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Research Article

ANALYSIS OF EFFECT OF *AMLA RASA* (SOUR FOOD) IN DIFFERENT CONCENTRATIONS ON *MAMSA DHATU* (MUSCLE TISSUE)

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ABSTRACT

It is said that one should consume *Shad-Rasayuktha Ahara* for better nourishment. The nutritive value of the 6 *Rasas* (taste) has been explained in the classics of Ayurveda along with their harmful effects when used in excess. When *Amla Rasa* is taken in excess it produces *Dantaharsha* (Morbid sensation of teeth), *Trishna* (thirst) etc.

Objectives- The present study is designed by administering *Amla Rasa Pradhana Drvya* given in different concentration 10% and 15% and effect on the *Mamsa Dhatu* is assessed by certain blood parameters.

Material and Methods- Wistar strain albino rats of either sex, weighing of 200-300 g. Obtained from S.D.M Centre for Research in Ayurveda, Udupi, Karnataka. 5Groups were taken and Group 1 is Control, Group-2 is 15% *Chincha*, Group-3 is 15% *Vrukshamla*, Group-4 is 10% *Chincha*, Group-5 is 10% *Vrukshamla* which receives drug and laboratory food for 28days, next day blood was collected by supra-orbital puncture with the help of micro capillary tubes under mild ether anesthesia.

Results- There was increase in the Total Protein, Serum Albumin and serum creatinine levels and decrease in Serum globulin, Serum Urea level and Body weight.

Conclusion- The study suggests that there is catabolic action of the *Amla Rasa* on the *Mamsa Dhatu* and anabolic act action on serum protein especially at the level of liver, so there will be a loss of muscle tissue which suggests *Mamsa Vidhahyati* action.

KEYWORDS: *Amla Rasa, Mamsa Dhatu, Mamsam Vidhahyathi,* Serum Protein, Total protein.

INTRODUCTION

Rasa is an *Indriyartha* which can be perceived through *Rasanendriya*.[1] There are six individual *Rasas*[2] and these *Rasas* are the basis for food selection. Each *Rasa* has its own impact on the body and each *Rasa* when consumed in excess can leads to harmful effects.

It is said that one should consume *Shad-Rasayuktha Ahara* for better nourishment. The nutritive values of the 6 *Rasas* (taste) have been explained.

In the present era people are found of taking more sour and spicy food so in order to understand the effect of sour food when it is taken in different concentrations on muscle tissue with the help of some of the blood parameters.

In this present study effort has been made to understand the effect of *Amla Rasa* (sour) on *Mamsa Dhatu* (muscle tissue) when consumed in different concentrations.

AIMS AND OBJECTIVES

To analyze the effect of *Amla Rasa* (sour food) on *Mamsa Dhatu* (muscle tissue).

REVIEW OF LITERATURE

Rasa is defined as the special senses known through the *Rasanendriya* (Tongue or Taste buds) and *Ahara Dravyas* are classified based on their *Rasas* (taste), *Rasa* of *Dravya* is not only the taste but it is an indicator of the Composition, properties and Probable action of the *Dravya.* There are 6 *Rasas* they are *Madhura, Amla, Lavana, Katu, Tikta* and *Kashaya,* in the same way *Aharadravyas* are classified into six.[3] *Amla Rasa Dravyas* are those which taste sour, they are acidic in nature.

Panchabhoutika constituents of *Amla Rasa*- It is predominant of *Prithvi* and *Agni Bhutas* and according to some authors it is *Jala* and *Agni Bhutas* which is responsible for formation of *Amla Rasa*.[4]

Properties of *Amla Rasa*[5] - It has *Laghu*, *Ushna*, *Snigdha*, *Tikshna* and *Sara Guna*.

Characters of *Amla Rasa*[6]

Dantaharsha (dentine hypersensitivity), *Mukhasrava* (secretion in the mouth), *Swedana* (sweating), *Mukhabodhana* (increase interest towards food), *Asyakanthavidaha* (burning pain in mouth and throat), *Sharira Shaithilaya* (looseness of body), *Durbalanam Shwayathu Apadayati* (oedema in week persons), *Dosha Pachana* of *Kshata*, *Dagdha*, *Bhagna*, *Shotha.* (suppuration in wounds, burns, fractures or swelling), *Paridahati Kantham Urohridaya* (burning sensation in throat, heart and chest).

Functions of *Amla Rasa*[7]

Amla Rasa pacifies *Vata* by acting as carminative (*Anulomana*), creates burning sensation in stomach (*Koshthvidahi*) and increases *Pitta* and *Raktha Dosha*. It is hot in potency but cold to touch, nourishes sense organs, produces interest in foods (*Rochana*) and acts as a digestive and appetizer. It increases and nourishes body (*Brimhana*, *Tarpana* and *Prinana*) promote secretion like digestive juice (*Kledana*) and *Hridya*. It nourishes all the *Dhatus* except *Shukra Dhatu*.

Signs and symptoms of excess consumption of *Amla Rasa*[8]

Dantaharsha (morbid sensation of teeth*), Trishna* (thirst), *Akshinmilana* (closing of eyes), *Samvejayati Lomani* (Horripilation), *Kapha Vilapayati* (It liquefy mucus)*, Pittam Abhivardhayati* (it increases the *Pitta*)*, Raktham Dushayati* (It pollutes *Raktha*)*, Mansa Dhatu Vidaha* (it burns muscle tissue), *Sharira Shaithilya* (Flaccidity of body), *Durbalanam Shwayathu Apadayati* (produces edema in weak persons), *Dosha Pachana* of *Dagdha, Bhagna, Shotha Kshat Paridahati Kanthamuro Hridaya* (it produces burning sensation in the throat and chest regions)*, Timira* (darkness in front of eyes*), Bhrama* (dizziness), *Kandu* (itching), *Pandu* (pallor)*, Visarpa* (spreading type of skin disease)*, Visphota* (skin rash)*, Jwara* (rise in body temperature).

Proteins- These are highly complex substance that is present in all living organisms. Proteins are of great nutritional value and are directly involved in the chemical processes which are essential for life.[9]

Protein Digestion

Protein digestion starts in the mouth with chewing, leading to food disruption and hydration of the proteins. Once swallowed, the protein digestion processes start in the stomach through the action of the enzyme pepsin in acidic medium. The combined action of gastric peristalsis and acid digestion reduces the size of the swallowed particles. The proteins enter then the small intestine and are subjected to further hydrolysis by pancreatic and intestinal enzymes; Nitrogen enters the systemic circulation as amino acid or small peptides via a large variety of transport mechanisms. Lastly, the non-digested proteins from dietary or endogenous origin reach the large intestine where they undergo important hydrolysis by the micro flora, leading to the release of amino acid, peptides and metabolites.[10]

Protein Metabolism in liver

The liver is a site of a wide variety of biochemical pathways which can direct the Amino Acid towards catabolism and ultimately CO2 and urea synthesis, transamination of amino acid which participates to the carbon and nitrogen shuttle within the body, or anabolism because the liver is the site of various biochemical pathways using nutrients, one of the major roles of the liver is to find a balance between the maintenance of aminoacidemia and ammonia levels within physiological limits and the supply of sufficient amounts of amino acid to the peripheral tissues. This balance is also influenced by the maintenance of minimum metabolism necessary to sustain the integrity of the liver and the necessary basal metabolism. The liver is hence at the cross-road between the supply of amino acid from the gut and the demand of other tissues in amino acid and glucose and the amino acid supply to the liver correlates very strongly with urea synthesis,

Muscle mass [11]

According to Heymsfield, 30 to 40 percent of a healthy person's body mass is made up of skeletal muscle. It is found through whole body MRI testing that women tend to have less muscle mass, closer to 30 percent of their body weights, than men, who have closer to 40 percent. Based on this information, a 200-pound man has about 80 pounds of muscle mass. Muscle mass may vary depending on age and fitness level.

Relation between Creatine and Muscle

Creatinine is a by-product of muscle metabolism in which creatine in the muscle is converted non-enzymatically to creatinine. Because the total body content of creatine is fairly constant, there is a continual production of creatinine and a continual excretion of it in the urine. The typical 70kg adult man produces about 2g of creatinine per day. Creatinine is slightly secreted by the kidneys so that at low plasma (creatinine) the clearance of creatinine is about 5–10% greater than the inulin clearance.[12]

Serum creatinine (a blood measurement) is an important indicator of renal health because it is an easily measured byproduct of muscle metabolism that is excreted unchanged by the kidneys. Creatine is

synthesized primarily in the liver from the methylation of glycocyamine (guanidino acetate, synthesized in the kidney from the amino acids arginine and glycine) by S-adenosyl methionine. It is then transported through blood to the other organs, muscle, and brain, where, through phosphorylation, it becomes the high-energy compound phosphor-creatine. Creatine conversion to phosphocreatine is catalyzed by creatine kinase; spontaneous formation of creatinine occurs during the reaction. [13]

Urea- it is also known as carbamide and is a waste product which is excreted through urine. It is at the end of chain of reactions which break down the amino acids that make up proteins. These amino acids are metabolized and converted in the liver to ammonia, CO_2, water and energy. But the ammonia is toxic to cells, so the liver converts the ammonia to a non-toxic compound, urea. [14]

MATERIALS AND METHODS

Animals: Thirty Wistar strain albino rats (*Rattusnovergicus*) of either sex; weighing 100 to 300gms were used for the study.

The animals were obtained from the animal house attached to the Pharmacology Laboratory S.D.M Centre for Research in Ayurveda and Allied Sciences. IAEC Clearance was obtained for the study and the studies were conducted as per its guidelines (IAEC NO: CPCSEA/IAEC/SDMH-SK- 22) six animals were housed in each. Animals were fed with food from Sai Durga feeds Pvt. Limited, Banglore. The experiments were carried out in conformity with the Institutional Animal Ethics Committee after obtaining its permission.

Test drugs

The fruit pulp of *Chincha* (*Tamarindus indica* Linn.) and pulp of *Vrukshamla* (*Garcinia indica)* were used for study. Both drugs were collected in local market near Udupi, and authentication is done with experts of Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Udupi, Karnataka.

Drug Preparation

Chincha and *Vrukshamla* pulp were taken & weighed separately, fruit pulp of 30gms & 20gms each for 15% and 10% respectively was taken and soaked in the equal quantity of water over a night, next morning the fresh juice was prepared out of it. Juice was prepared by adding 30ml of *Swarasa* in 170ml of distilled water for 15% group and 20ml of *Swarasa* in 180ml of distilled water for 10% group.

Drug administration:

The fresh juice was administered according to the percentage and solution is given through water feeding bottles for 28days.

Animal profile and grouping: The selected animals were divided in to five groups, each group comprising 6 animals.

No.	Group Name	% of drug
1	Normal Control	-
2	Group 2 *Chincha*	15
3	Group 3 *Vrukshamla*	15
4	Group 4 *Chincha*	10
5	Group 5 *Vrukshamla*	10

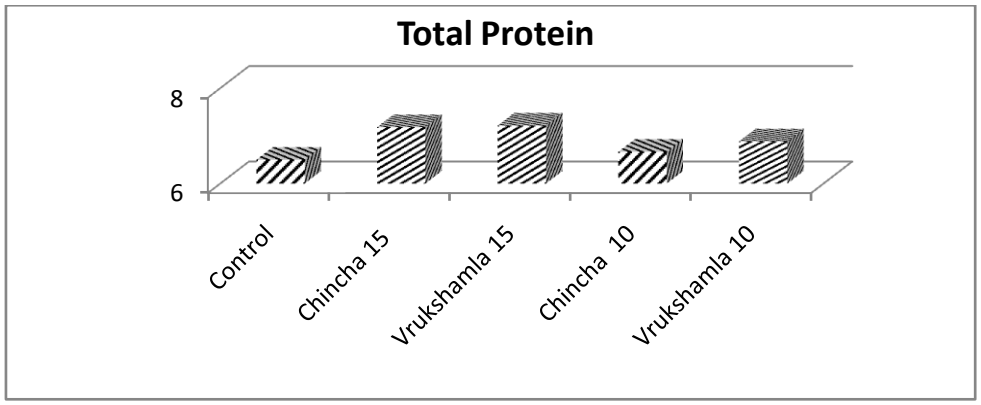
OBSERVATIONS AND RESULTS

The present study was conducted for 28days; two *Amla Pradhana Dravyas* were selected for the present study in order to differentiate the drug effect and effect of *Rasa*.

Table 1a: Effect of *Amla Rasa* on different parameters

Group	Total protein (g/dL)	Albumin (g/dL)	Globulin ((g/dL)	Creatinine (mg/dL)	Body weight (gms)
Normal Control	6.5 ± 0.09661	3.3 ± 0.073	3.2 ± 0.0856	0.5 ±0.07303	33.695± 2.472
Chincha 15%	7.183±0.1537**	4.133±0.1116**	3.05±0.2320	0.6166±0.05426	12.2783±2.682**
Vrukshamla 15%	7.216± 0.060**	4.283±0.2358**	2.933±0.2512	0.6166±0.04773	-0.6833± 1.289**
Chincha 10%	6.666± 0.1022	3.3 ± 0.1000	3.360±0.033	0.65±0.05627	5.875±0.9593**
*Vrukshamla*10%	6.883 ± 0.060*	3.283±0.1662	3.6 ± 0.1183	0.6333±0.04216	-0.0721± 1.014**

Table 2a: Effect of *Amla Rasa* on Serum Total protein

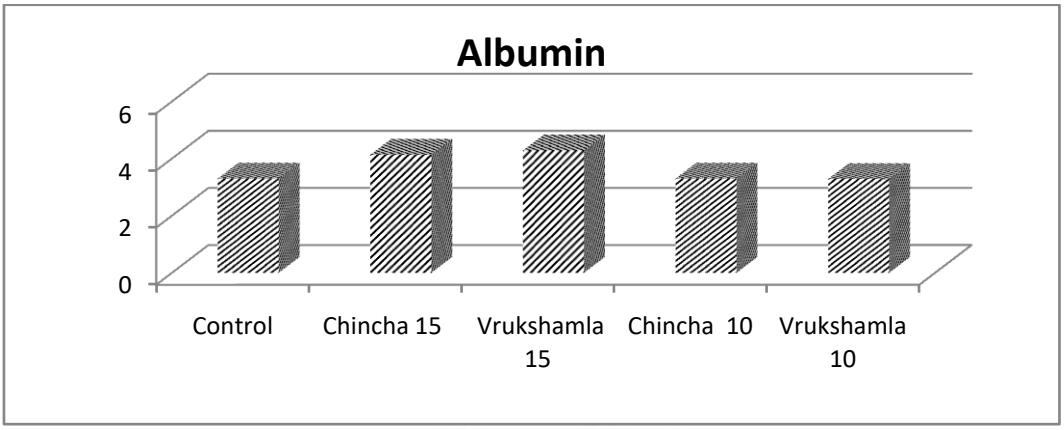


Data: MEAN ± SEM, *P<0.05, **P<0.01

The data related to the effect of *Amla Rasa* in different doses on Serum Total protein can be found in table 2a

The data shows there was increase in the Total Serum protein of *Amla Rasa* 15% and *Amla Rasa* 10% groups, when compared to the control group. The data shows there was increase in the Serum Total protein content of *Chincha* 10% groups when compared to the control group was statistically non-significant.

Table 2b: Effect of *Amla Rasa* on Serum Albumin

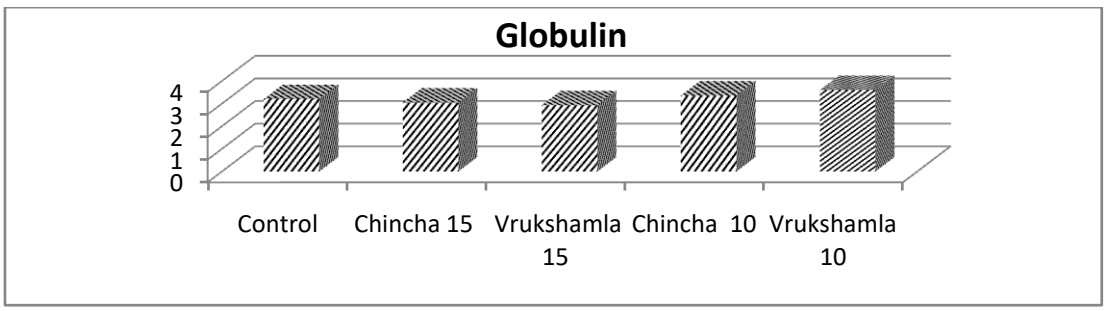


Data: MEAN ± SEM, **P<0.01

The data related to the effect of *Amla Rasa* in different doses on Serum Albumin can be found in table 2b

The data shows there was increase in the Serum Albumin content of *Amla Rasa* 15% and there was decrease in the Serum Albumin content of *Amla Rasa* 10% when compared to the control group. The data shows there was increase in the Serum Albumin content of *Chincha* 15% and *Vrukshamla* 15% group when compared to the control group and is statistically significant. And there was no change in the *Chincha* 10% but in the *Vrukshamla* 10% groups observed changes were found to be statistically non-significant.

Table 2c: Effect of *Amla Rasa* on serum Globulin

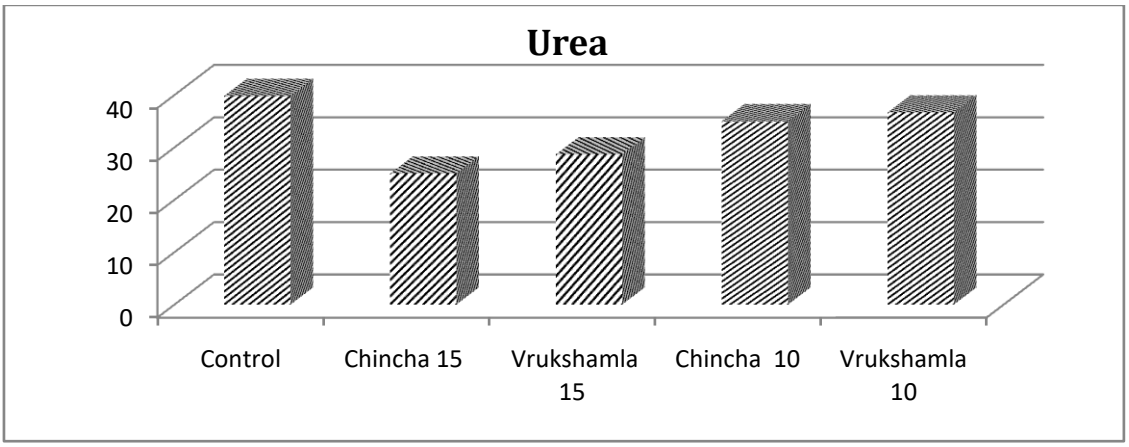


Data: MEAN ± SEM, P>0.05

The data related to the effect of *Amla Rasa* in different doses on Serum Globulin can be found in table 2c

The data shows there was increase in the Serum Globulin content of *Amla Rasa* 15% and there was decrease in the Serum Globulin content of *Amla Rasa* 10% groups, when compared to the control group. The data shows that all four are statistically non-significant.

Table 2d: Effect of *Amla Rasa* on Serum Urea Level

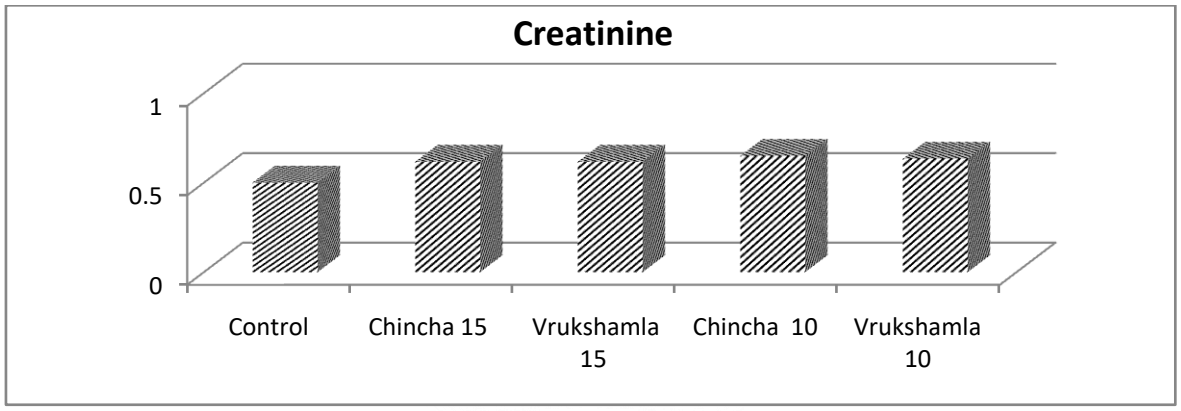


Data: MEAN ± SEM, **P<0.01

The data related to the effect of *Amla Rasa* in different doses on Serum Urea Level can be found in table 2d

The data shows there was decrease in the Serum Urea Level of *Amla Rasa* 15% and *Amla Rasa* 10% groups, when compared to the control group. The data shows there was decrease in the Serum Urea Level of *Chincha* 15% and *Vrukshamla* 15% groups when compared to the control group and is statistically significant.

Table 2e: Effect of *Amla Rasa* on Serum creatinine level

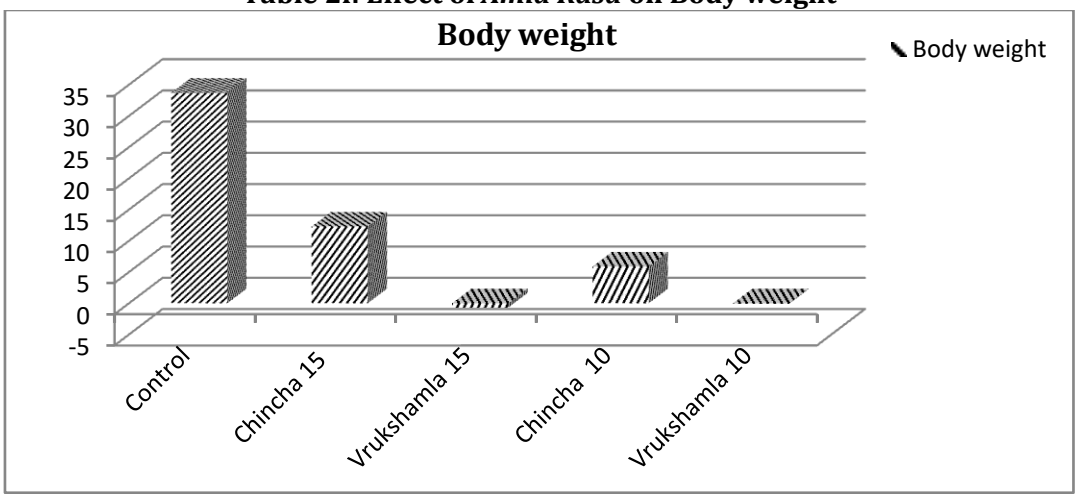


Data: MEAN ± SEM, P>0.05

The data related to the effect of *Amla Rasa* in different doses on Serum creatinine level can be found in table 2e

The data shows there was increase in the Serum creatinine level of *Amla Rasa* 15% and *Amla Rasa* 10% groups, when compared to the control group. The data shows there was increase in the Serum creatinine level of *Chincha* 15% and 10%, *Vrukshamla* 15% and 10% groups when compared to the control group and is statistically non-significant.

Table 2f: Effect of *Amla Rasa* on Body weight

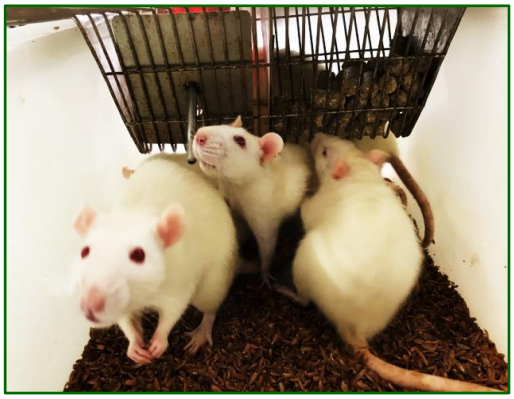


Data: MEAN ± SEM, **P<0.01

The data related to the effect of *Amla Rasa* in different doses on Body weight can be found in table 2f

The data shows there was decrease in the Body weight of *Amla Rasa* 15% and *Amla Rasa* 10% groups, when compared to the control group. The data shows there was decrease in the Body weight of entire four groups when compared to the control group and is statistically significant.

Pictures



Wistar strain albino rats

***Chincha* (*Tamarindus indica* Linn.)**

***Vrukshamla* (*Garcinia indica*)**

Administration of *Vrukshamla* Juice

Administration of *Chincha* juice

DISCUSSION

In the present study two *Amla Rasa Pradhana Dravyas* were selected and juice was extracted and administered to the animals in different concentration.

Creatinine- The amino acids obtained from body proteins are utilized for protein biosynthesis and the production of a wide range of N_2 containing compounds like creatine, amines, etc.

So the elevated level of creatinine indicates that there is catabolism in the muscles which results in depletion of muscle tissue, this process is termed in *Ayurveda*as *Mamsam Vidahyati*, which is the *Atiyoga lakshana* of *Amla Rasa*.

Protein Levels-Increased protein levels due to *Amla Rasa* having the catabolic action on muscle tissue which leads to the increase in the serum protein levels and this may be regarded as *Raktha Dusthi*. Where increased serum proteins will increase the viscosity of the blood due to its molecular size, this viscosity will hamper the functions of blood.

Urea- it is the end product of Amino acid metabolism, decrease in the urea indicates that the amino acids are not much utilized for energy metabolism. Though there will be catabolism of muscle tissue, but amino acids are not utilized for energy purpose (gluconeogenesis etc.), amino acids are utilized by Liver to synthesize Proteins (Albumin). So there will be decrease in urea level and increase in the Serum protein level.

***Shareera Shaitilyam* –** Increase in the Serum Protein levels is mainly due to *Mamsa Vidhahana* which is nothing but catabolic activity inside the muscle tissue which causes *Shithilatha* of *Shareera* indicated through weight loss observed in the study.

CONCLUSION

- *Amla Rasa Dravyas* have catabolic action on *Mamsa Dhatu* as subjected to decrease in weight and increased in serum creatinine.
- *Amla Rasa Dravyas* have an anabolic function in proteins especially at the level of liver as suggested by increased in serum protein, Albumin and decreased in serum urea level.
- Muscle catabolism suggests *Mamsa Vidahayati* action of *Amla Rasa*.
- As the concentration of the *Amla Rasa* intake increases the effects are also different.

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