WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 12, Issue 1, 1965-1981. Research Article ISSN 2277–7105

EFFECT OF PAKVA AMRAFAL RASA ON SHUKRA DHATU WITH SPECIAL REFERENCE TO SEMEN ANALYSIS – EXPERIMENTAL STUDY

Dr. Yusuf Ahemad Latif Ahemad Ansari[1]*, Dr. Dattatray T. Kodape[2] and Dr. Badgire Shaikh Ali Abbas[3]

[1]Assistant Professor,Yashwantrao Chavan Ayurvedic Medical College and hospital, Chh. Sambhajinagar.

[2]HOD & Associate professor Government Ayurved College Nagpur.

[3]Associate professor, Department of Agadtantra VA &VV, Yashwantrao Chavan Ayurvedic Medical College and hospital, Chh. Sambhajinagar.

Article Received on
20 November 2022,

Revised on 11 Dec. 2022,
Accepted on 01 Jan. 2023

DOI: 10.20959/wjpr20231-27072

***Corresponding Author**
Dr. Yusuf Ahemad Latif Ahemad Ansari
Assistant Professor,Yashwantrao Chavan Ayurvedic Medical College and hospital, Chh. Sambhajinagar.
yusufshaikh8698@gmail.com

ABSTRACT

Introduction

Ayurved is a science of life with a holistic approach to health and personalized medicine. It is known to be a complete medical system that comprised physical, psychological, philosophical, ethical, and spiritual health.[1] According to Ayurveda the body is said to be composed of the 7 *Dhatus* i.e. *Rasa* (Fluid), *Rakta* (Blood), *Mansa* (Muscles), *Meda* (Fat), *Asthi* (Bones), *Majja* (Marrow) and *Shukra* (Semen). *Dhatus* are nourished in this sequence from *Rasa* upto *Shukra Dhatu.*[2] *Shukra* is the seventh final *Dhatu*, end of the line in the *Dhatu* transformation cycle.The *Shukra* which is unctuous, dense, slimy, sweet, nonirritating & white (Transparent) like a crystal is to be known as pure or normal. Smell of pure *Shukra* is like honey. Colour of *Shukra* is like oil or honey.[3] *Garbhotpadan* is the important *Karma* of *Shukra Dhatu*,which increases Progeny.[4] *Shukra Kshya* produces inability to *Prajotpadan*. For the confirmation of male infertility semen analysis should be done. Under semen analysis following four parameters are considered prime Semen volume, sperm count, liquefaction time and sperm motility. Dietary supplements like fruits are considered a safe way to get the recommended daily intake of most minerals, vitamins, and antioxidants. Ripe Mango is unctous, laxative,

cardiotonic, haemostatic, "Aphrodisiac".[5] Ripe Mango is rich source of vit E which helps to reduce infertility.[6] *Pakva Aamrafal Rasa* is one of the *Ahariya dravya* mentioned as *Vrishya* and *Shukravardhak*.[7] So *Pakva Aamrafal Rasa* is responsible for increasing *Shukra Dhatu* by keeping *Samanya Vishesh Siddhanta* in the mind.

Primary research question

Is there any effect of *Pakva Aamrafal Rasa* on *Shukra Dhatu*?

Null Hypothesis (H_0)

There is no benefical effect of *Pakva Aamrafal Rasa* on *Shukra Dhatu*.

Alternate Hypothesis (H_1)

There is beneficial effect of *Pakva Aamrafal Rasa* on *Shukra Dhatu*.

Aim

To study the effect of *Pakva Aamrafal Rasa* on *Shukra Dhatu* with special reference to Semen Analysis.

Primary objectives

To study the effect of *Pakva Aamrafal Rasa* on *Shukra Dhatu* with special reference to Semen Analysis.

Secondary objectives

- To study *Shukra Dhatu* from *Ayurvedic* and modern prospective.
- To study *Pakva Aamrafal Rasa* as a *Ahariya Dravya* from ancient literature.
- To study *Shukra Kshaya Lakshanas from Ayurvedic* and modern prospective.

Review of literature

Dhatu

Nirukti

Dharana means which holds body.[8] So *Dhatu* hold and supports body as well as it nourishes body. *Dhatus* are essential constituents of human body.[9]

Definition of dhatu

Dhatu means which supports and nourishes human body.[10]

Dhatus are broadly divided into two types.

1. *Sthayi* (Permanent): Which is *Poshya*.

2. *Asthayi* (Temporary): This is *Poshaka* for other *Dhatus*.

Karma of dhatu:* 1. *Dharana

- To hold and support body.[11]
- *Ras, Rakta, Mansa* etc *Dhatus* together form human body.
- *Dosha* resides in shades of *Dhatu*. *Doshas* are active constituent of body while *Dhatu* plays supportive role.

From the above references, *Dhatu* also plays an important role in formation of solid part of body.

Dhatu Poshanam (Nourishment)

Dhatu acts like a food for next *Dhatu*. So it plays a role of nourishing *Dhatu* for further *Dhatus*. *Rasa Dhatu* nourishes *Rakta Dhatu, Rakta Dhatu* nourishes *Mansa Dhatu, Mansa Dhatu* nourishes *Meda Dhatu* and so on.[12]

Concept of *shukra dhatu*

***Vyutpatti*:** The word *Shukra* is derived from the root means lucent or pure.[13]

Word *Shukra* also denotes white colour. *Shukra* word is comprehensively used as it expresses purity, holiness, white colour and regeneration power.

***Nirukti*:** Body substance which comes out during coitus is "*Retas*".[14,15] (*Shukra*)

Synonyms: *Retas, Bala, Beeja, veerya, Majjasamudbhava, Anand Pabhava, Pumsatva, Indriya, Paurusham, Teja, Pradhan- Dhatu* are the synonyms of word *Shukra*.

1. *Teja*: Bywhich human becomes lustrous, energetic, brilliant and valiant. It shows activeness. *Garbhotpadana* (Reproduction) depends on *Shukra Dhatu*.
2. *Retas*: Which ejaculates during intercourse.
3. *Beeja*: This has power of reproduction.[16]

Shukra dhatu kshaya

Loss of *Shukra Dhatu* is called *Shukra Kshaya*. The symptoms of *Shukra Kshaya* are less quantity of *Shukra Dhatu*, delayed ejaculation, sometimes ejaculation with bleeding, local or generalized body pain, loss of sexual urge which may further results into impotency.[17,18]

As well as *Shukra Kshaya* causes *Daurbalya* (Weakness), *Mukhshushkata* (Dryness of mouth), *Shaithilya* (Lethargic movements), *Napunsakatva* (Impotency), *Medra-Vrushana Vedana* (Pain in Penis and Testis).

Male reproductive system

Reproductive system ensures the continuation of species. Normally, most of the animals including humans are either definite males or definite females.

Reproductive organs include:

1. Primary sex organs: testes are the primary sex organs or gonads in males
2. Accessory sex organs: accessory sex organs in males are:

i. Seminal vesicles,

ii. Prostate gland,

iii. Urethra, iv. Penis[18]

Semen

Semen, which is ejaculated during the male sexual act, is composed of the fluid and sperm from the vas deferens (About 10% of the total), fluid from the seminal vesicles (Almost 60%), fluid from the prostate gland (About 30%), and small amounts from the mucous glands, especially the bulbourethral glands.

Semen has 7.5 average pH value. The alkaline prostatic fluid neutralizes the mild acididy of the other portions of the semen. In the early minutes after ejaculation, the sperms remain relatively immobile, possibly because of the viscosity of the coagulum. As the coagulum dissolves, the sperms simultaneously become highly motile.[19]

Semen analysis

Parameters of semen analysis:

1. Volume,
2. Reaction of pH,
3. Liquefaction time,
4. Sperm count,
5. Motility of sperm,
6. Pus cells

Qualities semen required for fertility

Minimum required qualities of semen for fertility are:

1. Volume of semen is minimum 2 ml per ejaculation.
2. Sperm count is minimum 20 million/ml.
3. Number of sperms in each ejaculation must be at least 40 million. (i.e. 20 million per ml X 2 ml)
4. Out of all sperms 75% sperms must be alive.
5. 50% of sperms must be motile
6. Out of all sperms 30% sperms must be in normal shape.
7. Sperms with head defect must be less than 35%
8. Midpiece of sperm's defect must be less than 20%.
9. Sperms with tail defect must be less than 20%.[90]

Review of semen

Semen

Semen is the collection of fluids from testes, seminal vesicles, prostate gland and bulbourethral glands. The ejaculation process in sexual act discharged semen. Testes contribute sperms. Prostate secretion gives milky appearance to the semen. Secretions from seminal vesicles and bulbourethral glands provide mucoid consistency to semen.

Nature of semen

The nature of the human semen is liquid at the time of ejaculation. Immediately, it coagulates and after some time it becomes liquid once again (Secondary liquefaction). Fibrinogen secreted from the seminal vesicle is converted into a weak coagulum by the clotting enzymes secreted from prostate gland. When semen is ejaculated, the sperms are non-motile due to the viscosity of coagulum. When the coagulum dissolves, the sperms become motile.

Properties of semen

1. Specific gravity: Specific gravity of the semen is 1.028
2. Volume: Volume of the semen is 2 to 6 ml per ejaculation
3. Reaction: It is alkaline with a pH of 7.5.

Alkalinity is due to the prostate fluid.

Semen analysis[20]

Following are the various important purposes of routine semen analysis:

- Evaluation of infertility
- Routine follow up of patients who have undergone vasectomy
- Artificial insemination

Examination of stored semen specimen. (may be in the case of a husband away from home for long period and when the wife is undergoing complicated infertility therapy).

For men whose future fertility is threatened may be by the need for radiotherapy or chemotherapy in the treatment of cancer.

Amra

As per described in *Sushrut Samhita* the ***Pakva Aamrafal Rasa*** is *Hridyam, Varnakaram, Ruchya, Raktamasbalpradam, Kashay anuras, Swadu, Vataghna, Bruhanam, Guru, Pittavirodhi Sampakva Aamram* ***Shukravivardhanam.***[10]

Family: Anacardiaceae (heart shaped)

Latin name: Mangifera indica

English name: Mango

Botanical name: Mangifera indica

Sanskrit names: Mango has 63 names.

Some of them are as follows: *Kamashar, Madhavdruma, Bhrungubheeshta, Seedhurasa, Madirasav, Vasantdoota, Atisaurabha, Kokilabandhuk, Shukapriya.*

Nomenclature

Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidae
Order	Sapindales
Family	Anacardiaceae
Genus	Mangifera
Species	indica
Scientific Name	Mangifera indica L

Chemical composition- Fruit contains 61.5% cellulose and vit. C.

Nutritional contents of mango fruit

Nutritional value of mango	100grams contains
Calories	99
Protein	1.4 grams
Fat	0.6 grams

Dietary fiber	2.6 grams
Copper	20% of the RDI
Folate	18% of the RDI
Vitamin B6	11.6% of the RDI
Vitamin A	10% of the RDI
Vitamin E	9.7% of the RDI
Vitamin B5	6.5% of the RDI
Vitamin K	6% of the RDI

Properties

Guna **-** *Guru, Snigdha,*

Rasa **-** *Madhur, Kashay.*

Veerya **-** *sheet*

Vipak **-** *Madhur*

Mango has different properties according to its stages. Bark, leaves, flowers and seeds are kapha *pittashamak*, haemostatic and wound healing.

Ripe mango- unctous, laxative, cardiotonic, haemostatic, "**Aphrodisiac".**

It gives strength and improves complexion.

Raw mango - appetizer, improves digestion and vitiates *rakta pitta*.

'Panha' (sherbet) reduces burning.

Leaves- Antiemetic. In pyuria leaf juice is useful.

Flowers- Astringent, antidiarrhoeal.

Bark- Astringent heals the wounds and reduces inflammation of uterus.

Seed- Antihelmintic reduces inflammation of uterus, antidiuretic, constipative and useful in menorrhagia and leucorrhoea.

Srotogamitva

Dosha

Raw fruit - *Tridosh Prakopak,*

Ripe fruit - *Vata Pitta Shamak*.

Dhatu

Shukra **–"Aphrodisiac**."[9]

Mala**:** *Mutragami* (Leaf juice-pyruia), seed (Antidiuretic, purisha antidiarrhoeal), seed-antihelmintic.

Organs: Intestine, uterus.

Benefits of mango

- Mango is one of the most popular of all tropical fruits. Mangiferin, being a polyphenolic antioxidant and a glucosyl xanthone.
- It has strong antioxidant, anti lipid peroxidation, immunomodulation, cardiotonic, hypotensive, wound healing, antidegenerative and antidiabetic activities.
- Various parts of plant are used as a dentrifrice, antiseptic, astringent, diaphoretic, stomachic, vermifuge, tonic, laxative and diuretic.
- It is used to treat diarrhea, dysentery, anaemia, asthma, bronchitis, cough, hypertension, insomnia, rheumatism, toothache, leucorrhoea, haemorrhage and piles.
- All parts are used to treat abscesses, broken horn, rabid dog or jackal bite, tumour, snakebite, stings.
- It is also used to treat Dhatura poisoning, heat stroke, miscarriage, anthrax, blisters, wounds in the mouth, tympanitis, colic.
- Mango is used to treat diarrhea, glossitis, indigestion, bacillosis, bloody dysentery, liver disorders, excessive urination, tetanus and asthma.
- Ripe mango fruit is considered to be invigorating and freshening. The juice is restorative tonic and used in heat stroke.
- The seeds are used in asthma and as an astringent.
- Fumes from the burning leaves are inhaled for relief from hiccups and affections of the throat.
- The bark is astringent, it is used in diphtheria and rheumatism, and it is believed to possess a tonic action on mucus membrane.
- The gum is used in dressings for cracked feet and for scabies.
- It is also considered anti-syphilitic.

METHODOLOGY

Study setting

Educational Institute, Hospital & its periphery.

Study population

30 Married male individuals having age group 25-40 years.

Study duration

18 months after synopsis approval.

Treatment duration

30 days.

Inclusion criteria

1) Married male individual of age group 25 to 40 years, irrespective of religion.
2) Individuals having shukra kshaya lakshanas.[14]
   Selected Male individuals having base line values as,
3) Semen volume = less than 1.5 ml per ejaculation
4) Total Sperm Count= less than 39 million per ejaculation
5) Sperm Motility = less than 40%
6) Liquefaction Time = less than 20 min
7) Individuals who fully co-operated for examination & the investigations.

Exclusion criteria

1) Individuals suffering from Testicular varicocoel, Hydrocele, Erectile dysfunction, Orchitis or any other testicular disorders.
2) Individuals having past history of Torsion of testies, Undescended testies in childhood.
3) Individuals suffering from any systemic disease.
4) Individuals with any addiction like alcholic, smoking, tobacco chewing.
5) Individuals having any problems or complications during the period of *Pakva Aamrafal Ras* ingestion.

Intervention method

Pakva Aamrafal Rasa (*Kesar* Mango in pulp form) supplied to patients.

Dose: 100 gm/Day

Duration: 30 days.

Kaal: *Sagras*

Route of administration: Oral route.

Assessment criteria

Method of assessment of objective parameter.

Semen anyalysis

In this study four parameters of semen analysis were studied.

1) Semen volume (ml / ejaculation)
2) Total sperm count (Millions / ejaculation)
3) Liquefaction time (in minutes)
4) Sperm motility (in percentage)

Gradations for subjective parameters are as follows

***Daurbalya* (Weakness/General debility)**

Characteristic of Daurbalya	Grade
No weakness and can perform routine work effectively	0
Slight weakness but can do routine work normally	1
Slight weakness and feels difficulty in performing routine work	2
Marked weakness and can't perform routine work	3
Marked weakness and can't do any type of work	4

Mukhashosha (Dryness of mouth)

Characteristic of Mukhashosh	Grade
Feeling of thirst 7 to 9 times in 24 hrs , or Intake of water 5 to 7 times with quantity 1.5 to 2 liters in 24 hrs	0
Feeling of thirst 9 to 11 times in 24 hrs, or Intake of water 7 to 9 times with quantity 2 to 2.5 liters in 24 hrs	1
Feeling of thirst 11 to 13 times in 24 hrs, or Intake of water 9 to 11 times with quantity 2.5 to 3 liters in 24 hrs	2
Feeling of thirst 13 to 15 times in 24 hrs, or Intake of water 11 to 13 times with quantity 3 to 3.5 liters in 24 hrs	3
Feeling of thirst more than 15 times times in 24 hrs or Intake of water more than 13 times with quantity more than 3.5 liters in 24 hrs	4

Pandutvam (Paleness/Pallor)

Characteristic of Pandutvam	Grade
Absent	0
Present in Palpebral conjunctiva only	1
Also present in nails, tongue and lips	2
Also present in palms and face	3
Present on whole body	4

Sadanam (Decreased enthusiasm)

Characteristic of Sadanan (Decreased enthusiasm)	Grade
No decrease in enthusiasm	0
Occasionally feels decrease in enthusiasm	1
Often feels decrease in enthusiasm	2
Always feels decrease in enthusiasm	3

Shrama (Fatigue/Tiredness)

Characteristic of Shrama (Fatigue/Tiredness)	Grade
No tiredness with any type of exertion	0
Tiredness only with excessive exertion	1
Tiredness with moderate exertion	2
Tiredness with mild exertion	3
Tiredness without any exertion	4

During assessments of these subjective parameters, the subjects who would indicating to have some other disorders will be further investigated and if any pathology is found, they would be excluded from the study.

Plan of work

Screening of 38 individuals was done out of which 30 individuals with Primary Infertility were selected on the basis of criteria of selection.

They were selected by convenient sampling method after taking consent.

30 Individual were given *Pakva Aamrafal Rasa*

Assessment was done by objective and subjective parameters

Statistical analysis with appropriate test and interpretation was done

Conclusion

Treatment details

100 gm**.** ***Pakva Aamrafal Rasa*** (*Kesar* Mango in pulp form) with lunch for 30 days.

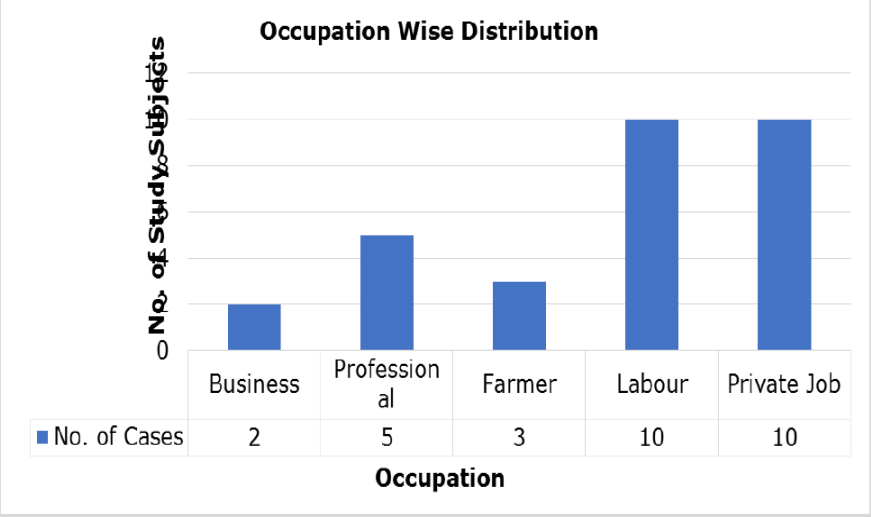
OBSERVATION AND RESULTS

In this study 38 individuals were screened out of which 30 individuals with infertility were studied and selection of individuals was done by using as per selection criteria. All

individuals in the study were selected according the diagnostic criteria. Individuals attending OPD of department of our hospital were examined before starting the treatment with respect to the case report form. *Pakva Aamrafal Rasa (Kesar* Mango in pulp form*)* was advised for the individuals. After completion of study all values of investigation and examination were recorded. All observation is statistically analysed and results obtained are presented below.

Table 1: Table occupation wise distribution of study population.

Occupation	No. of cases	Percentage
Business	2	6.67
Professional	5	16.67
Farmer	3	10.00
Labour	10	33.33
Private Job	10	33.33



Graph 1: Showing occupation wise distribution.

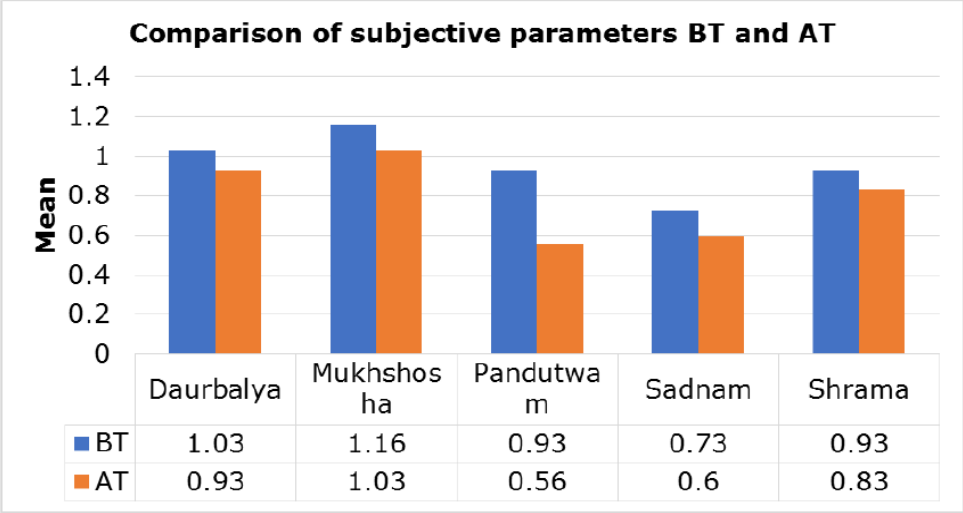
Occupation

Out of 30 subjects 10 (33.33%) subjects of were in private job, 10(33.33%) subjects were Labour, 5 (16.67%) subjects were professionals, 3 (10.00%) subjects were farmer and 2 (6.67%) subjects were businessmen.

Table 2: Table Showing Comparison of Score of Subjective Parameters Before and After Treatment.

	Before treatment			After treatment			Z-value	p-value	Significance
	Mean	SD	Median	Mean	SD	Median			
Daurbalya	1.03	0.61	1	0.93	0.69	1	1.73	0.0833	NS
Mukhshosha	1.16	0.79	1	1.03	0.89	1	2.00	0.0455	S
Pandutvam	0.93	0.45	1	0.56	0.56	1	3.31	0.0009	HS

Sadnam	0.73	0.63	1	0.60	0.67	0.5	2.00	0.0455	S
Shrama	0.93	0.69	1	0.83	0.74	1	1.73	0.0833	NS



Graph 2: Showing Comparison of Score of Subjective Parameters Before and After Treatment.

Daurbalya- Mean+SD before and after treatment were 1.03+0.61 and 0.93+0.69 resp.which donot show significant effect because p=0.0833.

Mukhshosha- Mean+SD before and after treatment were 1.16+0.79 and 1.03+0.89 resp.which show significant effect because p=0.0455

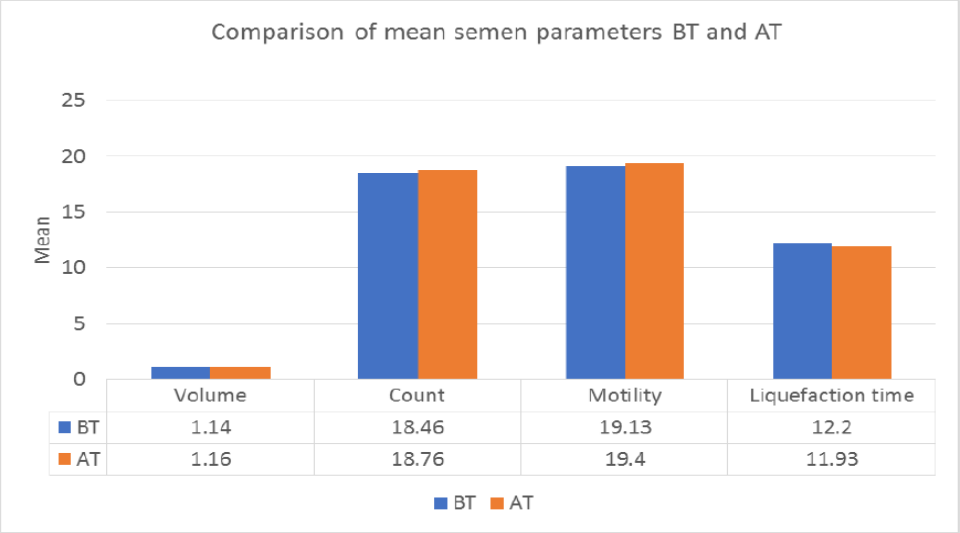
Pandutvam- Mean+SD before and after treatment were 0.93 +0.45 and 0.56+0.56 resp.which show highly significant effect because p=0.0009

Sadnam- Mean+SD before and after treatment were 0.73+0.63 and 0.60+0.67 resp.which show significant effect because p=0.0455

Shrama- Mean+SD before and after treatment were 0.93+0.69 and 0.83+0.74 resp.which do not show significant effect because p=0.0833

Table 3: Table Showing Comparison Of Mean Semen Parameters Before And After Treatment.

	Before treatment			After treatment			t-value	p-value	Significance
	Mean	SD	Median	Mean	SD	Median			
Volume	1.14	0.097	1.1	1.16	0.10	1.2	2.4083	0.0264	S
Count	18.46	4.04	20	18.76	3.97	20	2.3400	0.0264	S
Motility	19.13	3.43	20	19.4	3.68	20	1.6820	0.1033	NS
Liquefaction time	12.2	1.93	12	11.93	1.70	12	1.7647	0.0881	NS



Graph 3: Showing Comparison of Mean Semen Parameters Before and After Treatment.

Volume- Mean+SD before and after treatment were 1.14+0.097 and 1.16+0.10 resp.which shows significant effect because p=0.0264

Count- Mean+SD before and after treatment were 18.46+4.04 and 18.76+3.97 resp.which show significant effect because p=0.0264

Motility- Mean+SD before and after treatment were 19.13+3.43 and 19.4+3.68 resp.which do not show significant effect because p=0.1033

Liquefaction time- Mean+SD before and after treatment were 12.2+1.93 and 11.93+1.70 resp.which do not show significant effect because p=0.0881

DISCUSSION

A. Data related to Objective Parameters

B. Data related to Subjective Parameters

A) Data related to Objective Parameters

Semen volume

The effect of *Pakva Aamrafal Rasa* on semen volume is significant i.e there is increase in semen volume by 0.5% due to the *Shukra Vriddhikar* properties of *Pakva Aamrafal Rasa*. This properties like *Bruhnam, Guru, Madhur, Vrishya and Snigdha.*

Sperm count

The effect of *Pakva Aamrafal Rasa* on sperm count is significant i.e there is increase in sperm count by 0.9%. The effect of *Pakva Aamrafal Rasa* slightly increases the sperm count due to *Madhur, Snigdha and Shukral* properties.

pH

In this study, the pH of 30 subjects semen were Alkaline, as all subjects were normal.

B) Data related to subjective parameters

Mukhshosha

Pakva Aamrafal Ras shows significant effects on *mukhshosha* because it increases "*Ruchi*" that will help in salivation, keeping mouth free from dryness.

Pandutvam

Pakva Aamrafal Rasa shows significant effects on *pandutvam* because it has property of "*Rakta-mansa Balapradam*" that will help in decreasing *pandutvam.*

Sadanam

Pakva Aamrafal Rasa shows significant effects on *Sadanam* because it has property of "*Rakta-Mansa Balapradam*" *(Balvardhak)* that will help in increasing enthusiasm.

CONCLUSION

- *Pakva Aamrafal Rasa* is significantly effective in *Mukhshosha*, *Pandutvam* and *Sadanam*. It means *Pakva Amrafal Rasa* is effective to relieve *Mukhshosha*, *Pandutvam* and *Sadanam*.
- *Pakva Aamrafal Rasa* is significantly effective on semen volume and sperm count. It means *Pakva Amrafal Rasa* is effective in increasing semen volume & sperm count.
- *Pakva Aamrafal Rasa* has no significant effect on *Daurbalya* and *Shrama*. It means *Pakva Aamrafal Rasa* is unable to relieve *Daurbalya* and *Shrama*.
- *Pakva Aamrafal Rasa* has no significant effect on motility and liquefaction time. It means *Pakva Aamrafal Rasa* doesn't work on motility and liquefication time.
- Hence, it can be concluded that the alternate hypothesis is partially accepted that there is beneficial effect of *Pakva Aamrafal Rasa* on *Shukra.*

REFERENCE

1. Semwal DK, Mishra SP, Chauhan A, Semwal RB. Adverse health effects of tobacco and role of Ayurveda in their reduction.J Med Sci, 2005; 15: 139-46.
2. Shastri A. Sushruta Samhita, with Ayurveda Tatva Sandipika Hindi commentary, Published by Chaukhamba Sanskrit Sansthan Varanasi; Re-print edition, Sutrasthan, chapter no, 2016; 14: 10-65.
3. Shastri A. Sushruta Samhita, with Ayurveda Tatva Sandipika Hindi commentary, Published by Chaukhamba Sanskrit Sansthan Varanasi; Re-print edition, Sharir sthana, chapter no, 2016; 2: 13-14.
4. Tripathi B. Charak-Samhita, Chaukhamba Surbharati Prakashan; Varanasi: Chikitsasthana, Chapter no, 2017; 15, 16: 554.
5. Gogte V, Ayurvedic Pharmacology and Therapeutic Uses of Medicinal Plants, Chaukhamba Publication, New Delhi, 2017; 549.
6. Reference Legacy Release (SR Legacy), USFoundation Foods, Food and Nutrient Database for Dietary Studies 2013-2014 (FNDDS 2013-2014), National Nutrient Database for Standard DA Global Branded Food Products Database (Branded Foods), and Experimental Foods.
7. Chunekar K.C.Bhavaprakasa Nighantu, Chaukhamba Bharati Academy Varanasi; Reprinted: Madhyam Khanda, Aamradi Phalvarga, Verse no, 2018; 5: 538.
8. Garade G, Sarth Vaghbhata Ashtanghrudhyaya, Reprint edition, Varanasi: Chaukhmba Surbharti Prakashana; Sutrasthana, Chapter no, 2011; 1: 13-10.
9. Shri P Hargovindashatrina, Amarakoshaha, edition Chaukhamba Sanskrita Sansthana, 2: 52.
10. Vavhal S. Sharir Kriya Vidnyan, Shantanu Prakashana, 2007; 4, 1: 1.
11. Garade G, Sarth Vaghbhata Ashtang hrudhyaya, reprint edition, Chaukhmba surbharti prakashana, Sutrasthana, Chapter no, 2011; 1: 13-10.
12. Shabdakaldruma, Shri-Varadaprasadvasuna tadnujen shriharicharanavasun ch, Nag publishers, pancham khanda, Reprint, 1987; 114.
13. Amarakoshaha, shri P Hargovindashatrina, Chaukhamba Sanskrita Sansthana, edition, 2: 125.
14. Tripathi B, Sharangdhara Samhita, Chaukhamba Surbharti prakashan, Purva khanda, Chapter, 2013; 05: 16-40.
15. Amarakoshaha, shri P Hargovindashatrina, Chaukhamba Sanskrita Sansthana, edition, 2: 110.

16. Tripathi B, Ashtang Hridayam, Chaukhamba Sanskrit Publication, Varanasi: Sutrasthana, Chapter no, 2013; 01: 20-12.
17. Shastri A, Sushruta Samhita, Chaukhamba Sanskrit Sansthan, Varanasi, Reprint: Sutra Sthana, Chapter no, 2012; 15: 09-241.
18. K Sembulingam and Prema Sembulingam; Essential of medical physiology, Jaypee brothers medical publishers, Chapter no, 6, 74: 345.
19. https://en.m.wikipediaorg>wiki>semen-analysis
20. https://en.wikipedia.org/wiki/Semen_analysis