



Pharmacokinetics of Vayasthapan Mahakashay from Charak Samhita

Dr D V Kulkarni¹, Dr Abhijeet Pachpor^{2*}, Dr Sneha Shinde³

¹Professor and HOD, Dravyaguna, Government Ayurved College, Osmanabad, India

^{2,3}PG Scholar, Dravyaguna, Government Ayurvedic College, Osmanabad, India.

ABSTRACT: Charak has categorized important medicinal herbs into different classes, according to their pharmacokinetics, which are well-known as 50 Mahakashay. This work is committed for the study of the Vayasthapan Mahakashay, one of the Mahakashay from this classification. The herb, which sustains the youth stage and prevents the aging process, is termed as Vayasthapan. All the 10 ingredients from Vayasthapan Mahakashay are of herbal origin and were screened for their different properties, uses, actions according to different Ayurvedic lexicons, textbooks and scholarly research articles. Ageing process is enhanced due to increased metabolism in body, which is due to vitiated Pitta dosha. We have concluded that Vayasthapan Mahakashay include 70% medicinal herbs in possession of *Madhura-tikta* rasa and 50% of the herbs are in possession of *Kashaya rasa*, which help in alleviating pitta dosha, resulting in decreased metabolism in the body. Out of 10 herbs 50% of herbs are effective in keeping good mental health, while 50% herbs are effective in keeping good physical health. We also found that all these herbs are having antioxidant property which neutralizes the free reactive oxygen species responsible for the early rapid aging.

© 2017 A D Publication. All rights reserved

Keywords: Anti-aging herbs, Kashay rasa, Vayasthapan Mahakashay, Anti-oxidant action

1. Introduction

The aging (jara) is a natural phenomenon. It is a Svabhavabalapravrita vyadhi like Hunger (kshudha), Thirst (pipasa), sleep (nidra) and Death (mrityu) [1, 2]. The aging is of two types: -

- 1) Natural Aging (kalaja) - occurs at 60 years of age or after that.
- 2) Premature Aging (akalaja) - occurs before 60 years of age and due to disturbed life style.

According to modern science Ageing is the process of deterioration of function of various organs after attainment of adulthood. Today's lifestyle is very much responsible for the early ageing, In India last few decades have seen the influence of westernization on its new generation, like consumption of alcohol, cigarette smoking, eating junk food like pizza, sandwich, packed food, drinking aerated drinks like thumps-up and coke, exposure to ultra-violet radiation consumption of vegetables contaminated with pesticides and fertilizers. Now a day the fruits are ripped before their maturation by treating them with harmful chemical agents which give rise to free reactive oxygen species in the body triggers the process of oxidation. Due to this modern India is facing early signs of ageing like wrinkles over face (vali), graying of hairs (palitya), baldness (khalitya), attack of cough (kasa), dyspnoea (swasa) diminished mental (smaran) as well as physical abilities (bala) [3,4], low immunity, development of allergies, major health problem. According to Sushruta, Rasayanais Vayasthapan (maintaining youth), provide long

* Corresponding author e-mail: dvkulkarni13@gmail.com
Tel.: +91 0000000000

Journal access: www.adpublication.org
© 2017 A D Publication. All rights reserved

life, intellect and strength and also eliminates the disease[5]. The 10 herbs mentioned in Vayasthapan Mahakashay are proved to inhibit tissue degeneration and their cell regeneration capacity.

Aim

Literary study of medicinal plants from Charakokta Vayasthapan Mahakashay
To study Vayasthapan Mahakashay with special reference to anti-aging activity

Objectives

To study the chemical composition of medicinal herbs from Vayasthapan Mahakashay.
To study the Pharmacological action of medicinal herbs from Vayasthapan Mahakashay with respect to Ayurvedic and modern aspect.

2. Material and methods

Through review of Vayasthapan Mahakashay from Charak sutrasthan was undertaken. Study of herbs done from various Nighantu (lexicons) as well as related work done by research scholars was referred. Vayasthapan are the drugs which remove derangement of vitiated dosha in body & bring back it to the normal state i.e. Tridoshsamyā, also inhibit tissue degeneration & stop the further damage.

The medicinal herbs mentioned in Vayasthapan Mahakashay are listed below.

Name of herb	Latin name
1. Guduchi	<i>Tinospora cordifolia</i> (Willd.) Miers ex Hook. f. & Jhoms.
2. Haritiki	<i>Terminalia chebula</i> Retz
3. Amalki	<i>Embllica officinale</i> Linn
4. Mukta (Rasna)	<i>Pluchea lanceolata</i> Oliver & Hiern
5. Shweta (shwetaparajita)	<i>Clitoria ternatea</i> Linn.
6. Jeewanti	<i>Leptadenia reticulata</i> (Retz.) Wight & Arn
7. Atirasa	<i>Asperagus racemosus</i> (Willd)
8. Mandukparni	<i>Centella asiatica</i> (Linn) Urban
9. Sthira (sarivan)	<i>Desmodium gangeticum</i> (Linn) D C
10. Punarnava	<i>Boerhavia diffusa</i> Linn

Definition of Vayasthapan—the drug which sustains the youth stage and prevents the aging process is called as Vayasthapan. According to Acharya Sushruta, *Rasayanais Vayasthapan* (maintaining Youth) provides long life, intellect and strength[5].

1. Guduchi (*Tinospora cordifolia* Willd. Miers ex Hook. f. & Jhoms.)

Description of Guduchi—It is a large deciduous climbing shrub found throughout India.

Chemical composition[6]—Guduchi contains a variety of constituents like alkaloids, diterpenoid, steroids, glycosides, lactones, polysaccharides and tinosporic acid, cordifolisides A to E, tinosporone, syringin, giloin, gilenin, crude giloinin and, berberine, arabinogalactan polysaccharide, picrotene, bergenin, giloesterol, tinosporol, tinosporidine etc.

Properties as per lexicons (Nighantu)- Katu, tikta and kashay in taste, Laghu Guna, Ushna Veerya, Madhura Vipaka, ameliorates tridoshas, and saptadhatuposhak[7]. Due to Guru and Snigdha Guna it is nutritive in nature and also balances Vata dosha, it shows quality similar to Rasadhatu hence strengthens Rasadhatu and nourishes the remaining six dhatus. Being tikta Rasait pacifies Pittadosha; due to Kashaya as a secondary rasa it also balances kapha. Due to Ushna veerya it promotes Jatharagni and helps in digestion of Aamadosha. Mathew S and Kuttan G (1997) established the antioxidant property of *Tinospora cordifolia*[6]. Kapil A & Sharma S (1997) revealed that Guduchi possesses immunomodulatory properties[8]. Dose for Kwath- 5-100 ml, Churna- 3 -6 gm, Satva- 1- 2 gm. Some preparations of Guduchi are sanshamnivati, amrutadyarishta, guduchyadi modak, amrutashtakkwath, amrutaghrut etc.

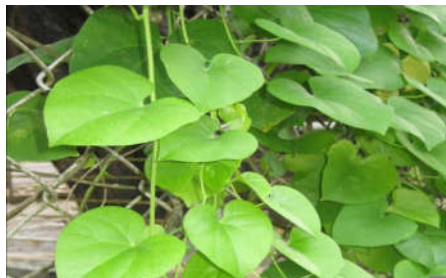


Fig.1 Guduchi (*Tinospora cordifolia* Willd. Miers ex Hook. f. & Jhoms.)

2. Haritaki (*Terminalia chebula* Retz.)

Description of Haritaki – It is a medium sized deciduous tree with a height of upto 30 m. wide spreading branches and broad roundish crown.

Chemical composition- *T. chebula* contains 32% of tannin. With the geological variation the tannin content varies. Triterpenoids, Flavonol, glycosides, coumarin conjugated with gallic acid called chebulin, as well as phenolic compounds were also isolated[9].

Properties as per lexicons (Nighantu) -Haritaki is pancharasatmak with predominance of Kashaya rasa and exception of Lavan rasa. It ameliorates tridoshas. Though it is Laghu and Ruksha in Guna but due to its Ushna veerya and Madhuravipak it is found to pacify Vata dosha and used extensively in disorders of Vata. Hamada SI, Kataoka I & et.al (1997) prove that Haritaki is cytoprotective in action.[10] Naik GH, Priyadarsini KI & et.al (2004) revealed its Anti-oxidant activity.[11]



Fig.2 Haritaki (*Terminalia chebula* Retz.)

1. Amalki (*Emblica officinale* Linn)

Description of Amalki – A small to medium sized deciduous tree, 8-18 meters height with thin light grey bark exfoliating in small thin irregular flakes.

Chemical composition- Fruits of *Emblica officinalis* contain 28% of the total tannins. Fruit contains two hydrolysable tannins viz. Emblicanin A and B, which have antioxidant properties. The fruit also contains Phyllemblic acid, Ellagic acid Gallic acid, Phyllemblic acid, Emblicol and other minerals. 100gms of Amla contains about 700mg of vitamin C, which is 30 times the amount found in orange.[12]

Properties as per lexicons (Nighantu)-Amalaki is said to be the Shresthavayahsthan in all the 10 herbs. [13] Amalaki is pancharasatmak with predominance of Amla rasa with exception of Lavan rasa. It pacifies all the doshas. i.e. Tridosha Shamak, it alleviates Vata dosha by Amla rasa, Pitta by Madhura rasa and Sheet veerya, and Kapha dosha by Kashaya rasa and Rukshyaguna [14]. El-Mekkawy S, Meselhy MR & et.al (1995) established that Amalaki is having the Immunomodulatory [15] property. And Bhattacharya A, Chatterjee A & et.al (1999) proved antioxidant [16] property in Amalaki. Dose- Choorna- 3 to 10 gm. various preparations of Amalaki are Triphala Choorna, Chyawanprash, Dhatriloha, etc.



Fig.3 Amalaki (*Emblica officinalis* Linn.)

4. Mukta (Rasna) (*Pluchea lanceolata* Oliver & Hiern)

Description of Rasna- It is a hoary pubescent under shrub. In India it thrives in cultivated fields as well as in uncultivated areas.

Chemical composition- It contains flavonoids, triterpenoids, monoterpenes, lignan glycosides, and eudesmane-type sesquiterpenoids. The flavonoids include quercetin, hesperidin, isorhamnetin, and one isoflavonoid formononetin. Surendra Kr Sharma and Naveen Goyal (2011) showed presence of antioxidants & immunoregulatory action [17].

Properties as per lexicons (Nighantu) – Acharya Chakrapani commented Mukta as Rasna. Yogindranathasen said Rasna as Shresthavataharadrug. It is Guru in Guna Tikta Rasa, Katu in Vipaka, and Ushna in veerya. Kapha & Vata Shamak in action. Because of its Ushna veerya and Guru Guna it pacifies Vata dosha, and pacifies kapha dosha by its Tikta rasa, katuvipaka and Ushna veerya properties.

Dose – Choorna 1gm, some preparations of Rasna are Maharasnadi kwatha, Rasnasaptak kwatha, etc.



Fig. 4 Mukta (Rasna) (*Pluchea lanceolata* C.B. Clarke)

5. Shweta (Shweta Aparajita) (*Clitoria ternatea* Linn.)

Description of Aparajita- It is a perennial twining shrub, found throughout tropical areas of India.

Chemical composition- The phytochemical screening of the roots of Aparajita revealed the presence of flavonoids, glycosides, alkaloids, triterpenes, resins, saponins, phenols, proteins and carbohydrates [18, 19].

Jain NN, Ohal CC & et.al (2003) established the nootropic, anxiolytic, anticonvulsant [20] action. Taranalli AD, Cheeramkuzhy TC (2000) proved enhancing effect on memory [21]. Prof Dr Ali Esmail Al-Snafi (2016) reported that

Methanol extract of ShwetaAparajita showed significant antioxidant activity as compared to Neel Aparajita variety of *Clitoria ternatea*[22].

Properties as per lexicons (Nighantu) – Acharya Chakrapanihas mentioned Shweta as aparajita.

Aparajita is Medhya in action due to Prabhavawhich counteract stress induced aging. It is tikta in rasa, Katu in vipak, Sheet in veerya. It pacifies all the three doshas in the body. Acharya Bhavprakash explained that due to Vishghna property Aparajitait removes the poisonoussubstances from the body.This can be considered responsible for the process of anti-aging.Being Tridoshashamakait maintainshealthy state of the body. Dose,choorna of roots- 1.5-3gm & that of seed- 1-2gm.



Fig.5 Shweta (Shwetaparajita) (*Clitoria ternatea*Linn.)

6. Jivanti(*Leptadeniareticulata*(Retz.) Wight & Arn)

Description of Jivanti- It is a climber having stem with cork like deeply cracked bark with numerous branches. Found mostly near thorny trees. Distributed in tropical & subtropical parts of India.

Chemical composition- Flavonoids, β –sitosterol, stigma sterol, steroids, triterpenes, glycosides and proteins. Aerial parts contain tocopherol which shows anti-inflammatory activity. Deependra Singh, Vandana Jain & et.al. (2003) demonstrated antioxidant property[23]. Anjaria JV, Varia MR & et.al(1975) discovered its Estrogenomimetic action[24].

Properties as per lexicons (Nighantu) – Laghu & Snigdha in Guna, Madhura in Rasa, Madhura in Vipak, Shita in Veerya, it is Tridoshashamak. Due to snigdha guna, madhura rasa, Shita veerya & madhura vipaka, The Madhura vipaka nourishes Rasadhatu which ultimately nourishes successive dhatus which leads to formation of Ojas. Which improves health and immunity, it build and strengthen the body and support kapha dosha in maintaining stability of the tissues. The catabolic effect of vata and metabolic effect of pitta is countered by predominance of Snigdha Guna. Dose- Churna- 3-6 gm, Kwath - 50-100 ml

Various preparation- Jivantadyaghrut, Jivaniyadi tail etc.



Fig. 6 Jivanti (*Leptadeniareticulata*(Retz.) Wight & Arn)

7. Atirasa (Shatavari) (*Asperagus racemosus*(Willd))

Description of Shatavari – It is perennial climbing herbs, consisting of tuberous roots.

Chemical composition[25]- Flavonoids, tannins, phenols, alkaloids, steroids, saponins, terpenes, and polysaccharides. Root contains highest amount of vitamin-C, polyphenols, flavonoids which exhibit highest

antioxidant activity. Bhattacharya A, Murugandam AV (2004) investigated its Adaptogenic [26] activity. And Gautam M, Diwanay S et.al (2004) revealed its Immunomodulatory [27] activity.

Properties as per lexicons (Nighantu) – Shatavari is Shrestha Rasayan. It is Guru, Snigdha in Guna, Madhura, Tikta in Rasa which balances Pitta dosha, Madhura in Vipaka which pacify Vata dosha. It has nourishing effect on Rasadhātu due to Guru & Snigdha Guna, Madhura Rasa and Madhura Vipak it nourishes its Upadhātu i.e. stanya (breast milk). Also nourishes the successive dhatus & increase the Bala (strength) of body. Dose- Choorna- 10 to 20 gm, Anupan- Milk. Different preparations are Shatavari kalpa, Narayana taila, Shatavaryadighrita, Garbhachintamani rasa, Vishnu taila, Shatavari modaka, Shatamoolyadilauha, etc.



Fig. 7 Atirasa (Shatavari) (*Asperagus racemosus* Willd)

8. Mandukparni (*Centella asiatica* (Linn) Urban)

Description of Mandukparni- It is a small stoloniferous perennial creeping aromatic herb.

Chemical composition [28] - In Phytoconstituents it shows polyphenol, tannin, flavonoid, β -carotene, vitamin C, and vitamin E. Chatterjee TK, Chakraborty A & et.al (1992) established that there is increase in brain GABA Level [29], which causes significant improvement in concentration, attention, memory, and social improvement in mentally –challenged children. Gnanapragasam A, Ebenezer KK & et.al (2004) demonstrated its Antioxidant [30] property.

Properties as per lexicons (Nighantu) – Acharya Charak has mentioned Mandukparni in four Medhya Rasayanain Rasayanadhyay. And Acharya Sushruta used it as to increase intellect, strength, digestive fire and fair complexion [31]. Mandukparni is Tikta and kashaya in rasa, Madhura in vipaka and

Shita in Veeryahence pacify pitta dosha, it also pacifies kaphadosha by laghuguna & tiktakashayrasa

Mandukparni improve circulation of the peripheral tissues & brain. Due to this action it can prevent degenerative diseases of the blood vessels like varicose vein, arteriosclerosis and dementia in old age. Doses- Swaras- 7 to 15ml, Moolchurna- 360 to 900mg, Panchang choorna 3 to 5gm.

Various preparations are Brahmi panak, Bhrami tail, Saraswatarishta, Saraswatghrit



Fig. 8 Mandukparni (*Centella asiatica* (Linn) Urban)

9. Sthira (sarivan) (*Desmodium gangeticum* (Linn) D C)

Description of Sthira- It is a small plant of height of 2 to 4 feet. Leaves are ovate in shape that is 3 to 6 inch in length. The stem is angular. Flowering & fruiting occurs whole year especially in early summers.

Chemical composition- Aerial parts contains flavonoids and alkaloids. Ethyl acetate which helps in revascularization of injury R Govindarajan, M Vijayakumar & et.al proved its antioxidant [32] property.

Properties as per lexicons (Nighantu) – It is Guru, snigdha in Guna, Madhura & Tikta in Rasa, Madhura in Vipak, Ushna in Veerya. It is Tridoshashamak because it pacifies Vata dosha by Guru, Snigdha Guna, Madhura rasa and Ushna veerya. Pacify Pitta by Madhura, Tikta Rasa & Kapha, by the tikta rasa and Ushna veerya. R Govindarajan M Vijayakumar & et.al proved its cardio protective [33] and Anti-oxidants activities. Dose for kwath- 50 - 100 ml. Its preparation is Shalparnyadikwath.



Fig.9 Sthira (sarivan) (*Desmodium gangeticum* (Linn) D C)

10. Punarnava (*Boerhavia diffusa* Linn)

Description of Punarnava - It is a diffusely branched, pubescent and prostrate herb.

Chemical composition – it shows presence of flavonoids, β -Sitosterol, α -2-sitosterol, steroids, alkaloids, triterpenoids, lignin, lipids, carbohydrates, proteins, and glycoproteins. Punarnavine. Boeravinone have been isolated by Verma H.N., Awasthi L.P. and Saxena K.C. (1979) studied in detail for their biological activity [34]. Desai SK, Sanaye MM. Desai SM. (2009) demonstrated Anti-stress and Antioxidant [35] activity.

Properties as per lexicons (Nighantu) – Laghu, Ruksha in Guna, Madhura, Tikta, Kashaya in Rasa, Madhura in Vipak, Ushna in veerya, & Tridoshashamak, because of Madhura rasa, Ushna veerya and Madhuravipaka it pacify Vata dosha. Due to Madhura, Tikta, Kashaya Rasa it ameliorates Pitta dosha & Ushna veerya pacify Kapha dosha. Guru, Snigdha guna of Aamadosha is pacified by its Laghu guna & Ushna veerya.

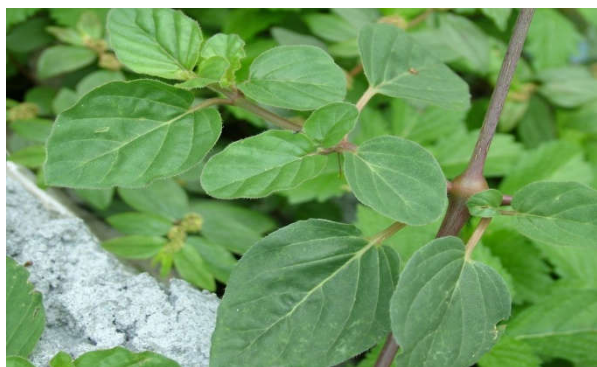


Fig.10 Punarnava (*Boerhavia diffusa* Linn)

Discussion

After reviewing these 10 herbs we found that there are two categories in which we can divide these 10 herbs. 5 herbs as Medhya Rasayan (mental health), e.g. **Guduchi, Mandukparni, Aparajita, Haritaki & Shatavari**. 5 herbs as Balya Rasayan (physical health), e.g. **Amalaki, Rasna, Jivanti, Sthira & Punarnava**. Guduchi [6], Haritaki [11], Amalaki [16], Rasna [17], Aparajita [22], Jivanti [23], Shatavari [25], Mandukparni [30], Sthira [32], Punarnava [35] are proven to have excellent anti-oxidant activity.

Jivanti have Estrogenomimetic activity [24]. Amalaki [15] have Immunomodulatory action and Shatavari [26] possesses Adaptogenic activity. Abhayais reported to prevent DNA breaking [36] and Rasna prevent Chromatid breaks induced by cadmium chloride [37]. 7 herbs out of 10 are Tridoshashamak action Being *Tridoshashamakait* maintains healthy

state of the body. Being Saptadhatuposhak it nourishes all the dhatu which helps in Ojas formation, result is delayed aging.

Role of anti-oxidant- Antioxidant compounds like phenolic acids, polyphenols, tannins, alkaloids and flavonoids scavenge free radicals such as peroxide, hydroperoxide or lipidperoxyl and thus inhibit the oxidative mechanisms that lead to degeneration of cell [38].

The ayurvedic plants mentioned in Vayasthapan Mahakashay contains tannin, flavonoids, vitamin C and vitamin E, phenolic acids, Triterpenoids, glycosides, alkaloids, steroids, etc.

Anti-oxidant action of Flavonoids-[39]

They suppress the formation of ROS (reactive oxygen species) by inhibition of enzymes & free radical scavenging action.

Anti-oxidant action of Tannins-[40] they stimulate superoxide dismutase inhibitors of radical formation and they are free radical quenching agents.

Anti-oxidant action of Phenolic acid-[41] they possess free radical scavenging properties and metal chelating property, they effect on cell signaling pathways and gene expression.

Anti-oxidant action of Tri-terpenoids-[42] they suppress the ROS formation by quenching of singlet oxygen, they help in hydrogen transfer and electron transfer.

Conclusion

The sole meaning of Vayasthapan that is sustaining the youth stage and preventing the aging process is achieved by not only Tridoshashamak, Rasayan, Saptadhatuposhak action of these 10 herbs but also by their anti-oxidant, Adaptogenic, Immunomodulatory, anxiolytic, Estrogenomimetic activity proven by researchers on modern parameters.

References

1. Shastri AD. Sushruta Samhita of Maharsi Sushruta. Part-I. Varanasi: Chaukhambha Sanskrit Sansthan; 2005. SutraSthan – 24:8 p.101.
2. Pandey K, Caturvedi GN. Charak samhita of Agnivesh. Vol I. Varanasi: Chaukhambha Bharati Academy; 2005. ShairSthan-1:115 p. 826.
3. Shastri AD. Sushruta Samhita of Maharsi Sushruta. Part-I. Varanasi: Chaukhambha Sanskrit Sansthan; 2005. SutraSthan – 35:35-6, p.134-5
4. Pandey K, Caturvedi GN. Charak samhita of Agnivesh. Vol I. Varanasi: Chaukhambha Bharati Academy; 2005. VimanSthan 8:122 p. 781-2
2. 5. Sharma PV. Dalhana and his comment on drugs. Published by manoharlal publishers, New delhi, India, First edition, 1982; P-112, 13
3. 6. Mathew S, Kuttan G. Antioxidant activity of *Tinospora cordifolia* and its usefulness in the amelioration of cyclophosphamide induced toxicity. *J Exp Clin Cancer Res.* 1997; 16(4):407
4. 7. Prof. K.C. Chunekar. Bhavprakash Nighantu (Hindi Translation). Chaukhamba Bharati Academy, Varanasi. Reprinted 2015 Guduchyadi varga, Verse no 8 pg.257
5. 8. Kapil A, Sharma S. Immunopotentiating compounds from *Tinospora cordifolia*. *J. Ethano-pharmacol.* 1997; 58 (2): 89-25
6. 9. R. Rathinamoorthy et al. "Terminalia Chebula - Review on Pharmacological and Biochemical Studies", *International Journal of PharmTech Research*, Vol.6, No.1, pp 97-116, Jan-March 2014
11. Hamada SI, Kataoka I, Wooji Yamada A, Yoshider T, Nishimura T, Otake N et al. Immunosuppressive effects of gallic acid & chebulagic acid on CTL-mediated cytotoxicity. *Biol Pharm Bull.* 1997; 20(9):1017-9
12. Naik GH, Priyadarsini KI, Naik DB, Gangabhagirathi R, Mohan H. Studies on the aqueous extract of *Terminalia chebula* as a potent antioxidant & a probable radioprotector. *Phytomedicine* 2004; 71 (6): 530-8
13. K.V. Santhi Sri and et al. "Effect of Amla, an approach towards the control of Diabetes mellitus", *IJCMAS Vol.2 NO. 9* (2013) pp. 103-108
14. Pandey K, Caturvedi GN. Charak samhita of Agnivesh. Vol I. Varanasi: Chaukhambha Bharati Academy; 2005. SutraSthan 25/40 p. 468
15. Prof. K.C. Chunekar. Bhavprakash Nighantu (Hindi Translation). Chaukhamba Bharati Academy, Varanasi. Reprinted 2015 Haritakyadi varga, Verse no 40 pg.10

16. El-Mekawy S, Meselhy MR, Kusumoto IT, Kadota S, Hattori M, Namba T. Inhibitory effects of Egyptian folk medicines on human immunodeficiency virus reverse transcriptase. *ChemPharm Bull (Tokyo)*.1995;43(4):641-8.
17. Bhattacharya A, Chatterjee A, Ghosal S, Bhattacharya SK. Antioxidant activity of active tannoid principles of *Emblica officinalis* (Amla). *Indian J Exp Biol*. 1999; 37(7):676-80.
18. Surendra Kr Sharma and Naveen Goyal "Biological Studies of the Plants from Genus *Pluchea*" Scholars Research Library *Annals of Biological Research*, 2011, 2 (3) : 25-34
19. Deka Manalisha. International research journal of pharmacy. 2 (12): 139-140.
20. M.s Subramanian & P. Prathyusha. *Int. J. Pharmtech research*. 3:608-6127.
21. Jain NN, Ohal CC, Shroff SK, Bhutada RH, Somani RS, Kasture VS, et al., *Clitoria ternatea* and the CNS. *Pharmacol Biochem and Behav*. 2003 Jun; 75(3): 529– 536.
22. Taranalli AD, Cheeramkuzhy TC. Influence of *Clitoria ternatea* extracts on memory and central cholinergic activity in rats. *Pharmac Biol*. 2000 Jan; 38(1):51–56.
23. Prof Dr Ali Esmail Al-Snafi. *Pharmacological importance of Clitoria ternatea– A review IOSR Journal of Pharmacy* Volume 6, Issue 3 (March 2016), PP. 68-83
24. Deependra Singh, Vandana Jain & et.al. *Jivanti*. *Indian J. Nat. Prod*. 2003; 19: 11-15.
25. Anjaria JV, Varia MR, Janakiraman K, Gulati OD. Studies on *Leptadenia reticulata*: lactogenic effects on rats. *Indian J Exp Biol*. 1975; 13(5):448-9.
26. Ramachandran Vadivelan, Mandal Dipanjan & et.al "Hypoglycemic, antioxidant and hypolipidemic activity of *Asparagus racemosus* on streptozotocin-induced diabetic in rats" *Pelagia Research Library Advances in Applied Science Research*, 2011, 2 (3): 179-185
27. Bhattacharya A, Murugandam AV, Kumar V, Bhattacharya SK. Effect of polyherbal formulation, EuMil, on neurochemical perturbations induced by chronic stress. *Indian J Experim Biol*. 2002; 40:1161-3
28. Gautam M, Diwanay S, Gairola S, Shinde Y, Patki P, Patwardhan B. Immuno-adjunct potential of *Asparagus racemosus* aqueous extract in experimental system. *J Ethnopharmacol*. 2004 Apr; 91(2-3):251-5.
29. Mijanur Rahman, Shahdat Hossain & et.al "Antioxidant Activity of *Centella asiatica* (Linn.) Urban: Impact of Extraction Solvent Polarity" *Journal of Pharmacognosy and Phytochemistry IC Journal* No: 8192 Vol. 1 Issue 6
30. Chatterjee TK, Chakraborty A, Pathak M, Sengupta GC. Effects of plant extract *Centella asiatica* (Linn.) on cold restraint stress ulcer in rats. *Indian J Exp Biol*. 1992;30(10):889-91
31. Gnanaprasam A, Ebenezer KK, Sathish V, Govindaraju P, Devaki T. Protective effect of *Centella asiatica* on antioxidant tissue defense system against adriamycin induced cardiomyopathy in rats. *Life Sci*. 2004; 76(5):585-97.
32. Shastri AD. *Sushruta Samhita of Maharsi Sushruta. Part-I. Varanasi: Chaukhambha Sanskrit Sansthan; 2005. Chikitsa Sthan 1/3/31 p. 39*
33. R Govindarajan; M Vijayakumar; V Rao, *Phytotherapy Research*, 2007, 21(10), 975-979.
34. Gino AK, Jose P. Methanol extract of *Desmodium gangeticum* DC root mimetic post conditioning effect in isolated perfused rat heart by stimulating muscarinic receptors. *Asian Pac J Trop Med*. 2012; 5(6): 448-54.
35. Verma H.N., Awasthi L.P. and Saxena K.C., Isolation of virus inhibitor from the root extract of *Boerhaavia diffusa* inducing systemic resistance in plants., *Canadian Journal of Botany*, 57, 1214-18 (1979)
36. Desai SK, Sanaye MM. Desai SM. Antistress activity evaluation of *Boerhaavia diffusa*. *Indian drugs* 2009;46(11): 4450.
37. Sathesh MA, Pari L. Antioxidant effect of *Boerhaavia diffusa* L. in tissues of alloxan induced diabetic rats. *Indian J Exp Biol*. 2004;42(10):989-92.
38. Walia H, Kumar S and Arora S. Attenuation of Protective Effect on DNA and Antioxidant Efficacy of Extracts from *Terminalia chebula* Prepared by Sequential Method. *Advance in Biological Research* 2012; 6 (6): 231-239.
39. Jahangir T, Khan TH, Prasad L, Sultana S. *Pluchea lanceolata* attenuates cadmium chloride induced oxidative stress and genotoxicity in Swiss albino mice. *J Pharm Pharmacol*. 2005;57(9):1199-204.
40. <http://www.news-medical.net/health/what-are-antioxidants.aspx> [cited on 14 July 2016]
41. Monika majewska, Michał skrzycki & et.al "evaluation of antioxidant potential of flavonoids: an in vitro study" *Acta Polonicae Pharmaceutica et Drug Research*, Vol. 68 No. 4 pp. 611-615, 2011
42. Wasnik Ujwala, Singh Vijender, Ali Mohammad "In-Vitro Antioxidant activity of Isolated Tannins of alcoholic extract of dried leaves of *Phyllanthus amarus* Schonn and Thonn" *International Journal of Drug Development & Research* | January-March 2012 | Vol. 4 | Issue 1 | ISSN 0975-9344 |
43. Mamta Saxena, Dr Jyoti Saxena and et.al "flavonoids and phenolic acids as antioxidants in plants and human health" *Int. J. Pharm. Sci. Rev. Res.*, 16(2), 2012; n 28, 130-134
44. Nayoung Han and Maricabakovic "Biologically active triterpenoids and their cardioprotective and anti-inflammatory effects" *Han and Bakovic, J Bioanal Biomed* 2015, S12