

# Evaluation of Phytochemical Contents in the Methanolic Extract of Phyllanthus Niruri Leaves

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**Abstract:** *Phyllanthus niruri* Linn. belongs to Euphorbiaceae family and it is a small herb giving wide range of medicinal properties, and it is used widely across the world. In Indian ayurvedic system it is used for Jaundice, ulcer, skin disease, diabetes and urinary complications. *Phyllanthus niruri* medicinal properties for the effective management of several ailments including hepatitis. The medicinal plant represents an enormous reservoir of potential Phytochemical components that could be useful as an alternative to allopathic drugs are being used to pharma drugs. This review covers information about ethanomedicinal uses of *Phyllanthus niruri* in different countries with pharmacological profile of the plant. The active Phytochemicals are Total Phenol, Flavonoids, Saponins, Quinones, Terpenoids, Steroids, Coumarins and Tannins have identified from *Phyllanthus niruri*. Extract of this herb have been proven to have therapeutic effects in many clinical studies.

**Keywords:** Phytochemicals, Methanolic, Extract, Euphorbiaceae, ethanomedicinal, *Phyllanthus niruri*

## 1. Introduction

Siddha system of medicine is an ancient system of medicine prevalent in South India (Bouslaugh, Sarah E.2009). The word siddha means "Spiritual perfection of enlightenment".

According to the recent survey of WHO, there are about 46% of global diseases and about 59% of the mortality rate is because of chronic diseases. In that way almost 35 million people in the world die because of chronic liver disease. Siddha medicine serves both therapeutic and prophylactic concept and hence it is holistic in nature. The ancient scholars only believed that herbs are only solution to cure a number of health related problems and diseases. They conducted through study about the same, experimented to arrive at accurate conclusions about the efficacy of different herbs that have medicinal value.

Most of the drugs, thus formulated, are free of side effects or reactions. This is the reason that herbal treatment is growing in popularity across the globe. These herbs that have Medicinal quality provide rational means for the treatment of many internal diseases, which are otherwise considered difficult to cure. Many commercially proven drugs in modern medicine were initially used in crude form intraditional or folk healing practices, or for other purposes that suggested potentially useful biological activity.

### Medicinal Plant

Medicinal plants still play important roles in the daily lives of people living in developing countries of Asia and Africa. Medicinal plants not only serve as complements or substitutes for modern medical treatments, which are often inadequately available but also enhance the health and security of local people. Thus, these plants play indispensable roles in daily life and are deeply connected to diverse social, cultural, and economic events associated with life, aging, illness, and death. Medicinal plants are used to treat and diagnose diseases and infections. From ancient

times, plants have been rich sources of effective and safe medicines (Russell - Smith et al.2006).

Ethnomedicinal practices are believed to be one of the potential bases for the development of safe and effective treatments. Also, the use of medicinal plants to treat infections is an old practice in large parts of Ethiopia to solve health problems for livestock and humans (Redda et al.2014; Giday et al.2009; Regassa 2013; Abera 2014; Tamene 2020; Mulatu 2020).

Due to the increasing awareness among the people towards natural products, natural medicine is attracting more attention than allopathic system. Moreover this system of medicine is effective and less toxic without side effects (Malviya R et al., 2012).

The whole plant or its different parts may be valued for its therapeutic, medicinal, aromatic qualities. Medicinal plants are cost efficient, more accessible to the most of the population in the world. Thus, it is need to encourage the use of medicinal plants as potential sources of new drug. There has been highly increased for herbal remedies in several parts of the world (Daniyan SY et al., 2008). Plant derived medicines are relatively Safar than synthetic alternatives, offering profound therapeutic benefits and more affordable treatment. Medicinal plants are a source of economical value, medicinal plants have a long history of beneficial plant material which have provided the models for 25 - 50% western drugs.

Herbal based traditional remedies are highly recommended by world health organization (WHO) because of their safety, easy availability, low cost in the treatment of various disease. In traditional system, these remedies have a richest bio - resource such as phenol, micro and macro nutrients etc. They can act as nutraceuticals, food supplement, pharmaceutical intermediates etc., (Lalitha. N.2013). An herbal based formulations improves the quality of human life through its potent natural compounds. They provide

remedy for various chronic disease and metabolic disorder which are multifactorial and therapeutic intervention (Rajani M et al., 2008).

### Phyllanthus Niruri

*Phyllanthus niruri* L. (Euphorbiaceae) is a small erect herbaceous medicinal plant with pale green leaves having small oblong elliptic glabrous leaves with diverse global naturopathic applications and potentials yet to be fully elucidated. It is widely distributed in the tropics, and grows up to 30 - 40 cm in height (Bagchi et al., 1992), with little birth. This plant is spread throughout the tropics and subtropics in sandy region as weed in cultivated and waste lands (Ross, 1999), and has a high utility in ethnobotanical medicine.



**Figure:** *Phyllanthus niruri* plant

*Phyllanthus niruri* has been utilized as a traditional medicine to cure kidney problems, diarrhea, fever, diabetes and colic (Kumaran and Karunakaran, 2007). *Phyllanthus niruri* also has the ability to reduce bad lipids, as well as exhibit an

analgesic effect (Amin et al., 2012, Kumaran and Karunakaran, 2007). In China, this plant is used as a traditional folk medicine and is known as 'pearls under the leaves' (Murugaiyah and Chan, 2009).

### Taxonomy

Kingdom: Plantae

Phylum: Anthrophyta

Class: Magnoliopsid

Order: Euphorbiales

Family: Phyllanthaceae

Genus: Euphorbiaceae Juss

Species: *Phyllanthus niruri* L. – gale of the wind

### Description

It grows 50–70 cm (20–28 inch) tall and bears ascending herbaceous branches. The bark is smooth and light green. It bears numerous pale green flowers which are often flushed with red. The fruits are tiny, smooth capsules containing seeds.

### Morphology

*Phyllanthus niruri* is an erect, slender, branched, annual herb from 10 to 50cm, of a light green to whitish. The leaves of the main stem fall very early, so that the side, horizontal and rather brief twigs, look like compound leaf. It has numerous small leaves which are simple, elliptic to elongated, carrying minute flowers to their base. Flowers are of small size and greenish. On half lower of the twigs, flowers are solitary, while they are grouped by 2 - 4 on terminal half. Seeds, wedge - shaped are of a light brown.



**Figure:** *Phyllanthus niruri* and flower

### Leaves

Leaves arise at nodes just below an axillary bud on woody stems and are usually petiolate, that is composed of a blade and stalk - like petiole. Petioles may have stipules, two small leaf - like flaps that are attached at the base. The leaves are simple and alternate, distichous, numbering from 15 to 35

per branch. Petiole is very short, measuring 0.4 to 0.7mm long.



**Figure:** Phyllanthus niruri leaf

### Uses of Medicinal Plant

The plant is widely used to tone - up sluggish liver and also given in chronic liver condition and jaundice. In Unani medicine, the plant is used in jaundice as diuretic, cooling and astringent. In recent studies, the herb and its root have exhibited antiviral actions on Hepatitis - B.

Phyllanthus niruri or “stone breaker tea” is one such natural alternative that is inexpensive, easy to obtain and has a low incidence of adverse effects. Although many studies have shown the beneficial effects of *P. niruri* and its potential to inhibit the formation of kidney stones.

### Phyllanthus Niruri As A Herbal Medicine

Phyllanthus niruri has a long history in herbal medicine systems such as Indian Ayurveda, Traditional Chinese Medicine and Indonesian Jammu. The whole plant is used as remedies for many conditions such as dysentery, influenza, vaginitis, tumors, diabetes, diuretics, jaundice, Kidney stones and dyspepsia. The plant is also useful for treating hepatotoxicity, hepatitis B, hyperglycemia, viral and bacterial diseases (Chopra et al 1986). *P. niruri* has been used in Ayurvedic medicine for over 2000 years and has a wide number of traditional uses for jaundice, gonorrhea, frequent menstruation and diabetes. In Jammu preparations of the plant is used as antiviral and hepatoprotective agent. In Malaysia, *P. niruri* known as Dukung Anak is used internally for diarrhea, kidney disorders, gonorrhea and coughs (Burkill 1996).

The extract of *Phyllanthus niruri* L. has shown several pharmacological activities. Methanolic extract of *Phyllanthus niruri* L. was found to have significant antidiabetic activity in insulin dependent diabetes mellitus rats but showed no effect on insulin dependent diabetes mellitus rat (Bavarva and Narasimhacharya, 2007). *Phyllanthus niruri* L has shown an inhibitory effect against calcium oxalate crystal growth and aggregation in human urine. This medicinal plant exhibited antiurolithic activity in both in vitro and in vivo studies (Barros et al., 2003). Scientific studies have shown that *Phyllanthus niruri* L. has an antihyperlipidemic effect. It was also reported that the aqueous extract exhibited antihyperlipidemic activity (Nwanjo et al., 2007 Mehta et al 2029, Meselhy et al 2020).

Meselhy et al. (2020) highlighted the direct methods used for extraction of lignans from aerial parts of *P. niruri* L. Identified lignans were phyllanthin, hypophyllanthin,

phylltetralin, nirtetralin, and niranthin. Different solvents gave yield based on extraction concentrations. Ethanolic extract of *Phyllanthus niruri* L. was found to have potential Anti plasmodial activity in vitro by inhibition of the developmental stage of a trophozoite to schizonts. Another study showed that *P. niruri* exhibited potent systemic antinociceptive actions against two models of neurogenic pain (Santos et al., 1995 Meselhy et al 2020).

### Phytochemistry

Phytochemistry is the chemistry of plants or chemical constituents of plants. Phytochemistry understood in pharmacy as the chemistry of natural products used as drugs or drugs if plants with the emphasis on biochemistry. The constituents are therapeutically active or inactive. The inactive constituents are structural of the plants like starch, sugars or proteins. The inactive constituents have however pharmaceutical uses.

The active constituents are secondary metabolites, like alkaloids glycosides, volatile oils, tannins etc. They are single substances or usually mixture of several substances. The secondary products of metabolism are formed from primary products and the plant is not able to realize them, and they are deposited in the cells and so are called secondary metabolites.

Phytochemicals are chemical of plant origin (Breslin. et 2017) Phytochemicals (from Greek Phyto, meaning “plant”) are chemicals produced by plants through primary or secondary metabolism (Molyneux. RJ et al, 2007) They generally have biological activity in the plant host and play a role in plant growth or defense against competitors, pathogen, or predators (Harborne. et al. .1999).

The medicinal plants are useful for healing as well as for curing of human diseases because of the presence of phytochemical constituents (Nostro A. et., 2000). Phytochemicals are naturally occurring in the medicinal plants, leaves, vegetables and roots that have defense mechanism and protect from various diseases (Krishnaiah D, et al., 2097).

## 2. Materials and Methods

### Plant Preparation:

Leaves of *P. niruri* plants were plucked and slightly rinsed in cold tap water to remove sand, dirt and dust particles. Washed leaves were blotted on the blotting paper, shade dried at room temperature and the sample were ground into a fine powder using a mixer grinder. The powdered samples were then stored in the refrigerator for further use.





Figure: Phyllanthus niruri powder

#### Preparation of Plant Extract:

The whole plant of Phyllanthus niruri were carefully washed with distilled water, shade dried and ground to a coarsely powdered form. 25g of the powdered sample was successively extracted using 75ml of distilled water. The extract was lasted for 12 hours. The extract resulting were dried and preserved separate plate for further use.



Figure: Phyllanthus niruri extract

#### Phytochemical Analysis

The Phytochemical screening of methanolic extract was done to detect the presence of following biomolecules by standard qualitative Phytochemical procedures.

- 1) **Test for phenol:** Total phenolic content was measured according to Folin ciocalteu method. A reaction mixture of 10 ml was made which comprised of 100µg/ml plant extract, 5ml Folin ciocalteu reagent, and 2ml Sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>) which was mixed, and then incubated at 400 C in water bath for 30 minutes. After that, OD was taken at 760nm. Gallic acid of different concentration was taken as standard, and the phenolic content was expressed as Gallic acid equivalents present per milligram of the dried plant extract sample.
- 2) **Test for Tannins:** To 100µg/ml of plant extract, 200ml of 5% Ferric chloride was formation of dark blue or greenish black indicates the presence of tannins
- 3) **Test for Coumarins:** To 100µg/ml of plant extract, 10% Sodium hydroxide was added. Presence of yellow colour shows the presence of coumarins.
- 4) **Test for Saponins:** To 100µg/ml of plant extract was added along with distilled water and shaken well. The formation of foam indicates the presence of saponins.

- 5) **Test for quinones:** To 100µg/ml of plant extract, add a few drops of Sulphuric acid. Appearance of red colour shows the presence of quinones.
- 6) **Test for Terpenoids:** To 100µg/ml of plant extract, 200µl of chloroform was added and concentrated sulphuric acid was added carefully. Formation of Red brown colour at the interface indicates presence of terpenoids.
- 7) **Test for steroids:** To 100µg/ml of plant extract, 1ml of concentrated sulphuric acid was added there is a formation of brownish red ring indicates presence of Steroids.
- 8) **Test for Flavonoids:** To 100µg/ml of plant extract, 100µl of 2N of sodium hydroxide was added. Formation of yellow colour indicates the presence of flavonoids.

### 3. Results

The Phyllanthus niruri was subjected to extraction by methanol. This extract of Phyllanthus niruri were collected and processed for studies. The methanolic extract of Phyllanthus niruri was studied and the results were obtained.

#### Phytochemical Analysis

The qualitative analysis of Phytochemical analysis of methanolic extract of Phyllanthus niruri extract revealed the presence of compounds like Total phenol, Flavonoids, Tannins, coumarins and Terpenoids and absence of other Phytochemicals like Saponins, Quinones and Steroids.

Phytochemical Test	Inference
Total Phenol	98 ± 0.2 MG/G
Flavonoids	Present
Tannins	Present
Saponins	Absent
Terpenoids	Absent
Coumarins	Present
Quinones	Present
Steroids	Absent

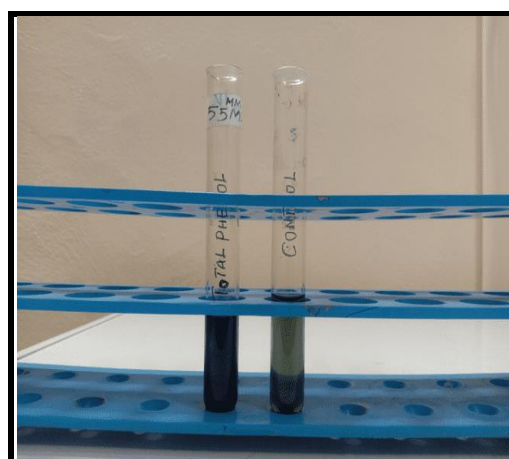


Figure: Test for Total Phenol

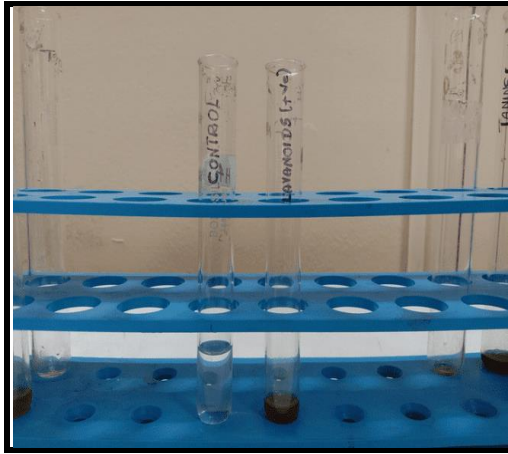


Figure: Test for Flavonoids

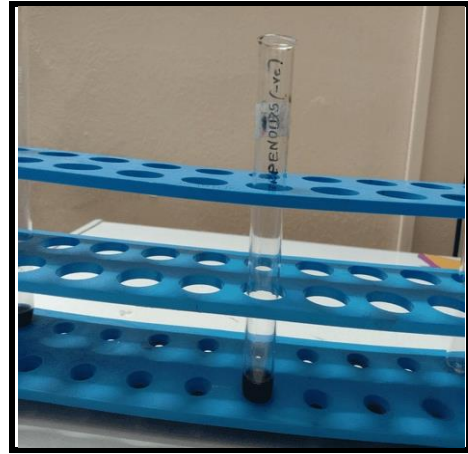


Figure: Test for Terpenoids

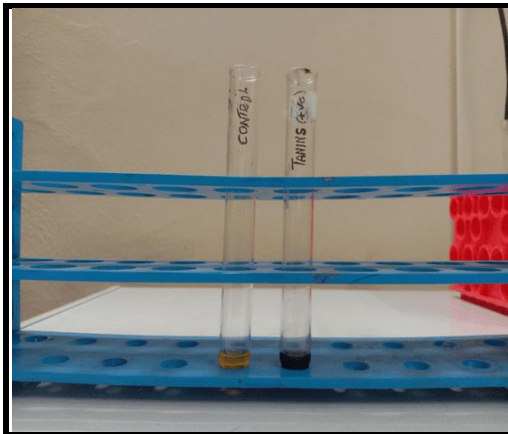


Figure: Test for Tannins

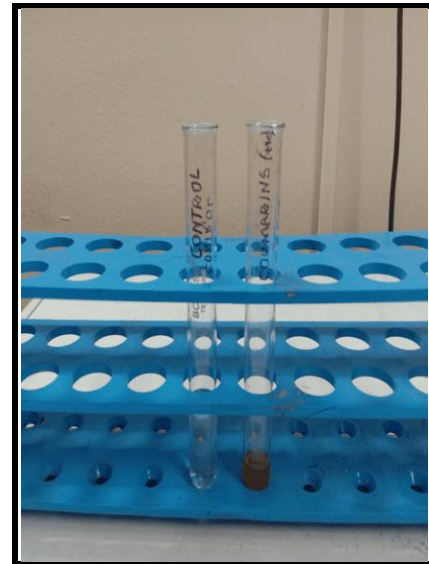


Figure: Test for Coumarins



Figure: Test for Saponins

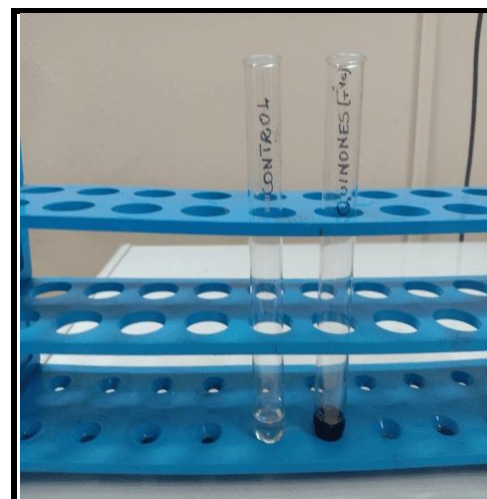


Figure: Test for Quinones



**Figure:** Test for Steroids

#### 4. Discussion

Medicinal plants have great contribution to mankind by combating health related issues including some liver disease and kidney stones. The present study deal with Evaluation of Phytochemical content in the methanolic extract of *Phyllanthus niruri* leaves. The methanolic extract of *Phyllanthus niruri* leaves were subjected to preliminary Phytochemical screening studies to identify the chemical constituents present in the leaves of *Phyllanthus niruri*.

The drug *Phyllanthus niruri* is traditionally used for Jaundice, liver related disease, Diabetes, ulcer and wounds. It is ability to control the blood glucose levels. It's bitter, diuretic, anti inflammatory and hepatoprotective properties help to maintain liver health and provide relief from diabetic condition. The Phytochemical research is done in *Phyllanthus niruri* leads to the discovery and isolation of plant metabolites. This review widely exposed the extract of *Phyllanthus niruri* has various Phytochemical compounds such as Flavonoids, Total Phenol, Coumarins, Steroids, Terpenoids, Quinones, Saponins and Tannins. The plant has traditionally produced a source of hope for drug compounds as plant herbal mixture have made large contribution to human health and well being. The use of plant extract with known properties can be great significance for therapeutic treatment.

#### 5. Conclusion

The present study demonstrated the methanolic extract of *Phyllanthus niruri* possess biological properties and various activities. *Phyllanthus niruri* Leaves is a source of potent bioactive compounds having essential and effective biological properties. *Phyllanthus niruri* is an important medicinal plant. The plant is widely used for the treatment of Hepatic disease, oedema, and urinary troubles. *Phyllanthus niruri* leaves as many effective traditional uses for a wide variety of diseases.

The preliminary Phytochemical analysis revealed the presence of different Chemical components. The Results obtained in this study have considerable value with respect to quantitative estimation of total phenols, tannins, saponins,

Quinones, Coumarins, Steroids, Terpenoids and flavonoids. These results suggest that the methanolic extracts are used for isolation of novel bio active compounds in ethnomedicinal and in the development of potential drugs. Purification and incorporation of these bioactive compounds from *Phyllanthus niruri* leaves into medicinal use could a better idea for further study.

#### References

- [1] Abera B (2014) Medicinal plants used in traditional medicine by Oromo people, Ghimbi District, Southwest Ethiopia. *J EthnobiolEthnomed* 10 (1): 1–15.
- [2] Acevedo - Rodruguez, Pedro&collaborators.1996. Flora of st. John, U. S. Virgin Islands. *Mem. New. York Bot. Garf.*78: 1.581.
- [3] Bagchi GD, Srivastava GM, Singh SC. (1992) Distinguishing Features of Medicinal Herbaceous Species of *Phyllanthus* Occurring in Lucknow. District (Up) India. *Int. J. Pharmacognosy.*30: 161 - 168.
- [4] Bavarva, Jasmin H., and A. V. R. L. Narasimhacharya (2007). Comparative Antidiabetic, Hypolipidemic, and Antioxidant Properties of *Phyllanthus niruri*. In *Normal and Diabetic Rats. Pharmaceutical biology* 45, no.7: 569 - 574.
- [5] Barros, Marico E., N. Schor, and M. A. Boim (2003). Effects of an aqueous extract in *Phyllanthus niruri* on calcium oxalate crystallization in vitro. *Urological Research* 30, no.6: 374 - 379
- [6] Bouslaugh, Sarah. The SAGE Encyclopedia of Pharmacology and Society. SAGE Publications. P.2492. ISBN 9781506346182
- [7] Bostro A, Germano MP, D'Angelo V, Marino A, Cannatelli MA (2000) Extraction methods and bioautography for evaluation of medicinal plant antimicrobial activity. *Lett Apply Microbial* 30: 379 - 384
- [8] Breslin, Andrew (2017). "The Chemical Composition of Green Plants". Sciencing, Leaf Group Ltd.
- [9] Burkill, I. H. (1996) A dictionary of the economic products of Malay Peninsula. Art Printing Works, Kuala Lumpur, pp 1748–1749
- [10] Chopra, R. N., Nayar, S. L., Chopra, I. C. (1986) Glossary of Indian medicinal plants. Catholic Press, Ranchi, CSIR, New Delhi, India
- [11] Daniyan SY, Muhammad IB, Evaluation of the antimicrobial activities and phytochemical properties of extract of *Tamaridus indica* against some diseases causing bacteria. *African journal of biotechnology*, 7, 2008, 2451 - 2453
- [12] Fassil K (2001) The status and availability of oral and written knowledge on traditional health care in Ethiopia. In: Conservation and sustainable use of medicinal plants in Ethiopia, pp 107–119
- [13] Giday M, Asfaw Z, Woldu Z (2009) Medicinal plants of the Meinit ethnic group of Ethiopia: an ethnobotanical study. *J Ethnopharmacol* 124 (3): 513–521.
- [14] Harborne, Jeffrey B; Baxter, Herbert; Miss, Gerard p., eds. (1999). "General Introduction". *Phytochemical dictionary a handbook of bioactive compounds from*



- plants (2nd ed.). London: Tqylor& Francis. P. vii. ISBN 9780203483756
- [15] Krishnaiah D, Sarbatly R, Bono A (2007) Phytochemical antioxidants for health and medicine: A move towards nature. *Biotechnol Mol Rev* 1: 97 - 104.
- [16] Kumaran A et al. In vitro antioxidant activities of methanol extracts of five *Phyllanthus* species from India *LWT - Food Sci. Technol.* (2007)
- [17] Lalitha N, *Journal of intellectual property rights.* 2013, 18, 272 - 282.
- [18] Le Bourgeois T., Jeuffrault E., Grard P., Carrara A. 2001. *AdvenRun V.1.0. Les Principalesmauvaisesherbes de La R union. CD - ROM. Cirad, SPV. France.*
- [19] Malviya R, Kumar A, Singh A, Kulkarni GT. Pharmacological Screening, Ayurvedic values and commercial utility of *Aegle Marmelos*, *International Journal of Drug Development & Research*, 2021, 4.6
- Pande PC, Tiwari L, Pande HC, (2007) Ethnoveterinary plants of Uttaranchal - A review. *Indian J Trad Knowl*, 6: 444 - 458.
- [20] Meselhy, M. R., Abdel - Sattar, O. E., El - Mekkawy, S., El - Desoky, A. M., Mohamed, S. O., Mohsen, S. M, & El - Hallway, A. (2020). Preparation of Lignan - Rich Extract from the Aerial Parts of *Phyllanthus niruri* Using Nonconventional Methods. *Molecules*, 25 (5), 1179.
- [21] Molyneux, RJ; Lee, ST; Gardener, DR; panter, KE; James, LF (2007). "Phytochemicals: the good, the bad and the ugly?". *Phytochemistry*.68 (22 - 24): 2973 - 85. Doi: 10.1016/j. phytochem.2007.09.004. PMID 17950388
- [22] Mulatu G (2020) Antibacterial activities of *Calpurnia aurea* against selected animalpathogenic bacterial strains. *Adv Pharmacol Pharm Sci*.
- [23] Murugaiyah V et al. Mechanisms of antihyperuricemic effect of *Phyllanthus niruri* and itslignan constituents. *Ethnopharmacol.* (2009)
- [24] Nwanjo, H. U., G. Oze, M. C. Okafor, D. Nwosu, and P. Nwankpa (2007). Protective role of *Phyllantusniruri* extract on serum lipid profiles and oxidative stress In hepatocytes of diabetic rats. *African Journal of Biotechnology* 6, no.15: 1744 - 1749.
- [25] Rajani M, Kanaku NS, in Ramawat K. G, Merillon J. M, (Eds), in *Bioactive molecules andmedicinal plants*, Springer, 2008, pp, 349 - 469.
- [26] Redda YT, Kebede E, Cruz C, Gugsu G, Awol N, Mengeste B (2014) Potential antibacterial activity of crude extracts from *Aloe vera*, *Zingiber officinale* and *Vinca major* medicinal plants. *Intl J* 5 (3): 202–207
- [27] Regassa R (2013) Assessment of indigenous knowledge of medicinal plant practice and mode of service delivery in Hawassa city, southern Ethiopia. *J Med Plants Res* 7 (9): 517–535
- [28] Richard S Weiss (2009). *Recipes for immortality: Healing, Religion and Community in South India.* Oxford University press. P.95. ISBN 9780195335231
- [29] Ross L. (1999) *Medicinal Plants of the World. Chemical Constituents, Traditional and Modem Medicinal Uses.* Pub: Humana Press Inc., Totowa, New Jersey: 249 - 254.
- [30] Russell - Smith J, Karunaratne NS, Mahindapala R (2006) Rapid inventory of wild medicinal plant populations in Sri Lanka. *Biol Cons* 132 (1): 22–323
- Fassil K (2001) The status and availability of oral and written knowledge on traditional health care in Ethiopia. In: *Conservation and sustainable use of medicinal plants in Ethiopia*, pp107–119
- [31] Santos, Adair RS, C. ValdirFilho, RosendoA. Yunes, and João B. Calixto (1995). Analysis of the mechanisms underlying the antinociceptive effect of the extracts
- [32] Tamene S (2020) Ethnobotanical study of indigenous knowledge on medicinal plant uses and threatening factors around the Malga District, Southern Ethiopia. *Int J BiodiversConserv* 12 (3): 215–226.
- [33] Webster, Grady L.1970. A revision of *Phyllanthus* (*Euphorbiaceae*) in the continental United States. *Brittonia*, 22: 44 - 76