ISSN: 2249- 5746
International Journal of Ayurvedic and Herbal Medicine 10:4 (2020) 3787–3794
Journal homepage:http://www.interscience.org.uk
DOI:10.31142/ijahm/v10i4.02
Impact Factor: 4.415

# Effect of *Tephrosia Purpurea (Sarapunkha)* on Cardio Vascular System

**Dr. Manoj Kumar[1], Prof. Sangeeta Gehlot[2]**

[1]Lecturer, Dept. of Kriya Sharir, Lalit Hari P.G. State Ayurvedic College and Hospital Pilibhit, U.P, India
[2]Professor and Head, Dept. of Kriya Sharir, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India

**Corresponding Author: Dr. Manoj Kumar**
Lecturer, Dept. of KriyaSharir, LalitHari P.G. State Ayurvedic College and Hospital Pilibhit, U.P. India

## ABSTRACT

*Ayurveda* is the ancient science of life, based on some of the oldest classics, and these are overfilled with various medicinal herbs. *Tephrosia purpurea (Sarapunkha)*i s one of the important drug in Ayurvedic system of medicine. It is an extremely variable species, usually divided into number of subspecies. *Tephrosia purpurea (Sarapunkha)* is a species of flowering plant in the pea family, it has played an important role in traditional and folk medicine as well. It helps in the production of blood cells ,so the herb also manage the symptoms like anaemia, fatigue bleeding associated with hepatomegaly and splenomegaly. The objective of present study was to find out the action of *Tephrosia purpurea (Sarapunkha)* on cardio vascular system and to review the various references of *Tephrosia purpurea (Sarapunkha)*which are mentioned in our ancient texts. Healthy adult male and female subjects having age between 25 to 35years were selected for the study. The ECG tracings were recorded along with the measurement of blood pressure, pulse and respiratory rate before and after the ingestion of *Tephrosia purpurea (Sarapunkha)* root powder decoction(100 mg/kg body weight) twice a day for 7days.The study on human volunteer shows that after taking root powder decoction of *Tephrosia purpurea (Sarapunkha),* the heart rate was observed to decrease and it was associated with a decrease in systolic blood pressure of the individual with little change in diastolic pressure. The action of the ingredients of *Tephrosia purpurea (Sarapunkha)* could be local on the cardiac muscle or the pace maker, so as to cause reduction in the heart rate .However the action of the drug on cardio- vascular system might be through the alteration in the activity of the autonomic nervous system.

**Key words:** ECG, *Hridaya, Tephrosia purpurea (Sarapunkha).*

## INTRODUCTION

*Ayurveda* is the first systematically written record of medicine of the world and incorporating all aspect of human life. The main purpose of *Ayurveda* is prevention of health of healthy and eradication of diseases of diseased[1]. The Science of *Ayurveda* primarily involves the use of the products of plant origin, either individually or in combination or from plants of different species and genera in different proportions. The roots, leaves, seeds, and whole plant of *Tephrosia purpurea* is extensively used as anti-pyretic and in diseases of liver, spleen, heart and purifier of blood etc[2]. It may presumed, that *Tephrosia purpurea* ingredients might act on highly dynamic cardiovascular system and may affect it. Consequently the

*Ayurvedic* crude preparations may be used in the treatment of more than one disease and may possess effect on more than one system of the body.

**Cardiovascular system in Ayurveda**

Concept and description of heart is well explained since pre vaidic period. In , *Rigveda*[3], *Atharvaveda*[4] , *Samveda*[5] , *Satpath Brahman*[6] , *Kathopnishad*[7] , *Chandogya Upnishad*[8], *Mahabharat*[9] , *Bagvatgeeta*, *Padmapuran*[10] and in so many other lexicon we find very rich description about heart. The term *Hridaya* has been commonly used in *Ayurvedic* lexicons to denote heart as well as seat of consciousness[11], which is primarily a function of brain[12]. *Sushruta* observed *Hridaya* like a red lotus having its apex downwards[13] but in another chapter it has been described that *Hridaya* is a place of consciousness and when it is enveloped by the illusive effects of *Tamas(darkness)*,*Nidra* (sleep)comes to the living beings[14]. According to the *Brahmopnishad* the term *Hridaya* is the physiological functions of the heart[15]. The word *Hridaya* consists of three verbs. *Hri* which means to bring back forcibly or venous return, *Da* to donate pumping function of the heart, *Ya* means to move or to circulate[16].

As per *Bhela Samhita*, *Rasa* gets ejected out of the heart and moves all over the body, after that returns to the heart through the blood vessels called *Siras* which originate at heart[17]. The description of cardiovascular system as a closed circuit is the specific contribution of *Bhela* which was actually re-invented by William Harvey in 17th Century[18].

## MATERIALS AND METHODS

**Study on healthy human volunteers**

Consent of the young male and female volunteers aged 25-35 years was taken for starting the study. Total 30 volunteers were registered for this study20 being males and 10 females.

**Criteria for selection of volunteers**

The volunteers were healthy male and female students and workers of the Institute of Medical Sciences, BHU. It was ensured that the volunteers did not suffer from any acute or chronic disease. It was also seen that the volunteers were not addicted to any drug. Some of the volunteers were vegetarian and others were occasionally non-vegetarians.

**Drug *(Tephrosia purpurea)***

*Tephrosia purpurea* is a Fabaceae family and Leguminoseae (Papilionateae) Sub-family[19], commonly known in sanskrit as 'sharapunkha'[20]. The plant grows throughout India and Western Himalaya upto height of 1500 meters. A much branched perennial, grows 30-60 cm. in height, with spreading branches. The leaves are 4-14 cm. long, imparipinnate leaflets 13-21, lanceolate, glaberescent above and glaucous beneath. The flowers are purple, in recemes and the fruit-pods are 2.5-5.0 cm long and 0.5 cm broad. The seeds are 6-10 per pod, smooth and grey in colour [21]. Whole plant and various parts of the plant are useful as ayurvedic medicines. Medicinal uses of drugs are tonic, laxative, diuretic, in bronchitis, bilious febrile attack, boils, pimples, diarrhoea, gonorrhoea, rheumatism and cures disease of heart, spleen and act as blood purifier [22].

**Method of Drug preparation and administration**

In the months of August–October *Tephrosia purpurea* was collected from the grass field of BHU Campus. Roots were separated from the rest of the plants and washed thoroughly and dried in shade for 7-10 days. Once the roots were found dry and free from moisture, they were ready for use. After drying, fine grinding of root was done. Six gm. of root powder taken and 100 ml. of water added to it in a beaker for the preparation of drug decoction. The contents were heated on a slow flame. The procedure of heating and boiling the mixture was continued till solvent was reduced to 25% of its original volume. The mixture filtered through a sieve with pore size No.1/120. The total time taken in boiling the mixture was around 30-40 minutes[23].

**Dose schedule for human volunteers**

0.5 ml/kg of the decoction prepared was given to the human volunteers twice daily after meals .This constituted a dose of 100 mg/kg body weight [24]. which was used in decoction form and quantity was taken 25 ml. Drug given for 7 days, twice a day.

Pulse rate, respiratory rate, blood pressure and ECG recordings were taken before and after administration of drug (*Tephrosia purpurea* root powder decoction). Tracing for speed was adjusted on 25 mm/sec.

Statistical analysis was done by calculating Mean±S.D. Inter-group and intra-group comparison was performed by using unpaired and paired t-test respectively.

## OBSERVATIONS AND RESULT

To evaluate the effect of *Tephrosia purpurea* in human healthy volunteers pulse rate, respiration rate, blood pressure, ECG recording were observed before and after therapy.

**Pulse Rate**

After drug therapy pulse rate was slightly decreased in comparison to before therapy. Mean±S.D. ranged between 70.0±7.18 to 71±8.70 before therapy and 66.4±5.48 to 69.6±6.18 after drug therapy. On intragroup comparison of mean±S.D. difference, significant change was found during $T_D - T_{150}$ interval (T=3.5, p<0.01) and at $T_D - T_{180}$ (t=2.74, p<0.05). As shown in **Table No.01.**

**Table No.01: Effect of *Tephrosia purpurea* on Pulse rate(per min.) at different interval in Human volunteers**

| Intervals | | Initial-TD | TD – T30 | TD – T60 | TD – T90 | TD - T120 | TD - T150 | TD-T180 |
|---|---|---|---|---|---|---|---|---|
| Intra-group Comparison | Mean ±S.D. of difference | 46.17 ±23.67 | 3.83 ±28.17 | 11.83 ±37.60 | 23.67 ±29.17 | 23.33 ±24.50 | 19.17 ±26.22 | 23.33 ±20.74 |
| | Paired t-test | t = 4.78 p<0.01 HS | t = 0.33 p>0.05 NS | t = 0.77 p>0.05 NS | t = 1.99 p>0.05 NS | t = 2.33 p>0.05 NS | t = 1.79 p>0.05 NS | t = 2.75 p<0.05 S |

**Respiration rate**

Respiration rate decreased after drug therapy. Mean±S.D. of respiratory rate ranged between 18.30±2.91 to 19.10±3.73 before therapy and after therapy it was found between 16.4±2.22 to 17.10±2.28.On intragroup comparison of Mean±S.D. difference, respiratory rate was found statistically significant .(t=2.55, p<0.05). As shown in **Table No.02.**

**Table No.02: Effect of *Tephrosia purpurea* on respiration rate (per min.) at different interval in Human volunteers.**

| Intervals | Initial - $T_D$ | $T_D - T_{30}$ | $T_D - T_{60}$ | $T_D - T_{90}$ | $T_D - T_{120}$ | $T_D - T_{150}$ | $T_D - T_{180}$ |
|---|---|---|---|---|---|---|---|
| Intra group comparison Mean ± S.D. of difference | 1.7 ±2.11 | 0.1 ±0.57 | 0.3 ±1.50 | 0.1 ±1.80 | 0.3 ±3.40 | 0.4 ±1.71 | 0.5 ±1.72 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Paired t-test** | t = 2.55 p<0.05 S | t = 0.55 p>0.05 NS | t = 0.63 p>0.05 NS | t = 0.32 p>0.05 NS | t = 0.28 p>0.05 NS | t = 0.74 p>0.05 NS | t = 0.92 p>0.05 NS |

**Blood pressure**

Slight decrease in both systolic and diastolic blood pressure was observed after drug therapy but on intragroup comparison, Mean±S.D. difference, systolic blood pressure was observed significant during comparison of TD-T¬90,120,150,180 interval, whereas diastolic blood pressure was also observed statisticaly significant at TD-T60,90 Details are shown in **Table No.03**

**Table No.03: Effect of *Tephrosiapurpurea* on Systolic & Diastolic Blood Pressure (mm of Hg) at different interval in Human volunteers**

| **Intervals** | | **Initial - $T_D$** | **$T_D - T_{30}$** | **$T_D - T_{60}$** | **$T_D - T_{90}$** | **$T_D - T_{120}$** | **$T_D - T_{150}$** | **$T_D - T_{180}$** |
|---|---|---|---|---|---|---|---|---|
| **Intra group comparison** | **Systolic** | 0.06 ± 5.42 | 1.6 ± 4.60 | 2.0 ± 4.42 | 3.1 ± 3.50 | 3.2 ± 3.80 | 3.6 ± 4.30 | 3.8 ± 4.80 |
| | | t=0.03 p>0.05 NS | t=1.10 p>0.05 NS | t=1.43 p>0.05 NS | t=2.80 p<0.05 S | t=2.66 p<0.05 S | t=2.65 p<0.05 S | t=2.50 p<0.05 S |
| **Mean ± S.D. of difference** | **Diastolic** | 0.4 ± 6.65 | 2.4 ± 3.50 | 3.2 ± 4.2 | 3.8 ± 5.12 | 0.2 ± 11.7 | 3.8 ± 6.95 | 4.2 ± 6.21 |
| **Paired t-test** | | t=0.19 p>0.05 NS | t=2.17 p>0.05 NS | t=2.41 p<0.05 S | t=2.35 p<0.05 S | t=0.05 p>0.05 NS | t=1.73 p>0.05 NS | t=2.14 p>0.05 NS |

**ECG Recording in Human Volunteer:**

**PR interval**

No significant alteration in PR interval was observed after drug therapy. On intragroup comparison no statisticaly significant change was observed.

**PR Segment**

No significant change in PR Segment was monitored after treatment .On intragroup comparison no statistical significant change was observed.

**QRS duration**

Mean±S.D. before therapy varied 0.042±0.006 to 0.048±0.006 and after therapy 0.042±0.006 to 0.052±0.0193 at different interval. On inter group comparison, it was found insignificant. As shown in **Table No.04.**

**Table No.04 Effect of *Tephrosiapurpurea* on QRS duration (sec.) at different interval in Human volunteers**

| **Intervals** | **Initial - $T_D$** | **$T_D - T_{30}$** | **$T_D - T_{60}$** | **$T_D - T_{90}$** | **$T_D - T_{120}$** | **$T_D - T_{150}$** | **$T_D - T_{180}$** |
|---|---|---|---|---|---|---|---|
| **Intra group comparison** | 0.0 ±0.01 | 0.002 ±0.01 | 0.004 ±0.016 | 0.002 ±0.015 | 0.008 ±0.02 | 0.012 ±0.02 | 0.006 ±0.02 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean ± S.D. of difference**<br><br>**Paired t-test** | t=0<br>NS | t = 0.63<br>p>0.05<br>NS | t = 0.79<br>p>0.05<br>NS | t = 0.42<br>p>0.05<br>NS | t = 1.26<br>p>0.05<br>NS | t = 1.90<br>p>0.05<br>NS | t = 0.95 p>0.05<br>NS |

**QRS Amplitude**

Mean±S.D. of QRS amplitude before therapy was found between 1.17±0.226 to 1.19±0.0251 and after therapy at different interval it ranged between 1.22±0.220 to 1.27±0.222. On intragroup comparison of Mean±S.D. difference, statistical significant change was assessed at intervals initial to TD, details are given in Table No.05.

**Table No.05: Effect of *Tephrosiapurpurea* on QRS Amplitude (mV.) at different interval in Human volunteers**

| **Intervals** | **Initial - $T_D$** | **$T_D$ – $T_{30}$** | **$T_D$ – $T_{60}$** | **$T_D$ – $T_{90}$** | **$T_D$ – $T_{120}$** | **$T_D$ – $T_{150}$** | **$T_D$ – $T_{180}$** |
|---|---|---|---|---|---|---|---|
| **Intra group comparison** | 0.07<br>±0.07 | 0.0<br>±0.07 | 0.03<br>±0.10 | 0.0<br>±0.1 | 0.04<br>±0.07 | 0.01<br>±0.09 | 0.02<br>±0.04 |
| **Mean ± S.D. of difference**<br><br>**Paired t-test** | t = 3.16<br>p<0.02 S | t = 0.0<br>NS | t = 0.95<br>p>0.05<br>NS | t = 0.0<br>NS | t = 1.81<br>p>0.05<br>NS | t = 0.35<br>p>0.05<br>NS | t = 1.58 p>0.05<br>NS |

**RR Interval**

RR interval increased after drug therapy, which shows decreased in heart rate. But on intragroup comparison of mean±S.D. difference, it was found insignificant on intra group comparison (Table No.06) As shown in Table No.01.

**Table No.06: Effect of *Tephrosiapurpurea* on RR interval (Sec.) at different interval in Human volunteers**

| **Intervals** | **Initial - $T_D$** | **$T_D$ – $T_{30}$** | **$T_D$ – $T_{60}$** | **$T_D$ – $T_{90}$** | **$T_D$ – $T_{120}$** | **$T_D$ – $T_{150}$** | **$T_D$ – $T_{180}$** |
|---|---|---|---|---|---|---|---|
| **Intra group comparison** | 0.014<br>±0.027 | 0.024<br>±0.034 | 0.0<br>±0.0 | 0.02<br>±0.043 | 0.024<br>±0.043 | 0.024<br>±0.043 | 0.04 ±0.065 |
| **Mean ± S.D. of difference**<br><br>**Paired t-test** | t = 1.64<br>p>0.05<br>NS | t = 2.23<br>p>0.05<br>NS | t=0<br>NS | t = 1.47<br>p>0.05<br>NS | t = 1.76<br>p>0.05<br>NS | t = 1.76<br>p>0.05<br>NS | t = 1.95 p>0.05<br>NS |

**QT Interval**

Before therapy Mean±S.D. of QT interval in human volunteers was observed between 0.334±0.028 to 0.348±0.0190 whereas after therapy it varied between 0.332±0.033 to 0.360±0.032 at different intervals. On intra group comparison Mean±S.D. difference, it was found statistically significant only when compared to TD-T60, TD-T120, TD-T150, TD-T180 (Table No.07 As shown in Table No.01.

**Table No.07: Effect of *Tephrosiapurpurea* on QT Interval (sec.) at different interval in Human volunteers**

| **Intervals** | **Initial - $T_D$** | **$T_D$ – $T_{30}$** | **$T_D$ – $T_{60}$** | **$T_D$ – $T_{90}$** | **$T_D$ – $T_{120}$** | **$T_D$ – $T_{150}$** | **$T_D$ – $T_{180}$** |
|---|---|---|---|---|---|---|---|
| **Intra group comparison** | 0.004 ±0.03 | 0.008 ±0.003 | 0.02 ±0.02 | 0.016 ±0.03 | 0.02 ±0.02 | 0.024 ±0.03 | 0.028 ±0.03 |
| **Mean ± S.D. of difference**<br><br>**Paired t-test** | t = 0.42 p>0.05 NS | t = 0.84 p>0.05 NS | t=3.16 p<0.02 S | t = 1.69 p>0.05 NS | t = 3.16 p<0.02 S | t = 2.53 p<0.05 S | t = 2.95 p<0.02 S |

## DISCUSSION

The study on human volunteer in heart rate shows gradual decrease in heart rate and it was associated with a decrease in systolic blood pressure, and little change was observed in diastolic blood pressure. The fall in systolic blood pressure therefore appears to be due to decline in cardiac output by virtue of reduction in the heart rate. The mechanism of action of the ingredients of *Tephrosia purpurea* on cardiovascular system can only be presumed. The action of the ingredients could be local on the cardiac muscle or the pace maker, so as to cause reduction in the heart rate. However the action of the drug on cardio vascular system might be through the alteration in the activity of the autonomic nervous system. Probably, it may be acting centrally ,the ingredients of *Tephrosia purpurea* bring about an increase in vagal tone. It is well known that increase in vagal tone decreases heart rate as well as force of contraction which can only be brought about by increased parasympathetic activity to the gut for the decline in heart rate and consequent fall in the blood pressure. It can be explained by an increase in parasympathetic activity over the heart and or a decrease in sympathetic activity to the heart.The present study does not provide any clue and cannot differentiate the effect of the drug on sympathetic and parasympathetic components of the autonomic nervous system, however the present observations clearly suggest that *Tephrosia purpurea* decoction preparation does influence the activity of the autonomic nervous system with consequent alterations in the functions of the cardio vascular system. *Tephrosia purpurea* decoction influences cardiac activity, so as to cause reduction in heart rate. Further longitudinal and more extensive studies are needed with large sample size to explore exact mechanism of action. Also studies should be extended to standardize the various extracts of *Tephrosi apurpurea* for the purpose of their use in specific herbal formulations.

## FIGURES (ECG Tracing) :

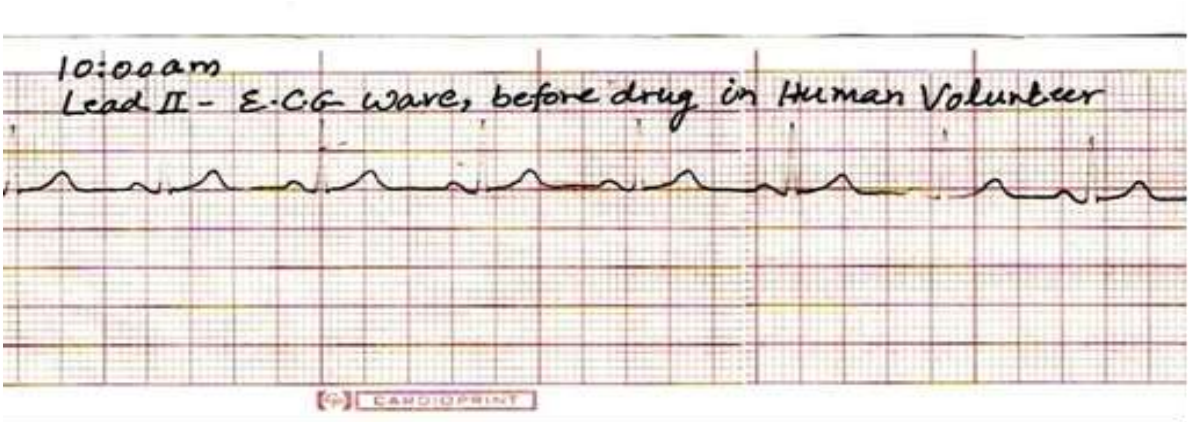


**Fig. No.1: ECG Tracing before oral drug administration of *Tephrosiapurpurea* root decoction in Human volunteer.**

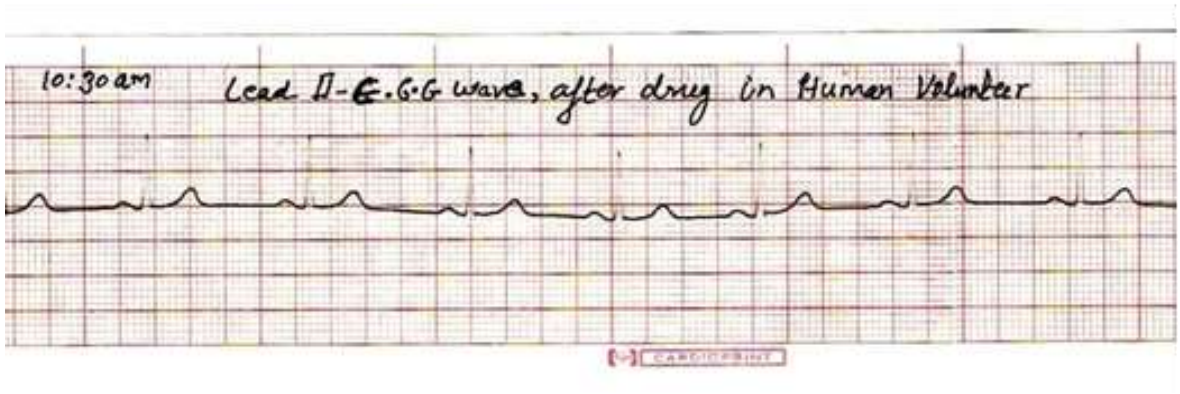


**Fig. No.2: ECG Tracing after oral drug administration of *Tephrosiapurpurea* root decoction in Human volunteer.**

## References


1. Srivastava Niraj et.al.Fundamental Nature of Medical Ethics in Kaumarbhritya ( Paediatrics of Ayurveda),JETIR,Vol.6,page 823.
2. Pankti P Dalwadi et al, Tephrosiapurpurea Linn (Sharpunkha, Wild Indigo): A Review on Phytochemistry and Pharmacological Studies, Indian Journal of Pharmaceutical and Biological Research (IJPBR)
3. Rigveda, (10/14/14), (10/67/03), (10/163/03)
4. Atharvaveda, (10/02/11),(10/02/27),(10/57/70),(18/8/43)
5. Samveda, (6/4/3)
6. Satpath Brahman, (4/1/5/12), (8/5/4/3), (8/5/4/6)
7. Kathopnishad ,(2/2/4), (2/3/1)
8. Chandogya Upnishad,(8/1/1), (2/33/3), (3/14/3)
9. Mahabharat Shantiparva (185/3),(185/15)
10. Padmapuran (22-23)
11. Agnivesha. Charaka samhita , English translation by Sharma RK, Dash B. Vol-I, SutraSthan (30/2-3), Chaukhambha Sanskrit series office, Varanasi. (2010)
12. Agnivesha. Charaka samhita , English translation by Sharma RK, Dash B. Vol-I, SutraSthan (30/4-6), Chaukhambha Sanskrit series office, Varanasi. (2010)
13. Sushruta. Sushruta samhita, English translation by Sharma P.V, Vol II, Sharirasthan(4/31), Chaukhambha Vishvabharati , Varanasi. (2005).
14. Sushruta. Sushruta samhita, English translation by Sharma P.V, Vol II, Sharirasthan(4/33), Chaukhambha Vishvabharati , Varanasi. (2005).
15. 15.Brahmopnisha
16. Vagbhata .Astanga Hriday , English translation by Srikantha Murty KR, Vol-II, Sharir- sthana (3/13) Chaukhambha, Krishnadas Academy Varanasi. (2015)
17. .BhelSamhita,Sutra-Sthan 21. Chaukhambha Sanskrit series office, Varanasi.
18. PatwardhanK.,Human Physiology in Ayurveda,First Edition,2005
19. Orwa C, Mutua A, Kindt R, Jamnadas R, Simons A, Agroforestree database: a tree reference and selection guide version, 2009,27,52-59. 4
20. Bhawprakash Nighantu
21. Medicinal and Aromatic Plants Abstracts, CSIR, Volume 24, No. 1, 2001, p. 308
22. Purushottam Kaushik and Anil Kumar Dhiman, Medicinal Plant and raw drug of India.page 197,1999.

23. Prajapati Mahendra P.,Effect of Albizzia lebbeck on Hunger and Gastrointestinsl Tract Function,2004,IMS,BHU,Varanasi.
24. Dastur J.F., Everybody guide of Ayurvedic Medicine.