

Healing properties of Himalayan Medicinal Plants

Ranjit Sarmah and Nikita Goswami*

University Institute of Biotechnology, Chandigarh University, Punjab, 140 413, India

(Received 12 May, 2020; accepted 14 June, 2020)

ABSTRACT

Plant plays a vital role for existence of life on the earth. India has a rich biological diversity and subsequent to the dawn of the civilization, medicinal plants have been most important resource of mankind. Medicinal plants are found in different areas of India. Some of the important regions are Aravallis and Himalayas. They hold high amount of biologically active phytochemical substances which are integrated in alkaloids, glycosides, corticosteroids and essential oils. Indian system of medicines engages 80% of the material derived from the plants. The soil in the Himalayan region is mountainous, rust-coloured and rich in debris of decomposed leaves. The paper discusses about the various therapeutic plants found in Himalayan region and its beneficial effects. A proportion of therapeutic plants found in Himalayan and Northern area which have medicinal properties are *Withania somnifera*, *Lavendula angustifolia*, *Terminalia arjuna*, *Celastrus paniculatus* Willd and *Terminalia chebula*. Medicinal plants as a potential origin of therapeutic components have gained a significant role in well-being system throughout the world, not only in ailment condition as well as in maintaining proper health.

Key words : Medicinal plants, Himalayan region, Phytoconstituents

Introduction

Plants play a vital role for existence of life on the earth. India is a home to various medicinal plants which are of great importance as they are beneficial in treating various diseases, also helps in stimulating different compounds that enhances the physiological activities of the body. These plants are not new to us. In fact, their uses are known from the ancient times and are used in various activities. Now, these plants are used across the globe to produce some potent drugs that are beneficial in treating diseases (Srivastava *et al.*, 1996) and people are mostly focused in using traditional knowledge to treat diseases, since they are believed to have no side effects or less side effects. As such, most people follow the traditional systems of Ayurveda, Homeopathy, Unani and Siddha (Satyavati *et al.*, 1997).

The Indian Himalayan region is a great biodiversity hotspot (Myers *et al.*, 2000) which provides adequate growth conditions to different types of medicinal plants. Most of the species of medicinal plants are found at altitudinal zone < 1800 m, identifying this area as of great interest (Samant *et al.*, 2007).

The Himalayan region has a complex geography as compared to other regions of India. The local or tribal people are well aware of the uses of different medicinal plants in different conditions as because this knowledge is passed on to them by their ancestors. Thus it led to the development of the area (Kala, 2006).

There are different varieties of medicinal plants that have great therapeutic and pharmacological properties. Some of the common medicinal plants originate in the Himalayan region, which are used

for therapy and diseases mentioned by (Kala, 2004) are shown in Table 1. This study focuses on five commonly found medicinal plants of Himalayan and Northern Region, namely *Withania somnifera* (Ashwagandha), *Lavandula angustifolia* (Lavender), *Terminalia arjuna* (Arjuna), *Celastrus paniculatus* Willd (Jyotishmati) and *Terminalia chebula* (Harad or Haritaki).

1. *Withania somnifera* (Ashwagandha)

Kingdom: Plantae
 Division: Angiosperma
 Class: Dicotyledons
 Order: Tubiflorae
 Family: Solanaceae
 Genus: *Withania*
 Species: *Somnifera* Dunal

Withania somnifera is commonly known as Ashwagandha, which is a member of solanaceae family. There are 23 different species of *Withania* but only two species, namely *Withania coagulans* and *Withania somnifera* are most common and can be used for medicinal purposes (Negi *et al.*, 2006).

Morphology

Withania somnifera is an erect, evergreen herb that grows up to a height of 1.25m which is branched or unbranched. Leaves grow up to 10cm long; colour of flowers is green or yellow. The plant bears fruit which is a berry; seeds are yellow in shading, also small and tight (Singh and Kumar, 1998; Atal *et al.*, 1975).

Properties

Withania somnifera has always been an important plant to cure various diseases related to cardio, muscular, immune system etc. It is also known as 'Rasayana' due to its various activities related to

health such as deaccelerates the process of ageing, helps in adaptation in adverse environmental conditions (Sharma and Dandiya, 1992). The root is the major part of the plant which consists of two main compounds namely, steroidal alkaloids and steroidal lactones (Tiwari *et al.*, 2014). Further, steroidal lactones (withanolides) have two main compounds, 'withanolides A and D' (Singh *et al.*, 2010), responsible to maintain various activities in the body such as anti-cancerous, anti-oxidant, anti-stress, anti-tumour, radio sensitizing activity, thyroid stimulant activity, immunomodulatory activity, anti-diabetic, anti-inflammatory activity, cardio protective activity and neuroprotective activity. Added to it, the paste prepared from the roots of the plant is also helpful in treating arthritis, osteoarthritis, carbuncles, asthma, piles, leucorrhoea, boils pimples, rheumatoid, flatulent colic, ulcers and painful swellings (Rasool and Varalakshmi, 2006; Salve *et al.*, 2006).

2. *Lavandula angustifolia* (Lavender)

Kingdom: Plantae
 Division: Magnoliophyta
 Class: Magnoliopsida
 Family: Lamiaceae
 Genus: *Lavandula*
 Species: *Angustifolia*

Lavandula angustifolia is usually known as Lavender, which is an individual from lamiaceae family. There are mainly 4 different varieties of Lavender namely, *L. officinalis*, *L. angustifolia*, *L. stoechas* and *L. latifolia* (Cavanagh and Wilkinson, 2002).

Morphology

Lavender is an evergreen, woody and perennial plant (Boelens, 1995; Ćemigielski *et al.*, 2009) which grows up to a height of 40-60cm. It is a flowering

Table 1. Some important medicinal plants of Himalayan Region

S. No.	Species	Local Name	Parts used
1	<i>Vitex negundo</i> L	Singoli	Leaf, stem
2	<i>Centella asiatica</i> L.	Brahmi	Fruit, leaf
3	<i>Oxalis corniculata</i> L.	Vilmora	Leaf
4	<i>Solanum nigrum</i>	Bhamboaln	Fruit, flower
5	<i>Argemone Mexicana</i>	Darudi	Leaf
6	<i>Anogeissus latifolia</i> Bedd.	Bakla	Bark
7	<i>Ocimum sanctum</i> L.	Tulsi	Leaf
8	<i>Cannabis sativa</i> L.	Bhang	Leaf
9	<i>Euphorbia hirta</i> L.	Asthma Plant	Whole plant
10	<i>Stevia rebaudiana</i>	Stevia	Leaves

plant which has different varieties of colour i.e., pale violet, pink and white flowers. The flowers grow in spikes and the leaves have curled edges which make the plant more attractive. Lavender requires a well-drained, fertile and lime soil to grow. July to August is the flowering season for Lavender due to requirement of moderate climate to grow.

Properties

Lavandula angustifolia is a plant which is acknowledged across the globe for its great medicinal properties such as biological, therapeutic properties etc. There are different compounds present in Lavender which makes it a useful medicinal plant. Among all the compounds, lavandulal, acetate linalyl acetate, ocimene, linalool, α -terpineol, terpinen-4-ol, caryophyllene and cineole are the major chemical components present in Lavender (Prusinowska and Ćemigielski, 2014). The essential oil produced from Lavender is widely used in different fields. Linalool, a monoterpene compound is responsible for the sedative effect (de Moura *et al.*, 2009). Lavender oil is also beneficial in reducing anxiety (Kritsidima *et al.*, 2010), shows inhibitory effect against certain microorganisms (Stanojević *et al.*, 2011) and antioxidant activity (Dapkevicius *et al.*, 1998). Along with it, Lavender is also beneficial in treatment of acute or chronic pain.

3. *Celastrus paniculatus willd* (Jyotishmati)

Kingdom:	Plantae
Class:	Angiospermae
Order:	Celastrales
Family:	Celastraceae
Genus:	<i>Celastrus</i>
Species:	<i>paniculatus</i>

Celastrus paniculatus willd is commonly known as "Jyotishmati" or "Malkangni". In ancient times, it was called as 'magzsudhi' or brain clearer (Nadkarni and Nadkarni, 1976).

Morphology

Celastrus paniculatus willd is deciduous, climber plant which is mostly found in the hilly areas (Arif *et al.*, 2018). It grows up to a height of 10m and stem up to 23cm in diameter (Deodhar and Ketakee, 2015), seeds are red arillus and brown in colour (Kirtikar and Basu, 1999).

Properties

Celastrus paniculatus willd. is a very useful plant

which is widely used as a brain tonic across the globe. It helps to promote intelligence and improves memory power of an individual (Verma, 2014). Jyotishmati is found to have analgesic and anti-inflammatory activities (Ahmad *et al.*, 1994) as well as sedative and anticonvulsant properties (Gaitonde *et al.*, 1957). The different compounds present in leaves are alkaloids, carbohydrates, sterol and triterpenoid phenolic compound, flavonoid, tannins, saponins and fixed oil (Debnath *et al.*, 2014). Compounds present in stem are paniculatine A & B and wifarnine F and the major compounds present in the seed are celastrine (Patel *et al.*, 1995) and pristimerin compound which have been described to have anti-malarial property (Pavanandt *et al.*, 1989). The oil is used to treat diseases like beriberi, malaria, mental confusion, asthma, headaches, joint pains, arthritis (Ravishankar and Shukla, 2007), diarrhoea, dysentery and fever (Ramanna, 2005).

4. *Terminalia chebula* (HARAD OR HARITAKI)

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Family:	Combretaceae
Genus:	<i>Terminalia</i>
Species:	<i>chebul</i>

Terminalia chebula is an Indian medicinal tree which is an individual to the combretaceae family. It is generally known as "Harad" or "Haritaki". It is of different types namely, Bala, Survari and Chambhari (Rangari) Haritaki.

Morphology

Terminalia chebula is an evergreen, deciduous tree that grows up to a height of 30m. It is a flower and fruit bearing tree, where flowering is seen from April to August and ripening of fruits occur from October to January. The tree bears dull white and yellow coloured flowers that have a strong unpleasant smell. The fruit of this tree is kernel like, 2 to 4.5cm long and 1.2 to 2.5 cm broad (Sharma *et al.*, 2014).

Properties

Terminalia have different medicinal properties along with different phytoconstituents such as tannins, fructose, sterols, resin, amino acids etc. (Kumar, 2006). The fruits of Harad have 14 hydrolysable tannins which includes gallic acid, neoclubulinic acid, chebulic acid, ellagic acid, chebulogic acid,

chebulinic acid, punicalagin, 3,4,6-tri-o-galloyl-D-glucose, corilagin, terchebulin, 1,2,3,4,6-penta-o-galloyl-b-D-glucose and casuarinin (Juang *et al.*, 2004). Harad is very beneficial in treatment of acidity, ulcers, diarrhoea, convulsion (Sharma *et al.*, 2018), urinary stones, dysuria (Kirtikar and Basu, 1935). The phytochemicals present in the herb show different properties such as, the fruit extract of Harad have antibacterial activity (Ahmad *et al.*, 1998), inhibitory effect on HIV-1 reverse transcriptase (Mekikaway *et al.*, 1995), anti plasmodial activity (Bagavan *et al.*, 2011), anti-mutagenic property, anti-carcinogenic property and is also used to treat acidity, ulcers, diarrhoea and convulsion (Sharma *et al.*, 2018).

5. *Terminalia arjuna* (ARJUNA)

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Family:	Combretaceae
Genus:	<i>Terminalia</i>
Species:	<i>arjuna</i>

Terminalia arjuna is generally known as Arjuna. It belongs to the combretaceae family and *Terminalia* genus. There are twenty four different species of *Terminalia*. Some of the selected species includes *Terminalia arjuna*, *Terminalia chebula*, *Terminalia catappa* etc. (Amalraj and Sreeraj, 2017).

Morphology

Terminalia arjuna is an evergreen, deciduous, flower and fruit bearing tree with a height up to 60-80 feet. The flower of this tree is white and bisexual and fruits are kernel like, smooth skinned and ovoid. The flowering season is from March to June and fruiting occurs from September to November.

Properties

Terminalia arjuna is a great therapeutic tree which have different restorative properties. The medicinal properties are because of the phytoconstituents such as polyphenols, saponins, triterpenoids, flavonoids, minerals, sterols, some amino acids, tyrosine, cysteine, tryptophan and histidine (Row *et al.*, 1970; Kandil and Nassar, 1998). There are also 15 different types of tannins present in Arjuna tree bark (Lin *et al.*, 2001). It is because of the presence of saponin glycosides that Arjuna shows inotropic effect. Anti-oxidant & amplification activity is due to the pres-

ence of flavonoids or phenolics. The bark of the tree is considered to have anti dysentric, styptic, aphrodisiac, purgative and laxative properties, (Dwivedi, 2007), cardio tonic and stimulant actions, anti-oxidant, anti-mutagenic, hypocholesterolamic, hypolipidemic (Rajni and Manish, 2014), astringent and diuretic property (Carak, 1941). The extracts of Arjuna tree are also beneficial in treatment of cancer. ROS production in cells of HepGQ is induced that causes apoptosis (Kumar *et al.*, 2009).

Conclusion

The Himalayan region is an area of high rainfall with rich soil and rich biodiversity. The biodiversity of Himalayan region consist of many important medicinal plants. For generations, people in India are dependent on herbal medicinal system for treatment of various ailments. The chapter focuses on the usefulness of some medicinal plants and the important constituents present in them. The medicinal plants discussed in the chapter are *Withania somnifera*, *Lavendula angustifolia*, *Terminalia arjuna*, *Celastrus paniculatus* Willd and *Terminalia chebula*. The plants mentioned above are rich in anti-oxidant, anti microbial, diuretic and anti carcinogenic activity. These plants contribute to the rich heritage of medicinal plants of Himalayan region.

References

- Ahmad, F., Khan, R.A. and Rasheed, S. 1994. Preliminary screening of methanolic extracts of *Celastrus paniculatus* and *Tecomella undulata* for analgesic and anti-inflammatory activities. *J Ethnopharm.* 42 : 193-198.
- Ahmad, I., Mehmood, Z. and Mohammad, F. 1998. Screening of some Indian medicinal plants for their antimicrobial properties. *J Ethnopharmacol.* 62 : 183-193.
- Amalraj, A. and Gopi, S. 2017. Medicinal properties of *Terminalia arjuna* (Roxb.) Wight & Arn.: a review. *Journal of Traditional and Complementary Medicine.* 7(1) : 65-78.
- Arif, P.T., Shaligram, S.S. and Babasaheb, K.S. 2008. Pharmacological profile of jyotishmati (*Celastrus paniculatus* willd): A review. *Int. J. Ayush.* 7(3) : 901-923.
- Aruna, D.S. and Nandakishore, D.L. 2014. Haritaki A Boon to Herbalism—A Review. *Scholars Acad. J. Biosci.* 2 : 132-6.
- Asha, V. and Kumar, A.A. 2014. Phytochemical investigations, extraction and thin layer chromatography of *Celastrus paniculatus*. *UIJPBS.* 02 (04): 14-16.

- Atal, C.K. 1975. Pharmacognosy and phytochemistry of *Withania somnifera* (Linn.) Dunal (Ashwagandha). Central Council for Research in Indian Medicine and Homoeopathy.
- Bagavan, A., Rahuman, A.A., Kamaraj, C., Kaushik, N.K., Mohanakrishnan, D. and Sahal, D. 2011. Antiplasmodial activity of botanical extracts against *Plasmodium falciparum*. *Parasitol Res.* 108 : 1099-109.
- Boelens, M.H. 1995. Chemical and sensory evaluation of *Lavandula* Oils. *Perf Flav.* 20 : 23-25.
- Carak Samhita, Vaidya Jadavaji Trikamji Acharya, Chakrapani with commentary. Bombay, India : Nirnaya Sagar Press ; 1941 .
- Cavanagh, H.M. and Wilkinson, J.M. 2002. Biological activities of Lavender essential oil. *Phytotherapy Research.* 16(4): 301-308.
- Dapkevicius, A., Venskutonis, R., van Beek, T.A. and Linsen, J.P. 1998. Antioxidant activity of extracts obtained by different isolation procedures from some aromatic herbs grown in Lithuania. *Journal of the Science of Food and Agriculture.* 77(1):140-6.
- de Moura Linck, V., da Silva, A.L., Figueiró, M., Piato, A.L., Herrmann, A.P., Birck, F.D., Caramao, E.B., Nunes, D.S., Moreno, P.R. and Elisabetsky, E. 2009. Inhaled linalool-induced sedation in mice. *Phytomedicine.* 16(4) : 303-307.
- Debnath, M., Biswas, M., Shukla, V.J. and Nishteswar, K. 2014. Phytochemical and analytical evaluation of Jyotishmati (*Celastrus paniculatus* Willd.) leaf extracts. *Ayu.* 35(1) : 54.
- Deodhar, K.A. and Shinde, N.W. 2015. *Celastrus paniculatus*: Traditional uses and Ethnobotanical study. *Indian Journal of Advances in Plant Research.* 2(1) : 18-21.
- Dwivedi, S. 2007. *Terminalia arjuna* Wight & Arn.—a useful drug for cardiovascular disorders. *Journal of Ethnopharmacology.* 114(2) : 114-129.
- Gaitonde, B.B., Raiker, K.P., Shroff, F.N. and Patel, J.R. 1957. Pharmacological studies with Malkangani indigenous tranquilizing drug. *Curr Med Prac.* 1 : 619-621.
- Juang, L.J., Sheu, S.J. and Lin, T.C. 2004. Determination of hydrolyzable tannins in the fruit of *Terminalia chebula* Retz. by high-performance liquid chromatography and capillary electrophoresis. *J Sep Sci.* 27(9) : 718-724.
- Kala, C.P. 2006. Medicinal plants of the high altitude cold desert in India: diversity, distribution and traditional uses. *The International Journal of Biodiversity Science and Management.* 2(1) : 43-56.
- Kandil, F.E. and Nassar, M.I. 1998. A tannin anti-cancer promotor from *Terminalia arjuna*. *Phytochemistry.* 47: 1567-1568.
- Kirtikar, K.R. and Basu, B.D. 1999. *Indian Medicinal Plants* (Vol-1). 2nd ed. Dehradun; International book distributors. 574-577.
- Kirtikar, K.R. and Basu, B.D. *Terminalia chebula* In: *Indian Medicinal Plants*, 2nd eds, Allahabad, India: Lolit Mohan Basu Pub 1935.p. 1020-23.
- Kritsidima, M., Newton, T. and Asimakopoulou, K. 2010. The effects of lavender scent on dental patient anxiety levels: a cluster randomised controlled trial. *Community Dentistry and Oral Epidemiology.* 38(1) : 83-87.
- Kumar, K.J. 2006. Effect of geographical variation on contents of tannic acid, gallic acid, chebulinic acid and ethyl gallate in *Terminalia chebula*. *Natural Products.* 2(3-4) : 170-175.
- Kumar, S., Enjamoori, R., Jaiswal, A., Ray, R., Seth, S., Maulik, S.K. 2009. Catecholamine-induced myocardial fibrosis and oxidative stress is attenuated by *Terminalia arjuna* (Roxb.). *Journal of Pharmacy and Pharmacology.* 61(11) : 1529-1536.
- Lin, T.C., Chien, S.C., Chen, H.F. and Hsu, F.L. 2001. Tannins and related compounds from Combretaceae plants. *The Chinese Pharmaceutical Journal.* 52(1) : 1-26.
- Mekaway, S.E., Meselhy, M.R., Kusumoto, I.T., Kadota S., Hattori, M. and Namba, T. 1995. Inhibitory Effects of Egyptian Folk Medicines on Human Immunodeficiency Virus (HIV) Reverse Transcriptase. *Chemical & Pharmaceutical Bulletin* 43(4) : 641-648.
- Myers, N., Muttermeier, R.A., Muttermeier, C.A., da Fonseca, A.B.G. and Kent, J. 2000. Biodiversity hotspots for conservation priorities. *Nature.* 403 : 853-858.
- Nadkarni, A. 1976. Nadkarni's Indian Materia Medica. Nadkarni's Indian Materia Medica. 1976
- Negi, M.S., Sabharwal, V., Wilson, N. and Lakshmikumaran, M.S. 2006. Comparative analysis of the efficiency of SAMPL and AFLP in assessing genetic relationships among *Withania somnifera* genotypes. *Current Science.* 25 : 464-471.
- Patel, D.K., Amin, K.S. and Nanavati, D.D. 1995. Chemistry and pharmacology of *Celastrus paniculatus* Willd. *Indian drugs.* 32(12) : 566-573.
- Pavanand, K., Webster, H.K. and Yongvanitchit, K. and Dechatiwongse, T. 1989. Antimalarial activity of *Tiliacora triandra* diels against *Plasmodium falciparum* in vitro. *Phytotherapy Research.* 3 : 136-139.
- Prusinowska, R. and Emigielski, K.B. 2014. Composition, biological properties and therapeutic effects of lavender (*Lavandula angustifolia* L.). *Herba polonica.* 60(2) : 56-66.
- Rajni, H.S. and Manish, RA. 2014. Review on pharmacological Ayurvedic compound of *Terminalia arjuna*. *International Journal of Phytotherapy Research.* 4(4) : 31-38.
- Ramanna, P., Siddapa, K. and Patil, S.K. 2005. An ethnobotanical plant for women folks health care in Central Western Ghat in Karnataka. *Recent Advances in Medicinal Plants.* New Delhi: Satish Publication. 266.

- Rasool, M. and Varalakshmi, P. 2006. Suppressive effect of *Withania somnifera* root powder on experimental gouty arthritis: an *in vivo* and *in vitro* study. *Chemico-biological interactions*. 164(3) : 174-180.
- Ravishankar, B. and Shukla, V.J. 2007. Indian System of Medicine: A Brief Profile. *African J Trad Compl Alter Med*. 4(3) : 319-337.
- Row, L.R., Murty, P.S., SubbaRao, G.S.R., Sastry, C.S.P. and Rao, K.V.J. 1970. Chemical examination of *Terminalia arjuna*: Part-XII: isolation and structure determination of arjunic acid, a new trihydroxytriterpene carboxylic acid from *Terminalia arjuna* bark. *Indian J Chem*. 8 : 716-721.
- Salve, B.U., Chauhan, V.B., Kasture, V.S. and Kasture, S.B. 2006. Effect of methanolic extract of *Azadirachta indica* leaves and *Withania somnifera* roots on some animal models of asthma. *Indian J. Pharmacol*. 38 : 85-85.
- Samant, Pant, S., Singh, M., Lal, M., Singh, A, Sharma, A, Bhandari, S. 2007. Medicinal plants in Himachal Pradesh, north western Himalaya, India. *The International Journal of Biodiversity Science and Management*. 3(4) : 234-251.
- Satyawati, G.V., Gupta, A.K. and Tandon, N. 1997. Medicinal plants of India. New Delhi. *Indian Council of Medical Research*. 262.
- Shaila, H.P., Udupa, S.L. and Udupa, A.L. 1998. Hypolipidemic activity of three indigenous drugs in experimentally induced atherosclerosis. *International Journal of Cardiology*. 67(2) : 119-124.
- Sharma, K. and Dandiya, P.C. *Withania somnifera* Dunal-present status. *Indian Drugs*. 29(6) : 247-253.
- Sharma, R., Raizada, S., Gautam, A. and Bhatia, A.K. 1992. Phytochemical and Antibacterial Analysis of *Terminalia chebula* and *Terminalia bellirica*. In: *Green Chemistry in Environmental Sustainability and Chemical Education 2018* (pp. 131-137). Springer, Singapore.
- Singh, G., Sharma, P.K., Dudhe, R. and Singh, S. 2010. Biological activities of *Withania somnifera*. *Ann Biol Res*. 1(3) : 56-63.
- Singh, S. and Kumar, S. 1998. *Withania somnifera*: The Indian Ginseng, Ashwagandha. Central Institute of Medical and Aromatic Plants, Lucknow, India.
- Smigielski, K., Raj, A., Krosowiak, K. and Gruska, R. 2009. Chemical composition of the essential oil of *Lavandula angustifolia* cultivated in Poland. *Journal of Essential Oil Bearing Plants*. 1; 12(3) : 338-347.
- Srivastava, J.P., Lambert, J. and Vietmeyer, N. 1996. Medicinal plants: An expanding role in development. The World Bank
- Stanojevic, L., Stankovic, M., Cacic, M., Nikolic, V., Nikolic, L., Ilic, D. and Radulovic, N. 2011. The effect of hydrodistillation techniques on yield, kinetics, composition and antimicrobial activity of essential oils from flowers of *Lavandula officinalis* L. *Hemijaska industrija*. 65(4) : 455-463.
- Tiwari, R., Chakraborty, S., Saminathan, M., Dhama, K. and Singh, S.V. 2014. Ashwagandha (*Withania somnifera*): Role in safeguarding health, immunomodulatory effects, combating infections and therapeutic applications: A review. *J Biol Sci*. 14(2) : 77-94.
-