



GLOBAL JOURNAL OF MEDICAL RESEARCH
PHARMA, DRUG DISCOVERY, TOXICOLOGY AND MEDICINE
Volume 13 Issue 6 Version 1.0 Year 2013
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)

A Survey on Traditional Medicinal Plants used for the Treatment of Diabetes in Urban Areas of Dhaka and Khulna, Bangladesh

By Md. Motiur Rahman, Ahmedullah Mishuk, Shimul Halder
& Abu Shara Shamsur Rouf

University of Dhaka, Bangladesh

Abstract- Diabetes Mellitus (DM) is a metabolic disorder which is greatly prevalent in Bangladesh and the use of traditional medicinal plants for its treatment is also very popular. In this study, a survey to identify the medicinal plants used for the treatment of DM in the urban areas of Dhaka and Khulna, Bangladesh was conducted. In this survey, 100 randomly chosen individuals of both Dhaka and Khulna, 50 each, were interviewed in a structured manner, regarding the use of anti-diabetic medicinal plants. A total of 30 medicinal plants belonging to 18 families were accounted for the treatment of DM in Bangladesh. The most widely mentioned plants were, *Coccinia indica* (Telachuka), *Azadirachta indica* (Neem), *Trigonella foenum-graecum* (Methi), *Syzygium cumini* (Jam), *Terminalia chebula* (Horituki), *Ficus racemosa* (Joiggi dumur), *Momordica charantia* (Korolla), *Swietenia mahagoni* (Mahogany), *Phyllanthus emblica* (Amlaki), *Terminalia bellirica* (Bohera), *Tinospora cordifolia* (Gulanha Iota), *Lagerstroemia speciosa* (Jarul), *Withania somnifera* (Aswagandha). Although a large number of traditional medicinal plants are being used for the treatment of DM in Bangladesh, extensive clinical intervention studies are essential prior to recommend their use to ensure proper public health outcomes.

Keywords: *diabetes mellitus, traditional medicinal plants, clinical intervention, bangladesh.*

GJMR-B Classification : NLMC Code: QV 738, WQ 248

A Survey on Traditional Medicinal Plants used for the Treatment of Diabetes in Urban Areas of Dhaka and Khulna, Bangladesh

Md. Motiur Rahman ^α, Ahmedullah Mishuk ^ο, Shimul Halder ^ρ & Abu Shara Shamsur Rouf ^ω

Abstract- Diabetes Mellitus (DM) is a metabolic disorder which is greatly prevalent in Bangladesh and the use of traditional medicinal plants for its treatment is also very popular. In this study, a survey to identify the medicinal plants used for the treatment of DM in the urban areas of Dhaka and Khulna, Bangladesh was conducted. In this survey, 100 randomly chosen individuals of both Dhaka and Khulna, 50 each, were interviewed in a structured manner, regarding the use of anti-diabetic medicinal plants. A total of 30 medicinal plants belonging to 18 families were accounted for the treatment of DM in Bangladesh. The most widely mentioned plants were, *Coccinia indica* (Telachuka), *Azadirachta indica* (Neem), *Trigonella foenum-graecum* (Methi), *Syzygium cumini* (Jam), *Terminalia chebula* (Horituki), *Ficus racemosa* (Joiggi dumur), *Momordica charantia* (Korolla), *Swietenia mahagoni* (Mahogany), *Phyllanthus emblica* (Amlaki), *Terminalia bellirica* (Bohera), *Tinospora cordifolia* (Gulancha lota), *Lagerstroemia speciosa* (Jarul), *Withania somnifera* (Aswagandha). Although a large number of traditional medicinal plants are being used for the treatment of DM in Bangladesh, extensive clinical intervention studies are essential prior to recommend their use to ensure proper public health outcomes.

Keywords: *diabetes mellitus, traditional medicinal plants, clinical intervention, bangladesh.*

I. INTRODUCTION

Bangladesh is a country in South Asia, located on the fertile Bengal delta. It lies between latitudes 20° and 27°N, and longitudes 88° and 93°E. Bangladesh is in the low-lying Ganges Delta. The location of the country allows for the deposition of alluvial soil which has created some of the most fertile plains in the world. The fertile lands of Bangladesh boasted with tropical forests and boggy jungle along with the floral biodiversity made it an excellent source of medicinal plants.

Inexpensive and easily accessible nature of the traditional medicines made it an integral part of public health services in Bangladesh (Ashraf A et al., 1982, Ahmed SM et al., 2009, Rahman SA et al., 2012).

In Bangladesh, the use of traditional medicinal plants for the treatment of DM has not yet been

studied in great detail. Hence, the research in this topic has become imperative as the prevalence of DM in Bangladesh is apparently irrupting. Although the prevalence of DM in urban areas is greater than in rural communities (Rahim MA et al., 2007, Bhowmik B et al., 2012), the rates for diabetes has increased from 2.3% to 6.8% in between 1999 to 2004 (Rahim MA et al., 2010).

It's a burning question now, whether the traditional Bangladeshi medicine provide a safe and effective alternative therapy for DM. In order to accost this question, a survey in urban areas of Dhaka and Khulna was conducted to identify the medicinal plants for the treatment of diabetes.

II. MATERIALS AND METHODS

a) Study Design

The survey was carried on the Dhaka Municipal Corporation areas which has an area of around 300 square kilometers (km²). According to the Bangladesh Bureau of Statistics, Dhaka metropolitan has a population of about 14.5 millions. The infrastructure and socio economic stature of the Dhaka city brings about continuous migration of new residents from all over Bangladesh, which contributes to a diverse background of dwellers.

The other part of the survey was conducted in the urban areas of Khulna district which has an area of 59.57 km² and a population of 1.44 millions. It possesses a rural environment with smaller towns as well as a lower population density as compared to the urban areas of Dhaka.

b) Data Collection

The objective of the study was to qualitatively identify traditional anti diabetic medicinal plants, accessible to the general people. Interviews of key informants were performed using a pre-defined questionnaire. A total of 100 interviews were conducted, of which 50 in the Dhaka city and 50 in the Khulna city. In this study, participants were divided into different informant groups and key informants were randomly chosen from these groups (see Table1). As a limited number of informants were participating in this study, quantitative conclusions are not practicable.

Authors α ρ ω: Lecturer Department of Pharmaceutical Technology, University of Dhaka, Dhaka-1000, Bangladesh.

e-mai : motiur47@yahoo.com, motiur@du.ac.bd

Author ο: Department of Pharmacy, Khulna University, Khulna, Bangladesh.

Interviews were conducted in the Bengali language and grounded on a semi structured question form and the answers were recorded. For the publication of this report informed consent was obtained from the participants. In this study, questionnaire was projected to gather information on educational background and social status of the informant, general knowledge about diabetes, accession to allopathic medicine, and anti diabetic traditional medicinal plants used in the therapy. In this study, the overall usage rate (%) of the medicinal anti diabetic plants was assessed (see Table 2).

Each person participating in the survey was interviewed once and the cited medicinal plants were recorded in local names including photographs. The plants listed were dried out, preserved, and finally identified by a phytologist.

c) Data analysis

The usage rate for a plant species was calculated to assess the incidence of a particular plant species used for the treatment of diabetes. It was calculated as follow-Usage Rate (%) = (Number of quotation for a particular plant species/Number of all quotation for all species) *100.

III. RESULTS AND DISCUSSION

A total of 100 interviews were conducted which divulged 30 different plants used for the treatment of diabetes alone or in combination with other plants. According to the survey, the top five plants used for the treatment of diabetes were, *Coccinia indica* (Telachuka), *Azadirachta indica* (Neem), *Trigonella foenum-graecum* (Methi), *Syzygium cumini* (Jam), and *Terminalia chebula* (Horituki). The usage rate of different anti-diabetic medicinal plants is shown in Figure 1.

The most frequently cited plants in Dhaka were, *Trigonella foenum-graecum* (Methi) and *Momordica charantia* (Korolla); whereas in Khulna, the most frequently cited plants were, *Ficus benghalensis* (Bot) and *Tinospora cordifolia* (Gulancha lota). The usage rate of top 13 most frequently mentioned anti-diabetic medicinal plants according to their locations is depicted in Figure 2. The study revealed that leaves, the whole plants, and seeds were most frequently used for the treatment of diabetes (Figure 3).

The survey revealed the use of 30 medicinal plants of 18 families for the treatment of diabetes in Bangladesh.

Coccinia indica (Telachuka) was the plant of choice in most of the cases both in Dhaka and Khulna for the treatment of diabetes. The hypoglycemic effects of *Coccinia indica* leaves have been reported in various animal (Venkateswaran S., 2003, Shibib BA et al., 1993, Hossain MZ et al., 1992,

Kar A et al., 2003) and human trials (Khan AK, 1980, Kamble SM et al., 1998, Kuriyan R et al., 2008).

The usage rate of *Trigonella foenum-graecum* (Methi) is high in Dhaka city. An Anti-hyperglycemic compound- GII by name has been purified from the water extract of the seeds of *Trigonella foenum-graecum* showed reduced blood glucose in glucose tolerance test (GTT) in the sub-diabetic rabbits.(Moorthy R et al., 2010).

Momordica charantia (Korola) is a popular edible vegetables and its usage rate was also high in Dhaka as compared to Khulna. Streptozotocin induced diabetic rats were treated with aqueous extracts of *Momordica charantia* for a period of 30 days which resulted in a significant reduction in blood glucose, glycosylated hemoglobin, lactate dehydrogenase, glucose-6-phosphatase, fructose-1,6-bisphosphatase and glycogen phosphorylase, and a concomitant increase in the levels of hemoglobin, glycogen and activities of hexokinase and glycogen synthase (Sekar DS et al., 2005). The use of leaves, stem and seeds were also reported for the treatment of DM (Kadir MF et al., 2012).

The usage rate of *Ficus racemosa* (Joiggi dumur) is high in Khulna city. The glucose-lowering efficacy of methanol extract of the stem bark was evaluated both in normal and alloxan-induced diabetic rats at the doses of 200 and 400 mg/kg orally and the ethanol extract (250 mg/kg/day orally) lowered blood glucose level within 2 weeks in the alloxan diabetic albino rats confirming its hypoglycemic activity (Anita Rani Shiksharhi, 2011).

Tinospora cordifolia (Gulancha lota) is used highly in Khulna region. Oral administration of the aqueous root extract resulted in a significant reduction in blood glucose & brain lipids in alloxan induced diabetic rats (Patel Nidhi et al., 2013).

Azadirachta indica (Neem) is a common medicina plant in Bangladesh (Kadir MF et al.,2012). Hypoglycemic activity of the 90% ethanolic extract of this plant was studied and compared with that of a reference antidiabetic drug glimeperide in glucose loaded and alloxan induced diabetic rats. Result showed that ethanol leaves extract (1 gm/kg) significantly reduced the elevated blood glucose level by 36.91% in glucose loaded rats and 30.20% and in alloxan induced diabetic rats, respectively compared to the respective diabetic control group (Rasheda Akter et al., 2013).

Anti-diabetic activity has been reported for *Terminalia chebula* (Horituki). Oral administration of the ethanolic extracts of the fruits significantly reduced blood glucose level glycosylated hemoglobin in Streptozotocin induced diabetic rats (Gandhipuram Periasamy et al., 2006).

Syzygium cumini (Jam) significantly reduced blood sugar level in alloxan induced diabetic rats but in case of clinical trials, the extracts obtained from the leaves are pharmacologically inert (Shweta Sharma et al., 2012).

IV. CONCLUSION

The socioeconomic structure of Bangladesh allows for the use of a wide range of traditional medicinal plants for the treatment of ailments and our study revealed 30 medicinal plants for the treatment of Diabetes in Dhaka and Khulna, although their efficacy is questionable due to the lack of proper clinical trials.

It is, therefore, mandatory to conduct proper clinical trials to evaluate the safety, efficacy, and dose dependant relationship of the plants of interests to ensure better public health outcomes.

V. ACKNOWLEDGEMENTS

The authors are thankful to all the members who participated in the survey projects and the students of the Faculty of Pharmacy, University of Dhaka, and Department of Pharmacy, Khulna University for actively participating in the survey.

REFERENCES RÉFÉRENCES REFERENCIAS

- Ashraf A, Chowdhury S, Streefland P: Health, disease and health-care in rural Bangladesh. *Soc Sci Med* 1982, 16:2041–2054.
- Ahmed SM, Hossain MA, Chowdhury MR: Informal sector providers in Bangladesh: how equipped are they to provide rational health care? *Health Policy Plan* 2009, 24:467–478
- Anita Rani Shiksharathi, Stuti Mittal. *Ficus Racemosa*: Phytochemistry, Traditional Uses and Pharmacological Properties: A Review; *International Journal of Recent Advances in Pharmaceutical Research* October 2011; 4: 6-15
- Bhowmik B, Binte Munir S, Ara Hossain I, Siddiquee T, Diep LM, Mahmood S, Mahtab H, Khan AKA, Hussain A: Prevalence of type 2 diabetes and impaired glucose regulation with associated cardiometabolic risk factors and depression in an urbanizing rural community in Bangladesh: a population-based cross-sectional study. *Diabetes Metab J* 2012, 36:422–432.
- Gandhipuram Periasamy, Senthil Kumar, Palanisamy Arulselvan, Durairaj Sathish Kumar, and Sorimuthu Pillai Subramanian. Anti-Diabetic Activity of Fruits of *Terminalia chebula* on Streptozotocin Induced Diabetic Rats; *Journal of Health Science*, 52 (3), 283-291 (2006),]
- Hossain MZ, Shibib BA, Rahman R: Hypoglycemic effects of *Coccinia indica*: inhibition of key gluconeogenic enzyme, glucose-6-phosphatase. *Indian J Exp Biol* 1992, 30:418–420.
- Kadir MF, Bin Sayeed MS, Shams T, Mia MMK: Ethnobotanical survey of medicinal plants used by Bangladeshi traditional health practitioners in the management of diabetes mellitus. *J Ethnopharmacol* 2012, 144:605–611.
- Kamble SM, Kamlakar PL, Vaidya S, Bambole VD: Influence of *Coccinia indica* on certain enzymes in glycolytic and lipolytic pathway in human diabetes. *Indian J Med Sci* 1998, 52:143–146.
- Kar A, Choudhary BK, Bandyopadhyay NG: Comparative evaluation of hypoglycaemic activity of some Indian medicinal plants in alloxan diabetic rats. *J Ethnopharmacol* 2003, 84:105–108.
- Khan AK, Akhtar S, Mahtab H: Treatment of diabetes mellitus with *Coccinia indica*. *Br Med J* 1980, 280:1044.
- Kuriyan R, Rajendran R, Bantwal G, Kurpad AV: Effect of supplementation of *Coccinia cordifolia* extract on newly detected diabetic patients. *Diabetes Care* 2008, 31:216–220.
- Moorthy R, Prabhu KM, and Murthy PS. Anti-hyperglycemic compound (GII) from fenugreek (*Trigonella foenum-graecum* Linn.) seeds, its purification and effect in diabetes mellitus. *Indian J Exp Biol*. 2010 Nov; 48(11):1111-8.
- Rahim MA, Azad Khan AK, Nahar Q, Ali SMK, and Hussain A: Impaired fasting glucose and impaired glucose tolerance in rural population of Bangladesh. *Bangladesh Med Res Counc Bull* 2010, 36:47–51.
- Rahim MA, Hussain A, Azad Khan AK, Sayeed MA, Keramat Ali SM, Vaaler S: Rising prevalence of type 2 diabetes in rural Bangladesh: a population based study. *Diabetes Res Clin Pract* 2007, 77:300–305
- Rahman SA, Kielmann T, McPake B, Normand C: Healthcare-seeking behaviour among the tribal people of Bangladesh: can the current health system really meet their needs? *J Health Popul Nutr* 2012, 30:353–365.
- Rasheda Akter, M Mahabub-Uz-Zaman, Md. Saidur Rahman, Most. Afroza Khatun, A. M. Abdullah, Nazim Uddin Ahmed, and Faridul Islam, Comparative Studies on Antidiabetic effect with phytochemical screening of *Azadirachta indica* and *Andrographis paniculata*; *IOSR Journal of Pharmacy and Biological Sciences* Volume 5, Issue 2 (Jan. – Feb. 2013), PP 122-128
- Sekar DS, Sivagnanam K, Subramanian S. Pharmazie. Antidiabetic activity of *Momordica charantia* seeds on streptozotocin induced diabetic rats. 2005 May; 60(5):383-7.
- Shibib BA, Khan LA, Rahman R: Hypoglycaemic activity of *Coccinia indica* and *Momordica charantia* in diabetic rats: depression of the hepatic

- gluconeogenic enzymes glucose-6-phosphatase and fructose-1, 6- biphosphatase and elevation of both liver and red-cell shunt enzyme glucose-6-phosphate dehydrogenase. Biochem J 1993, 292(Pt 1):267–270.
19. Shweta Sharma, BK Mehta, Darshna Mehta, Hemant Nagar, and Aditya Mishra; A review on pharmacological activity of *Syzygium cumini* extracts using different solvents and their effective doses; International Research Journal of Pharmacy; 2012, 3 (12), 54-58.
20. Venkateswaran S, Pari L: Effect of *Coccinia indica* leaves on antioxidant status in streptozotocin-induced diabetic rats. J Ethnopharmacol 2003, 84:163–168.

Table 1 : Different Informant Groups with Sample

Informant group	No of persons		Gender		Age
	Dhaka	Khulna	Male	Female	
Diabetic patients	20	20	20	20	55(40–65)
Allopathic doctors	10	10	10	10	48 (35–50)
Traditional healers (Kabiraj)	5	5	8	2	60 (45–70)
Native doctors ^a	9	9	10	8	43 (35-60)
Representatives of local medicine companies	6	6	10	2	40 (25–55)
Total	50	50	58	42	

^a = Doctors passed from Unani and Ayurvedic Medical Colleges and hospitals;

Table 2 : List of Traditional Medicinal Plants Used for the Treatment of Diabetes in Bangladesh and their Usage Rate.

Si. No	Botanical name	Family	Local Name	Plant parts used	When Used	Usage Rate (%)
1	<i>Coccinia indica</i> W.&A.	Cucurbitaceae	Telachuka	Fruit, leaf, root, whole plant	M, F, Pm	17.2
2	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Neem	Bark, leaf, seed	M, F	9.45
3	<i>Trigonella foenum-graecum</i> L.	Fabaceae	Methi	Seed, whole plant	M, F	8.45
4	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Jam	Leaf, seed	M, F	7.88
5	<i>Terminalia chebula</i> Retz.	Combretaceae	Horituki	Seed	M, F	6.18
6	<i>Ficus racemosa</i> L.	Moraceae	Joiggi dumur	Bark, fruit	M, Pm	5.05
7	<i>Momordica charantia</i> L.	Cucurbitaceae	Korola	Fruit, leaf, whole plant	M, F	4.24
8	<i>Swietenia mahagoni</i> Jacq.	Meliaceae	Mahogany	Seed	M, F	4.24
9	<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Amloki	Fruit, seed, whole plant	M, F	3.59
10	<i>Terminalia bellirica</i> L.	Combretaceae	Bohera	Seed	M, F	3.55
11	<i>Tinospora cordifolia</i> Hook. F. & Thoms.	Menispermaceae	Gulancha lota	Bark, leaf, root, whole plant	M	3.39
12	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	Jarul	Leaf	M	3.24
13	<i>Withania somnifera</i> (L.) Dunal	Solanaceae	Aswagandha	Leaf, root, whole plant	M, F	2.64
14	<i>Allium sativum</i> L.	Amaryllidaceae	Rosun	Root, whole plant	M	1.88
15	<i>Asparagus racemosus</i> L.	Asparagaceae	Sotomuli	Root	M, F	1.79

16	<i>Bunium persicum</i> Bois.	Apiaceae	Kalo Jeera	Seed, whole plant	M	1.69
17	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Durba	Leaf, whole plant	M, F	1.69
18	<i>Ficus benghalensis</i> L.	Moraceae	Bot	Leaf	M, F	1.69
19	<i>Tamarindus indica</i> L.	Fabaceae	Tetul	Seed	M	1.69
20	<i>Andrographis paniculata</i> Wall. ex Nees	Acanthaceae	Kalmegh	Leaf, whole plant	M	1.24
21	<i>Centella asiatica</i> L.	Apiaceae	Thankuni	Leaf	M	1.18
22	<i>Datura stramonium</i> L.	Solanaceae	Dhotura	Seed	M	1.08
23	<i>Eclipta alba</i> L.	Asteraceae	Kalokeshi	Leaf	M	0.92
24	<i>Mimosa pudica</i> L.	Fabaceae	Lojjaboti	Whole plant	M	0.89
25	<i>Ocimum sanctum</i> L.	Lamiaceae	Kalo Tulshi	Whole plant	M, F	0.89
26	<i>Swertia chirata</i> L.	Gentianaceae	Chirota	Root	-	0.89
27	<i>Terminalia arjuna</i> W.&A.	Combretaceae	Arjun	Seed	M	0.85
28	<i>Vernonia anthelmintica</i> Willd.	Asteraceae	Somraj	Whole plant	M	0.85
29	<i>Vinca rosea</i> L.	Apocynaceae	Noyontara	Leaf	F	0.84
30	<i>Vitex negundo</i> L.	Lamiaceae	Nishinda	Leaf	M	0.84

Plants listed according to the hierarchy of usage rate, with plant parts used; stage of maturity of plants at the time of use (M= mature, F = fresh, Pm = premature).

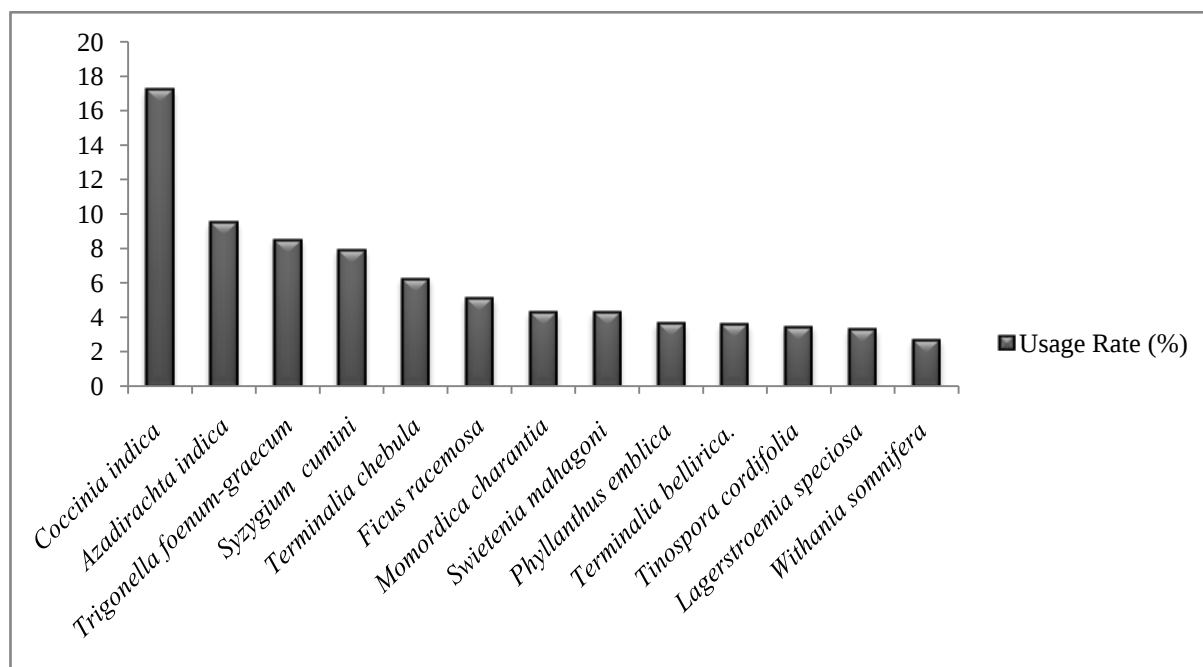


Figure 1 : Usage rate of different anti-diabetic medicinal plants (top 13)

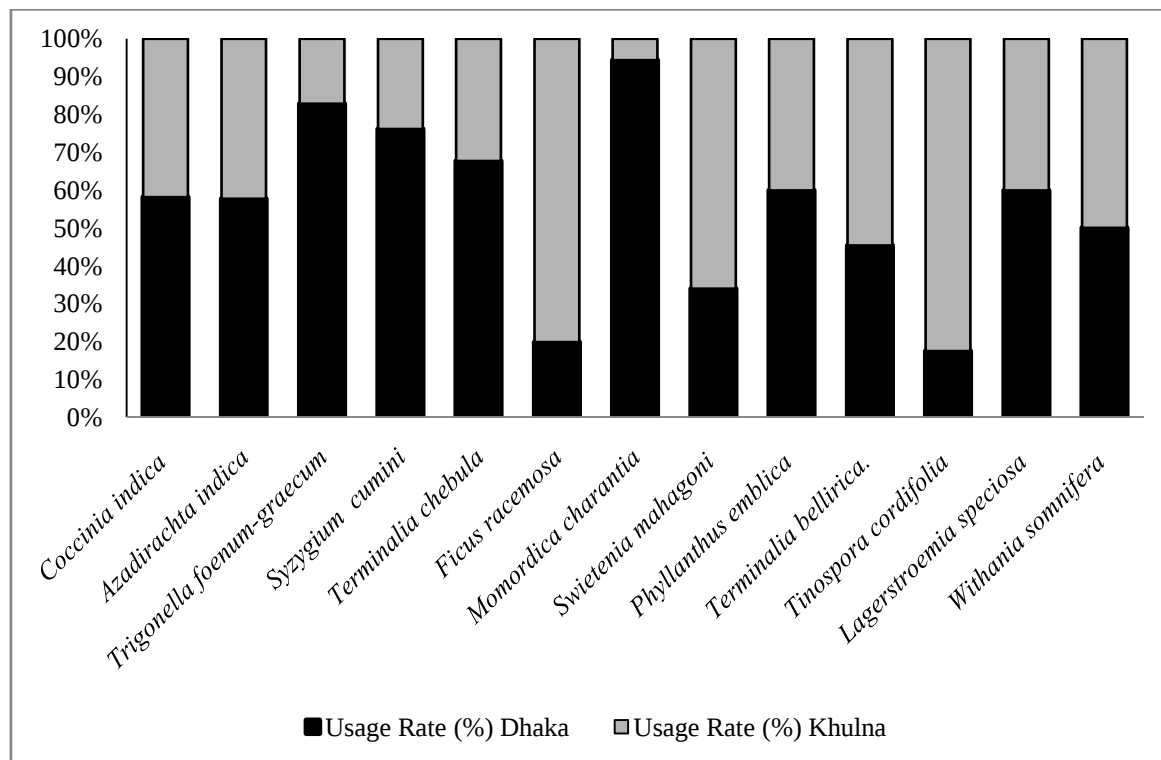


Figure 2 : Distribution of the top 13 most frequently mentioned anti-diabetic plants

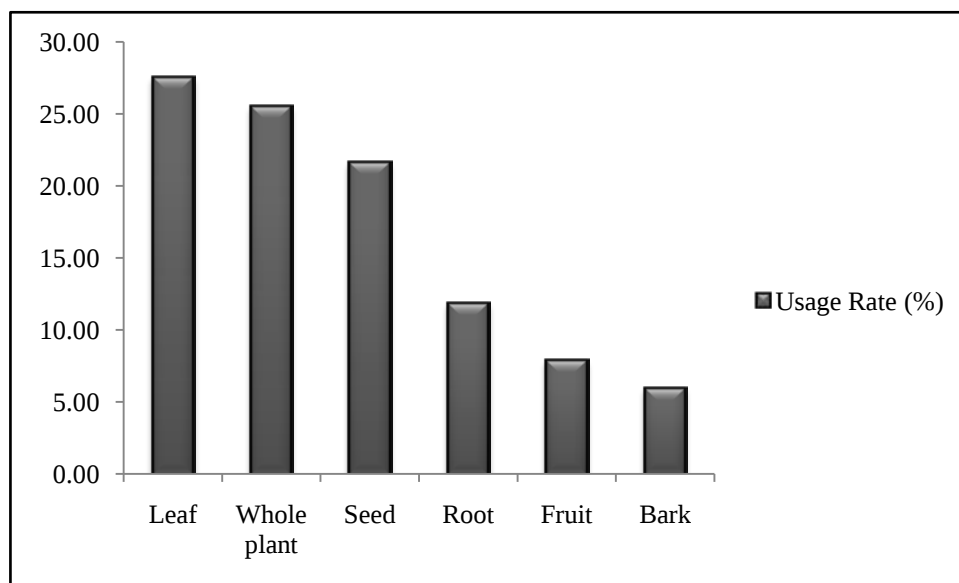


Figure 3 : Plant parts used for the treatment of DM