

Contribution of indigenous anti-diabetic flora in Almora district, Uttarakhand, India

Priti Kumari^{1,2*}, G. C. Joshi¹, L. M. Tewari²

¹Regional Research Institute of Himalayan Flora, CCRAS, Tarikhet-263663(Uttarakhand) India

²Department of Botany, DSB Campus, Kumaun University, Nainital (Uttarakhand) India

Abstract

Uttarakhand is characterized by a rich diversity of ethno-medicinal plants as well as a rich heritage of traditional medicine system. An ethno-botanical survey was conducted to collect information about medicinal plants used for the treatment of diabetes at Almora district. The indigenous knowledge of local traditional plants used for the treatment of diabetes were catalogued based on the collection during the field trips and the information was gathered through interviews conducted with local knowledgeable villagers of selected study areas. Use of ethno-medicine was studied on approx. 100 peoples suffering by this disease. The results showed that the inhabitants use 16 species belonging to 13 families to treat diabetics. They used frequently ethno- medicine for their hypoglycemic activities.

Keywords: Almora, Diabetes, Ethno-Medicinal Plants, Traditional Knowledge

INTRODUCTION

Plants have been used in traditional medicine for several thousand years [1]. The herbal medicines occupy a distinct place in our life that provides information on the use of plants or plant parts as traditional medicine. However, healing properties of plants in different diseases had been mentioned in Rigveda and subsequently in Atharva Veda (1200 B.C.)- Since the time of Charaka and Susruta (400 B.C.) the medicinal plants were regrouped and Nagarjuna while editing Susruta Samhita described the presence of active pharmacological materials in bark, leaf, flower, fruit, rhizome etc. The knowledge of medicinal plants has been accumulated in the course of many centuries based on different medicinal systems such as Ayurveda, Unani & Siddha. In India, it is reported that traditional healers use 2500 plant species and 100 species of plants serve as regular sources of medicine [2]. During the last few decades there has been an increasing interest in the study of medicinal plants and their traditional use in different parts of the world [3-7].

India holds a credibility of diverse social, cultural and medical heritage with an unbroken tradition coming down across millennia. Though, medical heritage is centuries old, millions people in rural area still depend on traditional medicine to congregate their healthcare needs [8]. Collection of information and documentation of traditional knowledge plays an important role in scientific research on drug development [9]. A study of WHO depicts that over 80% of world's population depends on biological resources for their primary healthcare demands [10]. Documenting the indigenous knowledge through ethno-botanical studies is important for the conservation and utilization of biological resources.

Diabetes mellitus has become the common disease of World. It

is a disease in which the body is unable to produce or unable to properly use and store glucose (a form of sugar). Glucose backs up in the bloodstream - causing one's blood glucose or "sugar" to rise too high. It is a metabolic syndrome of multiple etiologies characterized by chronic hyperglycemia with abnormalities in carbohydrate, fat and protein metabolism due to defect in insulin secretions. India, facing a diabetic explosion, the exact cause being unknown and both genetic and life style factors being blamed, has the world's largest diabetic population – about 25 million, and the number is predicted to rise to 35 million by 2010 and to 57 million by 2025[11]. The rapid growth of this disease is due to heredity, endocrine imbalance, dietary imprudence, after effects of infection, obesity, severe and continued mental stress, reduction in physical labour and big difference in social structure etc. which provide a productive atmosphere to diabetes [12].

MATERIALS AND METHODS

Study Area

Almora district has one of the oldest and richest cultural traditions of using medicinal plants. The district Almora lies between 29°30'N to 30°20'N latitudes and 79°20' E to 80°20'E longitudes. It is located in the central part of kumaun region of Uttarakhand (India) (Figure 1). Almora district covers an area of 46 km in north-south in length and 86 km east-west width. The study area covers 3629.66 sq. km. Thus, the total area covered ranges from 510 m to 2830 m exhibiting great variety of regions extending from tropical moist deciduous forest to moist mixed coniferous forest. The rivers that flow in this region are Ramganga, Kosi, Gagas and Sarju.

The mountainous tracts of the whole district have varying altitude and relief which contribute to a great extent for the variation of the climatic conditions. This climatic condition favors buffer plant growth and the vegetation attains its maximum development. The soil varies from place to place and is directly related to the factors prevalent in a particular locality. The rock type also plays an important role in the quality of soil and quantum growth of the plant in many localities. The soil texture ranges from sandy loam to clayey loam. There are three main types of forest in this district i.e., Subtropical Forest (500 m-1000m), Temperate Forests (1000-

Received: July 11, 2011; Revised September 11, 2011; Accepted September 11, 2011.

*Corresponding Author

Priti Kumari
Regional Research Institute of Himalayan Flora, CCRAS, Tarikhet-263663
(Uttarakhand) India

Tel: +91-5966-220151
Email: pritisingh78@yahoo.com

2000m), and Sub Alpine Forests (2000-2500m) with various dominant species like Sal, Khair, Shisham, Haldu, Sagawn,

Bamboo, Eucalyptus, Banj-Oak, Rhododendron, Moru, Blue Pine, Low level Silver Fir, Spruce, Deodar and Cypress.

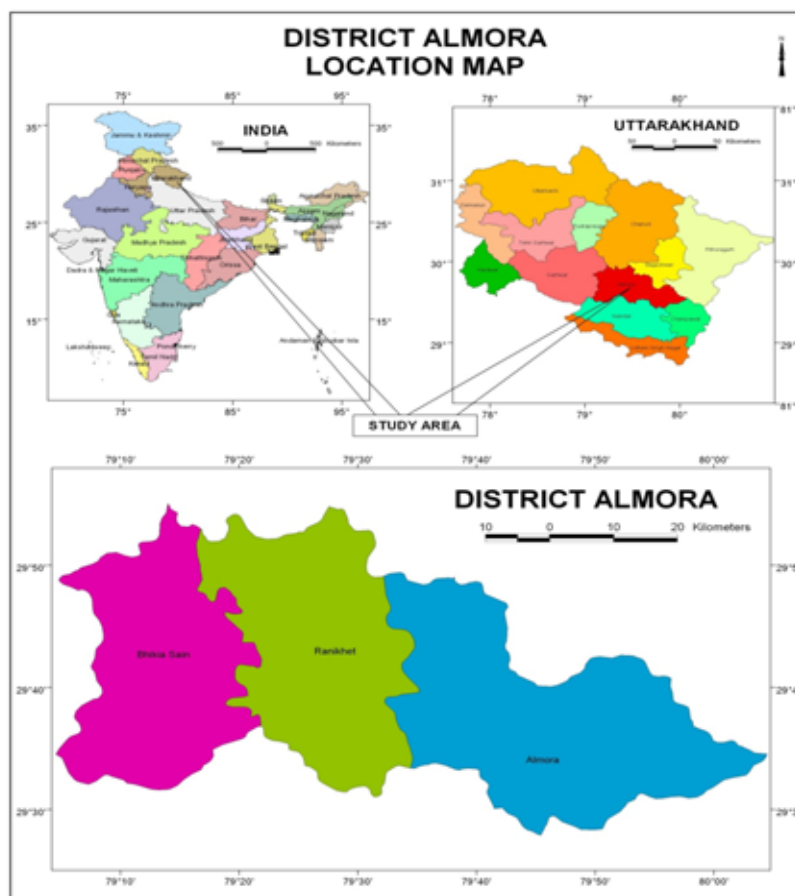


Figure 1. Location of the study area.

Objectives

- ❖ Document the uses of medicinal plants to cure diabetes in traditional health care system
- ❖ How they are relating in conservation of biodiversity promote community conservation and regeneration of resources.
- ❖ Assess the community perception on medicinal plants conservation.

Hypothesis

"Do the diabetic people of Almora district like to use traditional medicine for diabetes"

Subjects

The government hospitals are the main source of primary health

service in this district. The subjects with diabetes were randomly sampled by using the numbers they were assigned when they queued for consultation. The aim was to interview at least 100 subjects. The diabetic people were interview from different areas from this district.

Data collection

The questionnaire were used to obtain information on ethno-medicinal plants with their local name, parts used, mode of preparation. The questionnaire was written in Standard English. It was acceptable to rephrase the questionnaire in Kumauni (Local language of kumaun region of Uttarakhand) but not to prompt replies. The following are the format of questionnaire:

Format of questionnaire

Name-

Age-

Sex-

Occupation-

Address-

(1) Many people in this district use traditional medicines, do you use traditional medicine for your diabetes?

(Yes) ☐(No) ☐(Indifferent) ☐

(2) Where do you get traditional medicine?

Collect own ☐Friend or relative ☐Ayurveda shop ☐Traditional healers ☐Other/not known ☐

(3) How often do you use traditional medicine?

Every day ☐More than once a week ☐More than once a month ☐Less than once a month ☐Not known ☐

(4) What plants do you use for your diabetes?

Local name Part used Mode of preparation

(5)What type of troubles that you feel most?	
(6) Sugar level	
(7) Insulin treatment	<div style="display: inline-block; text-align: center; margin-right: 20px;"> Yes <input style="width: 50px; height: 20px; border: 1px solid black;" type="text"/> </div> <div style="display: inline-block; text-align: center;"> No <input style="width: 50px; height: 20px; border: 1px solid black;" type="text"/> </div>

In the questionnaire, question number four and five are open ended and allowed for up to 6-7 responses. On the other hand question number 1,2,3,6 & 7 are close ended. General information of subject like Name, Age, Sex, Educational qualification, Occupation and Address were obtained by questionnaire. Data on subject symptoms were obtained with the help of open ended question number five, subjects were asked to respond the question: What type of trouble that you feel most to your diabetes? The most frequent mentioned symptom were foot problems, thirst, sex problems, difficulty sleeping, tiredness, eye problems, weakness, itching, pain, and dizziness. Subject were categories under following age group (≤ 44 ; 45-54; 55-64; 65-74; ≥ 75 years). Plants that has been used by the subjects is categories under open ended question number four under the following heading like plants name, parts used and mode of preparation and administration. Lists of plants and their mode of preparation and administration used by subject for their diabetes were obtained with the help of this question and the specific plants were identified at Regional Research Institute of Himalayan Flora, Tarikhet, Uttarakhand. The collected data from the subjects has been analyzed with the help of important non- parametric test i.e., chi-square (χ^2) test. It is used as a test of independence to explain whether or not two attributes are associated. It is interesting in knowing whether a traditional medicine is effective in controlling diabetes or not. In such a situation, researcher proceeds with the hypothesis that the two attributes (Traditional medicine and control of diabetes) are independent, which means that traditional medicine is effecting/ not effective in controlling diabetes. Formula of chi-square is:

$$\text{Where, } \chi^2 = \sum \left[\frac{(F_o - F_e)^2}{F_e} \right]$$

F_o = observed frequency

F_e = expected frequency for each cell

F_e = (frequency for the column) (frequency for the row)/n

RESULTS

Use of herbal remedies from ethno-medicinal plants was studied in 100 people with diabetes mellitus attending 10 different health centers of Almora district. One subject with missing information about some question was excluded from the study therefore data were analyzed from 99 interviews. In this study there are 30 females and 70 males. During interview, it has been found that no one is using insulin. Overall, 64 out of 99 patients (64.65%) using ethno-

medicine whereas, 20 out of 99(20.2%) are purely depended on modern medicine and 15 out of 99 (15.15%) can't say anything about it i.e., the indifferent case in this study. Where the expected value for all three i.e. (yes, No, and indifferent) were 33 each (Figure 2).

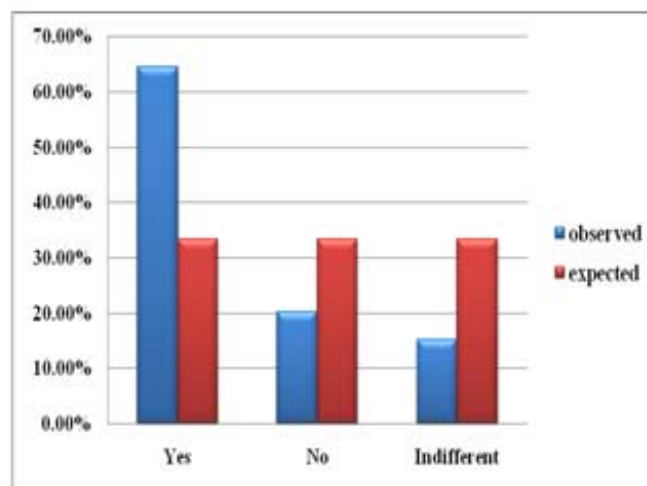


Figure 2: Observed and expected frequency

The calculate value of χ^2 is 44.06 which is greater than 5.991(value of 2df at 0.5 scale).The results of the survey of the plants used, family, life form, parts used and their ethno-medicinal use are presented in Table 1. In the ethno-medicine user, 26 out of 64 are female (40%) and 38 out of 64(60%) are male. Most patients reported collecting their own medicinal plants (51/64 or 80%) and a few were supplied with ethno-medicine by friends or relatives, but little use (3-4%) was made of herbal shops, herbalists or ethno-medicine doctors. Ethno-medicine was used daily by 42% of patients surveyed. The frequency of ethno-medicine use was not clear for 14% of users, possibly because they only took ethno-medicine when illnesses were experienced. There was no increase in ethno-medicine use with increasing age.

Table 1: Details of plants and their ethno-medicinal use by the subjects

(1) *Momordica charantia* Linn.

L.N.: Karela

F: Cucurbitaceae

L.F: Climbing Herb

P.U: Medicinal (Fruits)

E.M.U: fresh fruit juice and also used as vegetables.

(2) *Trigonella foenum-graecum* Linn.

L.N: Meti, Mutti

F: Fabaceae

L.F: Herb

P.U: Leaves, Seeds

E.M.U: One tea spoon of seed soak in water in a glass pot at night, drink water in empty stomach and chewed the seed after that, use raw leaves as vegetables.

(3) *Emblia officinalis* Gaerth.

L.N: Anonla

F: Euphorbiaceae

L.F: Small tree

P.U: Fruits

E.M.U: fresh fruit juice ones a day

(4) *Berberis aristata* Dc.

L.N: Kilmora

F: Berberidaceae

L.F: Shrub

P.U: Root

E.M.U: Decoction of root use in empty stomach

(5) *Muraya koenigii* (L.) Spreng.

L.N: Karipata

F: Rutaceae

L.F: Small Tree

P.U: Leaves

E.M. U: Decoction of fresh leaves juice is useful

(6) *Syzygium cumini* Linn. Skeels.

L. N: Jamun

F: Myrtaceae

L. F: Tree

P. U: Bark, Leaves, Fruits

E.M.U: Powder of seeds with water

(7) *Pueraria tuberosa* (Roxb.ex Willd.)Dc.

L. N: Biralu

F: Fabaceae

L. F: Climbing- Shrub

P. U: Tuber

E.M.U: Decoction of tuber

(8) *Curcuma longa* Linn.

L. N: Haldu

F: Zingiberaceae

L. F: Herb

P.U: Rhizome

E.M.U: Juice of rhizome

(9) *Ricinus communis* Linn.

L.N: Arandi

F: Euphorbiaceae

L.F: Shrub

P.U: Fresh Leaves

E.M.U: Juice of fresh leaves

(10) *Rubia cordifolia* Linn.

L.N: Mangitha

F: Rubiaceae

L. F: Climber

P.U: Whole plant

E.M. U: Decoction of whole plant

(11) *Urtica dioica* Linn.

L. N: Sisna

F: Urticaceae

L.F: Herb

P.U: Root

E.M.U: Decoction of root

(12) *Gymnema sylvestre* (Retz.)R.Br.

L.N: Gudmar

F: Asclepiadaceae

L.F: Woody climber

P.U: Whole Plant

E.M.U: Fresh juice take orally

(13) *Tinospora cordifolia* (Willd.) Miers.

L.N: Guduci, Geloi

F: Menispermaceae

L.F: Climber

P.U: Whole Plant

E.M.U: Fresh juice taken orally in empty stomach

(14) *Ajuga parviflora* Benth.

L.N: Ratpatia

F: Lamiaceae

L.F: Herb

P.U: Leaves

E.M.U: Fresh leaves chewed in empty stomach

(15) *Aegle marmelos* Linn. Correa

L.N: Belpatri

F: Rutaceae

L.F: Tree

P.U: Fruit, Leaves, Root

E.M.U: Equal quantity of the leaves of *Aegle marmelos*, *Syzygium cumini* (L.) Skeels., *Ocimum sanctum* L., *Azadirachta indica* Juss., and *Ficus religiosa* L. Extract the juice taken orally.(16) *Cinnamomum tamala* Nees & Eberm.

L. N: Kikari/ (Tejpat –Leaves)/ (Dalchini-Bark)

F: Lauraceae

L.F: Tree

P.U: Leaves, Bark

E.M.U: (1) Powder of bark with honey taken orally. (2) Tea of bark and leaves.

DISCUSSION

However, as no scientific literature properly recording the tangible effects of herbal medicine was available further scientific investigations of herbal medicine became necessary in different diseases including diabetes mellitus. Thus, a large volume of work carried out, was published or reviewed from time to time, yet a genuine herbal drug for diabetes mellitus remained out of sight [13-19]. Experimentally [20], confirmed the efficacy of traditional preparations claimed to be effective in the treatment of diabetics. Several herbs have shown anti-diabetic activity when assessed with the available experimental techniques [21]. Wide array of plants derived compounds with consistent anti-diabetic activity have proven their possible use in the treatment [22]. Plants like *Allium cepa*, *Allium sativum*, *Aloe vera*, *Cajanus cajan*, *Coccinia indica*, *Caesalpinia bonducella*, *Ficus bengalensis*, *Gymnema sylvestre*, *Ocimum sanctum*, *Pterocarpus marsupium*, *Swertia chirayita*, *Syzygium cumini*, *Tinospora cordifolia* and *Trigonella foenum-graecum* have been studied in relation to diabetes and their complications. However, these plants have shown varying degree of hypoglycemic and anti-hyperglycemic activity [23]. The main objective of this study was to assess the diversity of ethno-medicinal plants used in Kumaun region of Uttarakhand and document the traditional medical practices followed in healing complications

associated with diabetics.

On the basis of analysis of data the value of chi-square (χ^2) is greater than the table value. This interprets; there is association between the two associate's i.e. traditional medicine and control of diabetes. So the people of Almora district would like to use the traditional medicine for their diabetes. In this study documented plant species has been related with 13 families (Figure 3) out of them 31.25% were trees, 31.25% herbs, 18.75% shrubs and 18.75% climbers (Figure 4). The plant parts used by the subjects are as follows: bark-2, leaf-7, fruit-4, whole plant-3, seed-2, root-2, rhizome-1, tuber-1 (Figure 5).

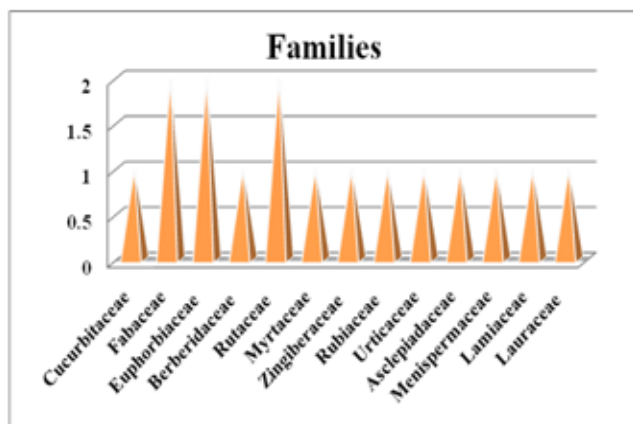


Figure 3: Family of plants used

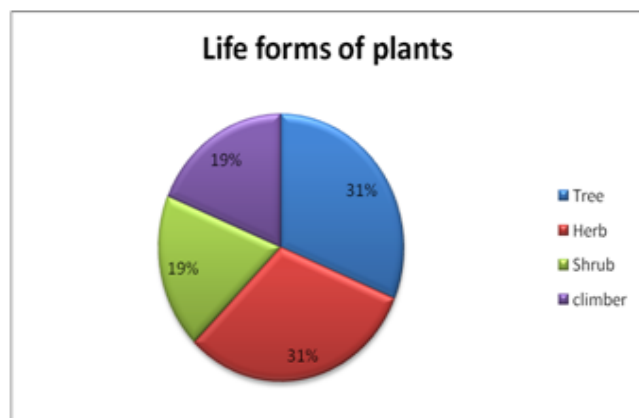


Figure 4: Various life form of plants

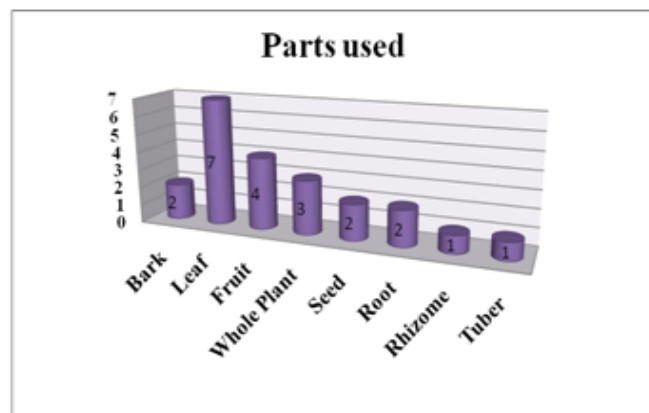


Figure 5: Various parts used

CONCLUSION

Diabetes has become the common disease of world. Though, advanced technology is being used in modern treatment system, yet we are far away in exploration of many aspects and remedy of this disease. Some oral anti - diabetic agents of modern medicine are not up to the mark due to their harmful side effects. The synthetic oral hypoglycemic agents have adverse health effects besides blood sugar lowering. Therefore, search for anti-diabetic herbs from traditional medicinal plants has become important. Indigenous anti-diabetic herbs, today gaining the popularity among alternative from of medicine, it is providing sound health and economic support to rural and hill communities' people also.

The present study showed that 64.5% peoples using ethno-medicine. Out of them 42% of patients attending different health centers for diabetes of Almora district were regular users of ethno-medicinal plants. In this study there are two variables ethno-medicine and control on diabetes. The researcher is interest to test the association between two variables. The calculate value of χ^2 is 44.06 which is greater than the table value 5.991(value of 2df at 0.5 scale) that indicate the diabetic people would like to use traditional medicine. So, the hypothesis has been accepted on basis of analysis of result.

REFERENCES

- [1] Abu-Rabia A2005. Urinary diseases and ethno-botany among pastoral nomads in the Middle East. J. Ethnobi Ethnomed, 1:4-14.
- [2] Pei SJ 2001. Ethno-botanical approaches of traditional medicine studies: Some experiences from Asia. Pharmaceutical Biology 39:74-79.
- [3] Lev E.2006. Ethno-diversity within current ethno-pharmacology as part of Israeli traditional medicine – A review. J. Ethnobi ethnomed. 2:4.
- [4] Al-Qura'n S 2005. Ethnobotanical survey of folk toxic plants in southern part of Jordan. Toxicon, 46:119-126.
- [5] Gazzaneo LR, Paiva de Lucena RF, Paulino de Albuquerque U 2005. Knowledge and use of medicinal plants by local specialists in a region of Atlantic Forest in the state of Pernambuco (Northeastern Brazil). J Ethnobi Ethnomed 1:9.
- [6] Hanazaki N, Tamashiro JY, Leitao-Filho H, Gegossi A 2000. Diversity of plant uses in two Caicarás communities from the Atlantic forest coast, Brazil. Biodiversity and Conservation 9:597-615.
- [7] Rossato SC, Leitao-Filho H, Gegossi A 1999. Ethnobotany of Caicarás of the Atlantic forest coast (Brazil). Economic botany 53: 387-395.
- [8] Ved, D.K., Goraya, G.S 2008. Demand and Supply of Medicinal Plants in India, Bishen Singh, Mahendra Pal Singh, Dehra Dun and FRLHT, Bangalore, India .
- [9] Ragupathy, S., Newmaster, S.G., Maruthakutti, M., Velusamy, B., Ul-Huda, M.M 2008. Consensus of the 'Malasars' traditional aboriginal knowledge of medicinal plants in the Velliangiri holy hills, India. J Ethnobi Ethnomed. 27(4):8-15.
- [10] WHO 2000. General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine Geneva, Switzerland WHO/EDM/TRM, 1:1-80.

- [11] Sicree R, Shaw J, Zimmet P 2006. Diabetes and impaired glucose tolerance. In Diabetes Atlas. International Diabetes Federation. Third Edition. Gan D, Ed, International Diabetes Federation, Belgium 15- 103.
- [12] Raghuram TC, Swaran Pasricha, Sharma RD 2003. Diet and Diabetes, Nation Institute of Nutrition, India council of Medical Research, Hyderabad. 1-6.
- [13] Elumalai S, Kesavan R, Ramganes S Murugesan R 2011 Isolation, Purification and Identification of the Anti-Diabetic Components from *Cinnamomum zeylanicum* and *Cinnamomum cassia* Bark Oil Extracts, *Current Botany* 2(6): 1-7.
- [14] Singh A G, M.P. Panthi M P, and Tewari D D 2011. Ethno Medicinal Plants Used by the Tharu and Magar Communities of Rupandehi District, Western Nepal. *Current Botany* 2(2): 30-33.
- [15] Chopra, R.N, Chopra I.C 1955. A review of work on Indian Medicinal Plant, ICMR Special series Report No. 30, New Delhi.
- [16] Chopra R.N, Nayar S.L, Chopra I.C 1966. Glossary of Indian Medicinal Plant, CSIR, New Delhi.
- [17] Mukherjee B 1957. Indigenous Indian Drugs used in the treatment of diabetes, *J.S.I.R.* 16A 10, Suppl.
- [18] Mukherjee S.K 1981. Indigenous Drugs in diabetes mellitus. *J. Diab Assoc. India* 21, Suppl. 1,
- [19] Mukherjee S.K, Mukherjee S.S 1966. Therapeutic advance in diabetes mellitus through ages. *J. Res. Ind.Med.* 1:1.
- [20] Shanmugasundaram, E.R, Gopinath, K.L, Shanmugasundaram, K.R 1990. Possible regeneration of the islets of Langerhans in streptozotocin-diabetic rats given *Gymnema sylvestre* leaf extracts. *J Ethnopharmacol* 30:265-279.
- [21] Mukherjee, P.K., Maiti, K., Mukherjee, K., Houghton, P.J 2006. Leads from Indian medicinal plants with hypoglycemic potentials. *J Ethnopharmacol.* 106(1):1-28.
- [22] Farnsworth, N.R 1998. Screening plants for new medicines. In Wilson, E.O. (Ed.), *Biodiversity* National Academy Press, Washington DC, pp 83-97.
- [23] Grover, J.K, Vats, V 2001. Shifting Paradigm from conventional to alternate medicine. An introduction on traditional Indian medicine. *Asia Pacific Biotechno News*, 5(1):28-32.