between these

differently processed *Shunthi* with *Aardrak* has not been done so far. Henceforth to enrich the knowledge on the subject the current study was conducted.

MATERIAL AND METHODS

Sample collection: Fresh matured *Aardrak* rhizomes (*Zingiber officinale* Roscoe.) were collected from field area of Bhehna, District Dungarpur, Udaipur Region, Rajasthan.

Processing of *Shunthi* from *Aardrak* by different drying methods: Before processing of *aardrak*, the rhizome were killed by these following methods.

- Peeling (Stainless steel knife or Bamboo splinter).
- Rough scraping (knife or abrasive rollers).
- Chopped into pieces.
- Boiling whole rhizome for 10 minutes.

Through the following12 different methods 12 types of dry samples of *Shunthi* was prepared and sample codes were given.

Table no 1: sample codes.

Sample code	Different processed *Shunthi* samples
B	Peeled, sundry
C	Peeled, ovendry
D	Peeled, blanched, sundry
E	Peeled, blanched, ovendry
F	Lemonjuice treated, sundry
G	Lemonjuice treated, ovendry
H	Lime water treated, sundry
I	Lime water treated, ovendry
J	Unpeeled, sundry
K	Unpeeled, oven dry
L	Unpeeled, blanched,sundry
M	Unpeeled, blanched,oven dry

Peeling: Peeling serves to remove the scaly epidermis and facilitate drying. During peeling it was ensured that the cortical parenchyma, which is rich in essential oil cells are not removed or cut as it would cause loss of volatile oil and there by decrease the aroma of the peeled rhizome.

Blanch: The meaning of *Blanch* is "to whiten". A partial precooking by plunging the sample into hot water (80-95^{o} C) for 5-10min. it helps in removal of the skin, denature enzymes and prevent the sprouting by killing the cells.

Sun dry: The samples were spread on blotting paper and kept in the sun light in morning and then air dry in shade during the rest of the day. It took about 8-12 days for drying.

Oven dry: The samples were packed in brown paper bags and kept in oven at 40^{0} C till it dried fully, mostly it took 8-12 days.

Lemon juice treated: The samples were washed with lemon juice mixed water (concentration was 60ml lime juice in 3 litre water) which produces white bleach ginger.

Lime water treated: The sample were soaked in normal water for one day and next day again soaked in lime water (concentration 250g slacked lime in 3 litre water) for a whole day. After that taken out the lime water plated ginger samples and spread over blotting paper to excess water.

Fig 1: Harvested *ardrak* Rhizome.

Fig 2: Fresh *Aardrak*.

Fig 3: Peeled *Aardrak* Rhizome.

Fig 4: Blanching of Rhizome.

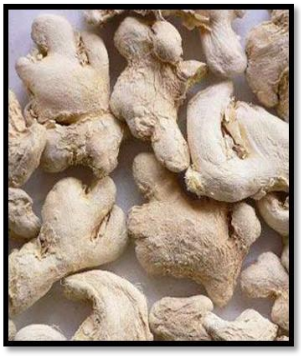


Fig 5: Sun drying.

Fig 6: Oven drying.

Fig 7: Soaking of rhizomes in lemon juice mixed. Water.

Fig 8: Soaking of rhizomes in lime water.

Physiochemical and phytochemical analysis:[5] All the 13 study samples were subjected for different physiochemical analytical parameters according to CCRAS Laboratory guidelines for the analysis of *Ayurveda* and *siddha* formulations, viz. Loss on drying, pH value, Ash value, Water soluble extractive, Alcohol soluble extractive, Qualitative phytochemical test to assess alkaloids, phenolic compound etc.

Chromatographic study:[6] High performance liquid chromatography (HPLC) was done for all the 13 samples and the calculation for quantitative assessment of 6-Gingerol and 6- Shogaol was done.

OBSERVATION AND RESULTS

After the whole making procedure of *Shunthi* total yield obtained from each process was observed and calculated.

Physiochemical parameters

Table no 1: Total yield of *Shunthi* from fresh *Aardrak*.

Sample code	Different processed *Shunthi* samples	Wt. of *Aardrak (*before processing)	Wt. of dried *Shunthi* (after processing
B	Peeled, sundry	1000g	242.5g
C	Peeled, oven dry	1000g	232.5g
D	Peeled, blanched, sundry	1000g	256.5g
E	Peeled, blanched, ovendry	1000g	240g
F	Lemonjuice treated, sundry	1000g	295.5g
G	Lemonjuice treated, ovendry	1000g	265.5g
H	Lime water treated, sundry	1000g	330g
I	Lime water treated, ovendry	1000g	261.5g
J	Unpeeled, sundry	1000g	284g
K	Unpeeled, oven dry	1000g	264g
L	Unpeeled, blanched,sundry	1000g	249g
M	Unpeeled, blanched,oven dry	1000g	267g

Table no 2: Observations on comparative physiochemical analysis b/w *Aardraka* and all processed samples of *Shunthi.*

Observation	A Aardrak	B	C	D	E	F	G	H	I	J	K	L	M
LOD (%)	8.1	7.6	7.23	6.52	6.5	7.5	5.7	6.95	6.2	7.1	6.95	6.8	7.2
pH	5.9	6.4	6.8	6.4	6.5	6.3	7.6	6.6	7	6.7	6.2	6.9	6.8
Starch (%)	7.06	3.3	3.02	3.4	2.8	2.8	3	1.9	2.6	3.8	3.5	3.1	3.23
Oil (%)	1.14	1.3	1.2	1	1	1	1.1	0.75	0.75	1	1	0.85	0.85
Total ash (%)	5.56	4.27	4.32	4.2	4.25	3.52	4.35	6.67	8.51	5.25	5.5	5.03	5.06
Acid insoluble ash(%)	0.83	0.49	0.19	0.4	0.45	0.23	0.4	1.34	071	0.42	0.73	0.61	1.02
Water soluble ash(%)	3.27	2.75	2.06	1.3	4.76	1.99	1.49	2.61	2.5	4.1	2.95	2.74	4
Aqu. Extractive value (%)	8.6	14.2	14	13	11	13.4	10.5	8.4	7	10.2	11.2	11	10.5
Al. Extractive value (%)	8	4.2	3	3.8	5.6	5.8	5	7	5.6	5.6	6.4	5.6	6
P. ether ext. value (%)	6.07	2.1	4	2.16	2.3	2.1	1.46	4.03	1.92	1.83	1.66	2.72	4.66

Phytochemical analysis

Table no 3: Observations of Carbohydrate Test.

Samples	MolishTest			BenedictTest			BarfoadTest			FehlingTest		
	Aqu. ext.	Alc. ext.	Pet.e ther	Aqu. ext.	Alc. ext.	Pet.e ther	Aq ext.	Alc. ext.	Pet.e ther	Aqu. ext.	Alc. ext.	Pet.e ther
A(*Aardrak)*	+ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve	+ve	-ve	-ve
B(P,SD)	+ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve
C(P,OD)	+ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve	-ve	+ve	-ve
D(P,B,SD)	+ve	-ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve
E(P,B,OD)	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve	-ve	+ve	+ve	+ve
F(LJ,SD)	+ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve
G(LJ,OD)	+ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve
H(LW,SD)	+ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve
I(LW,OD)	+ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve
J(U,SD)	+ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve
K(U,OD)	+ve	+ve	-ve	+ve	-ve	-ve	-ve	+ve	-ve	+ve	+ve	-ve
L(U,B,SD)	+ve	-ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve	-ve	+ve	-ve
M(U,B,OD)	+ve	-ve	-ve	-ve	+ve	-ve	-ve	-ve	-ve	+ve	+ve	-ve

Table no 4: Observations of Alkaloid Test.

Samples	Dragondroff'sTest			Wagner'sTest			Hager'Test		
	Aqu. ext.	Alc. ext.	Pet. ether	Aqu. ext.	Alc. ext.	Pet. ether	Aqu ext.	Alc. ext.	Pet. ether
A(*Aardrak*)	+ve	+ve	-ve	-ve	+ve	-ve	+ve	+ve	-ve
B(P,SD)	-ve	+ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve
C(P,OD)	+ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
D(P,B,SD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
E(P,B,OD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve
F(LJ,SD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
G(LJ,OD)	+ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
H (LW,SD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
I(LW,OD)	-ve	-ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
J(U,SD)	-ve	+ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve
K(U,OD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve
L(U,B,SD)	-ve	+ve	-ve	+ve	+ve	-ve	-ve	+ve	-ve
M(U,B,OD)	+ve	+ve	-ve	-ve	+ve	-ve	+ve	+ve	-ve

Table no 5: Observations of Protein Test.

Samples	BiuretTest			XenthotropicTest			MillonTest		
	Aqu. ext.	Alc. ext.	Pet. ether	Aqu. ext.	Alc. ext.	Pet. ether	Aqu ext.	Alc. ext.	Pet. ether
A(*Aardrak*)	+ve	+ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve
B (P,SD)	+ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve
C (P,OD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
D(P,B,SD)	+ve	-ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve
E(P,B,OD)	+ve	-ve	-ve	-ve	+ve	+ve	+ve	+ve	+ve
F(LJ,SD)	+ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve
G(LJ,OD)	-ve	-ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve
H (LW,SD)	+ve	+ve	-ve	+ve	+ve	-ve	-ve	+ve	-ve
I(LW,OD)	-ve	+ve	-ve	-ve	+ve	-ve	+ve	-ve	-ve
J(U,SD)	+ve	-ve	-ve	-ve	+ve	-ve	+ve	-ve	-ve
K(U,OD)	+ve	-ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
L(U,B,SD)	+ve	-ve	-ve	-ve	+ve	-ve	+ve	-ve	-ve
M(U,B,OD)	+ve	-ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve

Table no 6: Observations of Amino acid&SaponinTest.

Samples	Aminoacid (NinhydrienTest)			Saponin (FoamTest)		
	Aqu. ext.	Alc. ext.	Pet. ether	Aqu. ext.	Alc. ext.	Pet. ether
A(*Aardrak*)	+ve	+ve	+ve	+ve	-ve	-ve
B(P,SD)	-ve	+ve	-ve	+ve	-ve	-ve
C(P,OD)	-ve	+ve	-ve	+ve	-ve	-ve
D(P,B,SD)	-ve	+ve	-ve	+ve	-ve	-ve
E(P,B,OD)	-ve	+ve	-ve	+ve	-ve	-ve
F(LJ,SD)	+ve	+ve	-ve	+ve	+ve	-ve
G(LJ,OD)	+ve	+ve	-ve	+ve	+ve	-ve
H (LW,SD)	+ve	+ve	-ve	+ve	+ve	-ve
I(LW,OD)	+ve	+ve	-ve	+ve	+ve	-ve
J(U,SD)	+ve	+ve	-ve	+ve	-ve	-ve
K(U,OD)	+ve	+ve	-ve	-ve	-ve	-ve
L(U,B,SD)	+ve	+ve	-ve	+ve	-ve	-ve
M(U,B,OD)	+ve	-ve	-ve	+ve	-ve	-ve

Table no 7: Observations of Glycosides Test.

Samples	Borntrager'sTest			KellerKiliniTest		
	Aqu. ext.	Alc. ext.	Pet. ether	Aqu. ext.	Alc. ext.	Pet. ether
A(*Aardrak*)	+ve	+ve	-ve	+ve	+ve	-ve
B(P,SD)	+ve	+ve	-ve	-ve	+ve	-ve
C(P,OD)	+ve	+ve	-ve	+ve	+ve	-ve
D(P,B,SD)	-ve	+ve	-ve	+ve	+ve	-ve
E(P,B,OD)	+ve	+ve	-ve	+ve	-ve	-ve
F(LJ,SD)	-ve	+ve	-ve	+ve	+ve	-ve
G(LJ,OD)	+ve	-ve	-ve	-ve	+ve	-ve
H (LW,SD)	-ve	+ve	-ve	+ve	+ve	-ve
I(LW,OD)	-ve	+ve	-ve	+ve	-ve	-ve
J(U,SD)	+ve	-ve	-ve	-ve	+ve	-ve
K(U,OD)	-ve	+ve	-ve	-ve	+ve	-ve
L(U,B,SD)	+ve	-ve	-ve	+ve	-ve	-ve
M(U,B,OD)	+ve	-ve	-ve	+ve	+ve	-ve

Table no 8: Observations of Tannins Test.

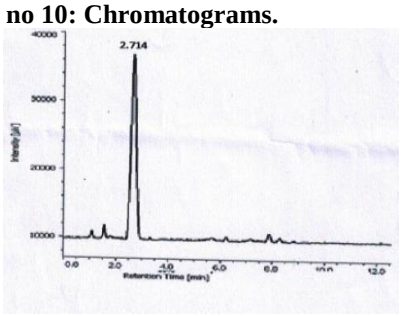
Samples	$FeCl_3$Test			LeadacetateTest			Potassiumdichromate Test		
	Aqu. ext.	Alc. ext.	Pet. ether	Aqu. ext.	Alc. ext.	Pet. ether	Aqu ext.	Alc. ext.	Pet. ether
A(*Aardrak*)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
B(P,SD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve
C(P,OD)	-ve	-ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve
D(P,B,SD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve
E(P,B,OD)	-ve	+ve	-ve	+ve	-ve	+ve	+ve	-ve	-ve
F(LJ,SD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	-ve	-ve
G(LJ,OD)	-ve	+ve	-ve	+ve	-ve	-ve	-ve	-ve	+ve
H(LW,SD)	-ve	+ve	-ve	-ve	+ve	-ve	+ve	+ve	-ve
I(LW,OD)	-ve	+ve	-ve	+ve	-ve	-ve	-ve	+ve	-ve
J(U,SD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
K(U,OD)	-ve	+ve	-ve	+ve	+ve	-ve	-ve	-ve	-ve
L(U,B,SD)	-ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve	-ve
M(U,B,OD)	-ve	+ve	-ve	-ve	+ve	-ve	+ve	-ve	-ve

Table no 9: observations of steroid test and phenolic compounds.

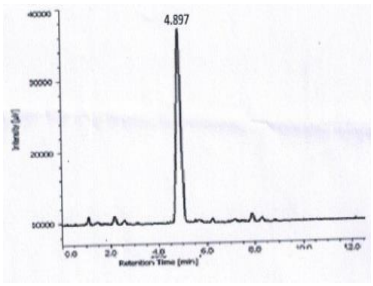
Samples	Steroids (SalkowerskiTest)			Phenoliccompound		
	Aqu. ext.	Alc. ext.	Pet. ether	Aqu. ext.	Alc. ext.	Pet. ether
A(*Aardrak*)	+ve	-ve	+ve	+ve	+ve	-ve
B(P,SD)	-ve	+ve	+ve	-ve	+ve	-ve
C(P,OD)	+ve	+ve	+ve	-ve	+ve	-ve
D(P,B,SD)	+ve	+ve	+ve	+ve	-ve	-ve
E(P,B,OD)	+ve	+ve	+ve	+ve	+ve	-ve
F(LJ,SD)	-ve	+ve	-ve	+ve	+ve	-ve
G(LJ,OD)	-ve	+ve	+ve	-ve	+ve	-ve
H(LW,SD)	-ve	+ve	+ve	+ve	-ve	-ve
I(LW,OD)	-ve	+ve	+ve	-ve	+ve	-ve
J(U,SD)	-ve	+ve	+ve	+ve	+ve	-ve
K(U,OD)	-ve	+ve	+ve	+ve	+ve	-ve
L(U,B,SD)	-ve	-ve	+ve	-ve	+ve	-ve
M(U,B,OD)	-ve	+ve	+ve	-ve	+ve	-ve

Chromatographic study

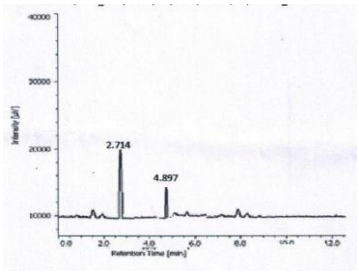
Table no 10: Chromatograms.



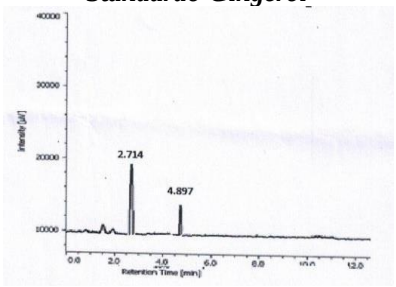
Standard6-Gingerol



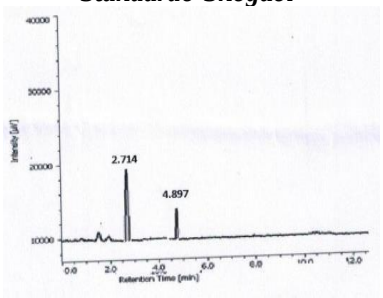
Standard6-Shogaol



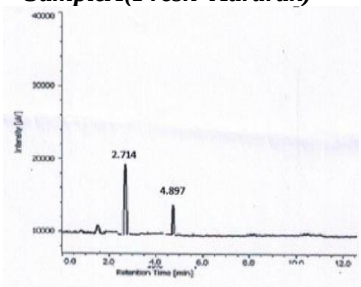
SampleA(Fresh Aardrak)



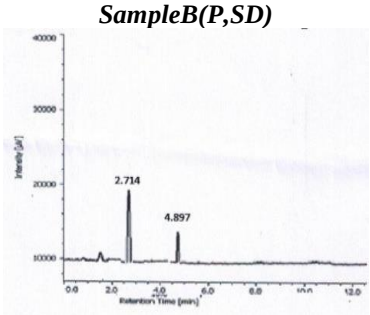
SampleB(P,SD)



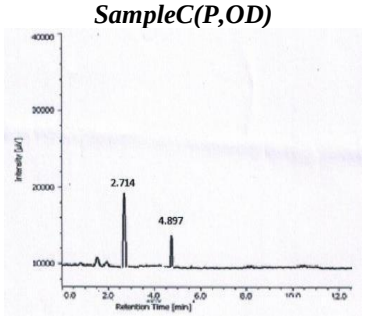
SampleC(P,OD)



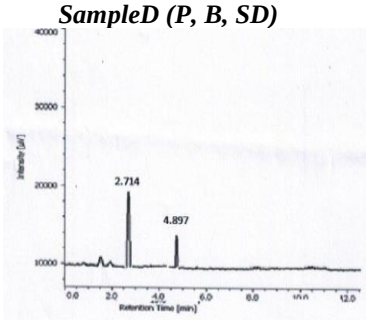
SampleD (P, B, SD)



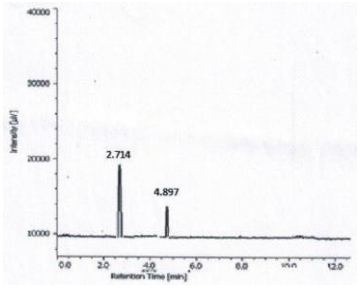
SampleE(P,B,OD)



SampleF(LJ,SD)



SampleG(LJ,OD)



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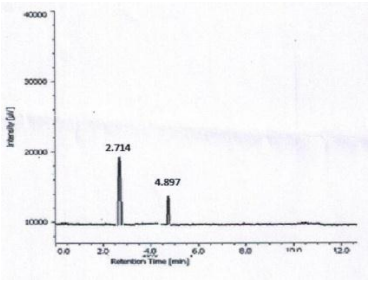

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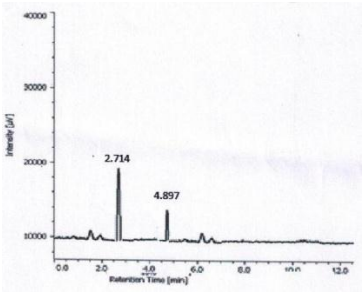
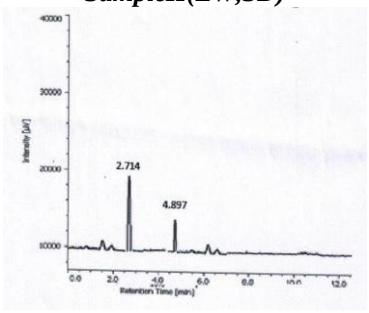
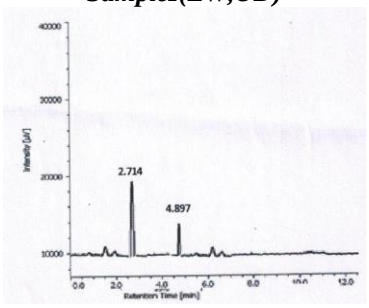


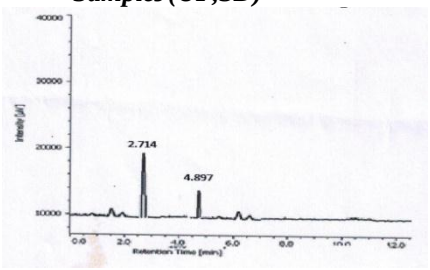
SampleJ(UP,SD)



SampleK(UP,OD)



SampleL (UP,B, SD)



SampleM(UP, B,OD)

Table no 10: Showing ratio between Gingerol and Shogaol concentration.

Samples	%w/w Conc. of Gingerol	%w/w Conc. of Shogaol	Ratio b/w Gingerol and Shogaol
A	1.874	0.845	2.217
B	1.667	0.809	2.060
C	1.666	0.809	2.059
D	1.646	0.799	2.060
E	1.646	0.799	2.060
F	1.643	0.803	2.046
G	1.649	0.804	2.050
H	1.649	0.804	2.050
I	1.692	0.811	2.086
J	1.714	0.807	2.123
K	1.711	0.819	2.089
L	1.719	0.818	2.101
M	1.728	0.811	2.119

DISCUSSION

According to table no 1 Lime water treated sundry *aardrak* yielded maximum amount *Shunthi* which was due to addition of calcium carbonate. Yield was found in least amount in peeled oven dry method. On comparison of sun dried and oven dried methods, the later resulted in lesser amount which may be due to uniform drying of the sample in regulated and protected environment of hot air oven.

According to table no 2, Moisture present in different type of dry samples does not show much significant difference and all were in API limits in range 5.7 to 7.6%. It was maximum recorded in sample C and minimum in sample L. pH of all *Shunthi* samples have slightly acidic nature except sample G (slightly basic) and sample I (neutral). Ginger has normal pH range but after processing increased in range 6.2 to 7.6.Starch content *of Shunthi* samples were found in range 1.9 to 3.8%. Maximum was recorded in sample J and minimum in sample H.There was no significant difference in the yield of volatile oil from different samples. It was found in a range 0.75 to 1.3%.Total ash present in different sample of *Shunthi* was within API limits NMT 6% except sample H and sample I. Acid soluble ash of all *Shunthi* samples were within API limit NMT .5% except sample H. Water soluble ash of all *Shunthi* samples were in range 1.30 to 4.10%. Water soluble extract value present in dry samples of *Shunthi* was in API limit except sample H and sample I. Alcohol and Petroleum ether soluble extract value of all samples of *Shunthi* was in limits of standard as per API NLT3%.

According to table no. 3 Aqueous and alcoholic extract of *Aardrak* and *Shunthi* samples shown positive test for carbohydrate. Table no. 4 shows Dragondroff, Wagner's, Hager's tests which done for presence of alkaloids are positive in aqueous and alcoholic extract of *Aardrak* and *Shunthi* samples. According to table no. 5 Alcoholic extract of *Aardrak* and Aqueous or alcoholic extract of

Shunthi samples are positive in Biuret, Xenthotropic, Millon protein test which indicates presence of Tyrosine residue proteins. Table no. 6 shows Ninhydrien test and foam test test is positive in each extract of *Aardrak* and Aqueous or alcoholic extract *Shunthi* samples indicating presence of Amino acids and Saponin. According to table no. 7 Aqueous and alcoholic extract of *Aardrak* and *Shunthi* samples shown positive test for Glycosides. According to table no. 8 Aqueous or alcoholic extract of *Aardrak* and Aqu. and petroleum ether extract of *Shunthi* samples B,C,D,F or Aqu., Alc.,and P. ether extract of sample E,G,J,K,L,M shown positive for $FeCl_3$, Lead acetate, Pottasium, Dichromate test indicating presence of Tannins. Table no. 9 shows Alcoholic and petroleum ether extract of *Aardrak* and *Shunthi* samples are positive in Salkowerski test indicating presence of Steroids.

Table no. 10 and 11 shows theRatio of Gingerol and Shogoal calculated for each test samples by w/w% of Gingerol and Shogoal which was obtained through HPLC study analysis. Sample A having ration 2.217%w/w and different samples of processed *Shunthi* having ratio in range 2.046 to 2.213%w/w. Maximum ratio was recorded for sample J 2.123% w/w and minimum ratio recorded for sample F 2.046%w/w**.**

CONCLUSION

In differently processed *Shunthi* samples slight variations were observed in physiochemical parameters like pH, moisture content, starch content, total yield of oil, ash content etc. and on the basis of these variations assessment of the therapeutic efficacy, pharmaceutical quality and stability of samples was done and the following conclusion were derived.

- Regarding drying method- oven dried method is suitable for preparation of *Shunthi* in comparison to open sun dried methodas it provides controlled atmospheric condition & temperature, and less chances of contaminations by dust & pathogens.
- After processing, pH of lemon juice treated oven dried method prepared *Shunthi* moves toward to lower acidic side to basic side indicating the acid neutralization of this sample. Therefore it may be most suitable for use in hyperacidic condition. Moreover it has minimum gingerol to shagaol ratio which is responsible for the pungency. So lemon juice treated oven dried *Shunthi* shows less pungency compared to other samples.
- Lemon juice treated oven dried sample is maximum stable compared to other samples with having minimum moisture content and oil content of % which is moderately higher compared to other *Shunthi* samples. Further the product is having high aesthetic value with white colour and smooth texture.
- Thus Lemon juice treated oven dried sample of *Shunthi* will be the best for therapeutic as well as commercial value.

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