ISBN: 978-978-67-0285-8 DOI: https://doi.org/10.55455/acsnigeria.1.3.12-17

Phytochemical Evaluation and Antidiabetic Potential of Two Medicinal Plants *Launaea taraxacifolia* and *Alternanthera brasiliana*

Dasola A. Apata*[1], and Hawawu A. Olorunoje[2]
[1]Department of Applied Chemistry, Federal Polytechnic Ado Ekiti, Ekiti State, Nigeria.
[2]Department of Science Laboratory Technology, Federal Polytechnic Ado Ekiti, Ekiti State, Nigeria.
Corresponding Author's email: apata_da@fedpolyado.edu.mg
DOI: https://doi.org/10.55455/acsnigeria.1.3.12-17

ABSTRACT

The high rate of mortality has been attributed to the presence of disease such as diabetic and this has called for all possible interventions especially from botanical sources. The use of plant to treat and manage diabetic has continue to yield positive outcome among global population and this has given room for more exploration among researchers of medicinal plants. In this present work, phytochemical analysis and antidiabetic activity of methanol extract of *Launaea taraxacifolia*and *Alternanthera brasilia*were investigated. Methanol was used for the extraction of leaves of *Launaea taraxacifolia* and *Alternanthera brasilia* and phytochemicals were quantitatively determined. Antidiabetic activities of the plants extract were determined via *in vitro* alpha- amylase and alpha – glucosidase assay. The phytochemical analysis showed the present of alkaloids, terpenoids, flavonoids, phenols and tannis in the two plants. Quantitatively, *Launaea taraxacifolia* and *Alternanthera brasiliana* have total phenol of 203.50 ± 0.10 mgGAE/g and 127. 65 ± 0.12 mgGAE/g respectively. The two plant extracts were used at varying concentration and they displayed antidiabetic potential by inhibiting the two enzymes *in vitro.* The two plant extracts examined were observed to be concentration dependent., at 7.5 mg/mL, *Alternanthera brasiliana* and *Launaea taraxacifolia* gave 79.45% and 70.76 % inhibitory activities respectively while a lower concentration (1 mg/mL), a low inhibitory activity were observed in the two plant extracts. The presence of the phenols, alkaloids and flavonoids suggest the therapeutic potential of *Alternanthera brasiliana* and *Launaea taraxacifolia.* Also, the inhibitory actions of the plant extracts against the enzymes responsible for diabetic clearly suggest their antidiabetic potential.

KEYWORDS: Diabetic, phytochemical, *Launaea taraxacifolia,* alpha-amylase.

1. INTRODUCTION

Modern medicine has dwells more into botanicals thereby unfolding the therapeutic potential of plants. The ethnomedicinal study of plants as a potential source of therapeutic agent has become popular among researchers. The use of plants for the cure management of diseases has come to stay among the global populace, for it is found to be cheap, accessible and effective [1]. Diabetes mellitus (DM) is simply the inefficient use of insulin to effectively metabolize blood sugar thereby resulting into hyperglycemia. It is a chronic disease that impaired the normal functionality of the body system and also leads to formation of other ailments such as high blood pressure, stroke and so on. (DM) is the most widespread form of diseases across all continents which is majorly diagnosed in the elderly and it is becoming increasingly common in children and adolescents [3,4,5]. There are two main types of DM: Type 1 due to insulin insufficiency and Type 2 non-insulin dependent which account for 90-95% of diabetic patients [6,7,8, 9]. Nigeria is one of the African countries that its populace have been faced with. Among such plants are *Alternantherabrasiliana*, and *Launaeataraxacifolia*. *Alternanthera brasiliana*(*A. brasiliana*) is commonly referred to as JoyWeed or Brazilian joyweed, a species of the Amaranthaceae family. The presence of phenolic compounds in *A. brasiliana* contribute to its antimicrobial action by damaging microbial cell walls and inhibiting enzyme activity [10, 11]. The acute and sub-acute toxicity of*A. brasiliana* have been conducted by Bilal *et al*., 2025[12]and revealed no adverse effects on heart, kidney or liver tissues at doses up to 3000 mg/kg; LD_{50}.The Extracts of *A.brasiliana* have been found to exhibit significant antimicrobial effects against various strains of bacteria and fungi, including *Staphylococcus aureus*, *Escherichia coli*, and *Candida albicans*[13] and also against; *Mycobacterium smegmatis* and herpes simplex virus (HSV) [14], *Launaeataraxacifolia* (*L. taraxacifolia*) commonly known as wild lettuce that is underutilized leafy vegetable and is indigenous to West Africa, but it is scarcely consumed for both nutritional and medicinal purposes. In Nigeria, it is locally known as *efoyanrin* (Yoruba), *namijindayi* (Hausa), and *agblòke* (Ghana). Wild lettuce belongs to the *Asteraceae* family and is recognized for its rich phytochemical profile, which includes flavonoids, saponins, tannins, alkaloids, terpenoids, and phenolic compounds [15,16].The plant also enhance the regulation of insulin and thus inhibit the carbohydrate digesting enzymes which suggest *L. taraxacifolia* as a potential antidiabetic [17]. *Launaeataraxacifolia* has long been valued in African traditional medicine for its wide range of therapeutic applications. In Nigeria and Ghana, decoctions and leaf extracts are commonly employed in the treatment of diabetes, malaria, hypertension, measles, and eye

infections such as conjunctivitis [18,19]. The leaves are also applied topically for wound healing, skin infections, and yaws, reflecting the plant's antimicrobial and anti-inflammatory potential [20]. The leaves of *L. taraxacifolia* were also reported to contain phenols [21], glycosides[22]and flavonoids [23] which make it a good potential antioxidant, immune enhancer, cardiac treatment and anti-inflammatory agent. *L. taraxacifolia* is the only Asteraceae species which has no trichomes [24]. It is also consumed as a salad ingredient or cooked in stew [25]. *L. taraxacifolia* contains useful amounts of bioactive chemicals and minerals. It has been shown to possess antioxidant [26], anti-inflammatory [27], antimicrobial[28], anticancer [29], neuro-nephroprotective [30], and cardio protective properties [31].

2. MATERIALS AND METHODS

2.1 Plant collection

The leaves of *A. brasiliana*and*L.taraxacifolia* were collected on Federal Polytechnic Ado Ekiti Campus, Ekiti State Nigeria. The plant material was identified and authenticated by Mr Oyebode of Botany unit of Applied biology department,Federal Polytechnic Ado Ekiti, Ekiti State, Nigeria, and voucher specimens (FPA 730 and FPA 731 respectively) were deposited at the school Herbarium.

2.2 Plant Preparation and Extraction

The collected plant sample was cleaned of the dust and soil. It was air dried at room temperature (25^{o}C) for six-weeks until constant weight was obtained. The dried sample was pulverized and stored in an air tight container prior to extraction. A 250 g of pulverized sample was soaked with 2.5 liter methanol for 72 hours. The extract was concentrated under a reduced pressure to a small volume by means of rotary evaporator.

2.3 Quantitative Phytochemical Screening of *A. brasiliana* and *L.taraxacifolia* leaves

The determination of phytochemicals in the extracts of the plants were conducted with methods used by Shaik and Patil, 2020 [32]. Four different phytochemicals; alkaloids, flavonoids, terpenoids and phenols.

2.4 In vitro Antidiabetic Assay

The antidiabetes potentials of the two plants at varying concentration (1, 2.5, 5, 7.5 and 10 mg/ mL)were carried out *in vitro* against alpha-amylase and alpha glucosidase inhibitory assay. The analysis was carried out in duplicate.

2.5 Alpha Amylase Activity

The assay was evaluated using a modified procedure of McCue *et al*[33]. A 100 µL of the plant extracts and 100 µL of 0.02 M phosphate bufferpH6.9 with 0.006 M sodium chloride) containing α-amylase from Aspergillus oryzae (0.5 mg/mL) were added to each tube and incubated at 40 °C for 10 min. After pre-incubation, 100 µL of 1% starch solution in 0.02 M sodium phosphate buffer (pH 6.9 with 0.006 M sodium chloride) was added to each tube. The reaction was halt with 200 µL of dinitrosalicylic acid. The test tubes were incubated in a water bath for 5 min, and cooled at room temperature. The alpha amylase inhibitory activity was determined.

2.6 Alpha glucosidase Inhibition Assay

The inhibitory activity of the plant extracts on alpha-glucosidase was evaluated according to the method described by McCue *et al* [33]. Alpha-glucosidase was derived from *Saccharomyces cerevisiae*. A 100 µL of α-glucosidase was dissolved in 100 µL of phosphate buffer pH6.8 which was pre-incubated with 50 µL of the sample for 10 min. Then 50 µL of 20 µL phosphate buffer (pH 6.9) was then added to start the reaction. The reaction mixture was incubated at 37°C for 20 min and stopped by adding 2 µL of 0.1 M Na2CO3. The glucosidase activity was determined by measuring the yellow-colored paranitrophenol released from pNPG at 405 nm.

2.7 Statistical Analysis

The data obtained from the study were analyzed using Analysis of variance (ANOVA) using R(3.5.1) with Turkey HSD post – hoc. A p-value of less than 0.05 was considered a statistically significant value were expressed as mean ± SEM of experimental replication.

3. RESULTS AND DISCUSSION

3.1 Phytochemical Analysis

The presence of secondary metabolites in plant contributes immensely to their bioactivities properties.. Phytochemicals such as flavonoids, alkaloids and phenols to mention but few have been known to be responsible for the therapeutic nature of botanicals [34,35]. The selected plants were evaluated quantitatively of Phytochemicals; flavonoids, terpenoids, phenols and alkaloids. *L. taraxacifolia* happened to have a higher concentration of all the phytochemicals analyzed than *A. brasiliana*. which was a bit high in except alkaloid The results as presented in table 1 show that *L. taraxacifolia* possess a higher concentration of phenol (203.50 ± 0.10) and lower concentration of alkaloid (8.45 ± 0.19) as compared to *A. brasiliana*(10.50± 0.15). The presence of phenol, alkaloid, terpenoid and flavonoid in the extracts signify antioxidant and anti- inflammatory potential as was also reported by Barua *et al* [36]. Various investigations have also shown that aqueous fraction of these plants exhibit pharmacological properties like antidiabetic, anticancer and anticonvulsant properties [37,38].

Table 1: Phytochemical analysis of *A. brasiliana* and *L. taraxacifolia* leaves extract

Phytochemicals	*L. taraxacifolia*	*A. brasiliana*
Phenol	203.50 ± 0.10	127. 65 ± 0.12
Flavonoid	19.65 ± 0.17	11.54 ± 0.15
Terpenoid	29.29 ± 0.11	5.40 ± 0.10
Alkaloid	8.45 ± 0.19	10.50± 0.15

3.2 Antidiabetic activity

Diabetes is one of diseases that have been known to contribute to the high rate of mortality in the human populace especially in Africa continent including Nigeria. So the search for therapeutic agent from botanical origin which are believed to be less toxic, readily available and affordable is inevitable [39]. Although some of the synthetic drugs have made huge successes in regulating blood sugar level, but their side effects are unaffordable and this table is a major concern in the middle and low income countries [40]. And Nigeria is one of the Africa countries that are richly endowed with medicinal plant. In this investigation, we explore the antidiabetic activities of *A. brasiliana* and *L. taraxacifolia* leaves extract *in vitro* through alpha amylase and alpha glucosidase inhibitory assay.Alpha amylase enzyme controls the breakdown of carbohydrate and disaccharides into simple sugar (glucose) there by making monosaccharides available in the body including blood stream.Therefore, alpha amylase inhibitory activity is one of the major routes to evaluate the hyperglycemia lowering efficacy of plant extracts. More so, alpha amylase enzyme inhibitor helps to manage type 2 diabetes and reduce blood glucose level of diabetic patients [41,42]. The methanol extract of *A. brasiliana* and *L. taraxacifolia demonstrated* increasing percentage inhibition as the tested concentration increased. As presented in table 2, the inhibitory effect of *A. brasiliana* at initial concentration (1 mg/mL) gave 47.06± 0.17% , higher than 29.09 ± 0.00% that was observed with *L. taraxacifolia,* but at subsequent concentrations, a remarkable inhibitory effect were observed for *L. taraxacifolia* higher than that observed for*A. brasiliana.*This results obtained are in line with the study performed by Ayele *et al* [43].

Table 2: Alpha amylase inhibitory activity of *A. brasiliana* and *L. taraxacifolia* leaves extract

Concentration	*L. taraxacifolia*	*A. brasiliana*

of Extract (mg/mL)		
1	29.09 ± 0.00	47.06± 0.17
2.5	41.23 ± 0.11	42.24 ± 0.15
5	49.43 ± 0.14	44.56 ± 0.16
7.5	54.42 ± 0.19	46.40± 0.12
10	60.90± 0.13	54.78± 0.13

Alpha glucosidase is the enzyme responsible for transferring broken starch and carbohydrate to the blood stream thereby increasing the blood sugar level and consequently causing diabetes. Table 3 showed the outcome of alpha glucosidase inhibitory effect of *A. brasiliana* and *L. taraxacifolia* leaves extract. At a higher dose of 10 mg/mL, both *A. brasiliana* and *L. taraxacifolia* gave 91.17± 0.19 and 96.81± 0.19 respectively. But at 5 and 7.5 mg/mL, a remarkable percentage inhibition of 67.43 ± 0.10% and 79.45± 0.15% respectively were observed higher than that obtained for *L. taraxacifolia* (59.18 ± 0.11% and 70.76 ± 0.19%).A similar results were also obtained by Ayele *et al* [44], Vallinayaki and Rajeshkumar [45] where *Mimosa Peduca*and *Scutellariatourneforti*i methanol extract gave comparable percentage inhibition and also comparable the work of Sapkota *et al* [46].The overall assessment depict *L. taraxacifolia having* a higher antidiabetic potential than *A. brasiliana which* may be attributed to the presence of phytochemicals analyzed.

Table 3: Alpha glucosidase inhibitory activity of *A. brasiliana* and *L. taraxacifolia* leaves extract

Concentration of Extract (mg/mL)	*L. taraxacifolia* % inhibition	*A. Brasiliana* % inhibition
1	24.75 ± 0.10	16. 06 ± 0.12
2.5	43.56 ± 0.17	29.54 ± 0.15
5	59.18 ± 0.11	67.43 ± 0.10
7.5	70.76 ± 0.19	79.45± 0.15
10	96.81± 0.19	91.17± 0.19

4. CONCLUSION

Based on our investigations, the methanol extract of *A. brasiliana* and *L. taraxacifolia* demonstrated in vitro alpha amylase and alpha glucosidase inhibitory activities, suggesting potential antidiabetic relevance. However, further phytochemical characterization, IC_{50} determination, *in vivo* validation and toxicity studies are needed before therapeutic claims can be made.

REFERENCES

1. Atanasov, A. G., Zotchev, S. B., Dirsch, V. M., &Supuran, C. T. (2021). *Natural products in drug discovery: Advances and opportunities in the modern era*. Nature Reviews Drug Discovery, 20(3), 200–216. https://doi.org/10.1038/s41573-020-00114-z
2. Weir GC, Gaglia J, Bonner-Weir S. Inadequate β-cell mass is essential for the pathogenesis of type 2 diabetes. Lancet Diabetes Endocrinol. 2020;8(3):249-256.
3. Shuey MM, Lee KM, Keaton J, et al. A genetically supported drug repurposing pipeline for diabetes treatment using electronic health records. EBioMedicine. 2023;94(8):122-131.
4. Wang X, Long D, Hu X, Guo N. Gentiopicroside modulates glucose homeostasis in high-fat-diet and streptozotocin-induced type 2 diabetic mice. Front Pharmacol. 2023;14(8):1172360.

5. Mehta, S.; Sharma, A.K.; Singh, R.K(2021): Therapeutic journey of *Andrographispaniculata (Burm.f.) Nees* from natural to synthetic and nanoformulations. *Mini-Rev. Med. Chem*. 21, 1556–1577
6. Vaughan P, Gilson L, Mills A. Diabetes in developing countries: its importance for public health. Health Pol Plan. 1989;4 (2):97–109.
7. Welz AN, Emberger-Klein A, Menrad K. Why people use herbal medicine: insights from a focus-group study in Germany. BMC Complement Altern Med. 2018;18(1):1–9.
8. Joseph B, Jini D. Antidiabetic effects of Momordicacharantia (bitter melon) and its medicinal potency. Asian Pacific J Trop Dis. 2013;3(2):93– 102. https:// doi. org/ 10. 1016/ S2222-1808(13) 60052-3.
9. World Health Organization. (2022). *Medicinal plants and traditional medicine in health systems*. Geneva: WHO Press.
10. Ahmed, F., Adebayo, A. H., &Abdullahi, M. (2021). *Pharmacological and therapeutic properties of Alternantherabrasiliana: An overview*. African Journal of Traditional, Complementary and Alternative Medicines, 18(1), 43–52.
11. Ogunmefun, O. T., Ajayi, O. I., & Adebayo, O. R. (2021). *Antioxidant and antimicrobial activities of tannin-rich extracts from medicinal plants*. African Journal of Pharmaceutical Research & Development, 13(2), 72–80.
12. Bilal, M., Hassan, M., & Khan, M. A. (2025). *Nephroprotective and diuretic effects of Alternantherabrasiliana leaf extract in experimental models*. BMC Complementary Medicine and Therapies, 25(2), 45–59.
13. Nwinyi, O. C., Ajiboye, T. O., & Ibrahim, M. (2020). *Antimicrobial activity of Alternantherabrasiliana extracts against selected pathogens*. African Journal of Microbiology Research, 14(6), 252–260.
14. Silva, R. L., Acuña, U. M., & Lima, A. C. (2024). *Pharmacological review of Alternantherabrasiliana (Joy weed): Ethnomedicinal uses and bioactivities*. Frontiers in Pharmacology, 15, 147293.
15. Olugbami, J. O., Ajani, E. O., &Adeoye, A. O. (2022). *In vitro antidiabetic activities of Alternantherabrasiliana extracts through alpha-amylase and alpha-glucosidase inhibition*. International Journal of Pharmacognosy and Phytochemical Research, 14(1), 23–29.
16. Iyabo AM, Hauwa A. Uterotonic effect of aqueous extract of LaunaetaraxacifoliaWilld on rat isolated uterine horns. Afr J Biotechnol. 2019;18(19):399–407.
17. Adinortey MB, Sarfo JK, Kwarteng J, Adinortey CA, Ekloh W, Kuatsienu LE, et al. The Ethnopharmacological and nutraceutical relevance of Launaeataraxacifolia (Willd.) Amin ex C. Jeffrey Evid Based Complement Alter Med. 2018;2018(01):1–13.
18. Adedayo BC, Oyeleye SI, Oboh G. Inhibition of some enzymes implicated in diabetes mellitus by raw and blanched extracts of African lettuce (Launaeataraxacifolia). Biokemistry. 2020;32(1):69–76.
19. Adebisi AA. LaunaeaTaraxacifolia (Willd) Amin ex C Jeffrey. Record from Protabase. Diera: PROTA (Plant Resources of Tropical Africa); 2004.
20. B.C. Anyanwu, I.E. Otuokere, J.O. Echeme, *et al.* Isolation and characterization of a secondary metabolite from the aerial parts of launaea (Lactuca) taraxacifolia J ChemSoc Niger, 46 (4) (2021), pp. 661-672.
21. Kuyoro S, Akinloye O, Ololade Z, Kayode O, Badejo O. Anti-diabetic properties of crude Methanolic leaf extract of Launaeataraxacifolia (wild lettuce). Niger J BiochemMol Biol. 2017;32(1):67–77.
22. Andrade-cetto A, Vasquez CR. Gluconeogenesis inhibition and phytochemical composition of two Cecropia species. J Ethnopharmacol 2010;130(1):93–7.
23. . Adedeji O, Jewoola O. Importance of leaf epidermal characters in the Asteraceae Family. Not Bot HortiAgrobot Cluj-Napoca. 2008;36(2):7–16.
24. Burkill HM. The Usefulness of Plants of West Africa. Edition 2, vol. 2(1). Kew, ISBN 10094764301X: R Bot GardIthakaHarb Incorporation; 1985. p. 1–2.
25. Koukoui O, Senou M, Agbangnan P, Seton S, Koumayo F, Azonbakin S, et al. Effective in-vivo cholesterol and triglycerides lowering activities of Hydroethanolic extract of LaunaeaTaraxacifolia leaves. Int J Pharm Sci Res. 2017;8(5):2040–7.
26. Ololade ZS, Kuyoro S, Ogunmola O, Abiona O. Phytochemical, antioxidant, anti-arthritic, anti-inflammatory and bactericidal potentials of the leaf extract of Lactucataraxacifolia. Glob J Med Res B Pharma Drug DiscovToxicol Med. 2017;17(2):19–28.

27. Thomford NE, Mkhize B, Dzobo K, Mpye K, Rowe A, Parker MI, et al. African lettuce (Launaeataraxacifolia) displays possible anticancer effects and herb-drug interaction potential by CYP1A2, CYP2C9, and CYP2C19 inhibition. Omi A J Integr Biol. 2016;20(9):528–37.
28. Akintunde JK, Woleola MT. Impairment of neuro-renal cells on exposure to cosmopolitan polluted river water followed by differential protection of Launeataraxacifolia in male rats. CompClin Path. 2019;01(01):1–15.
29. Salisu T, Ottu B, Okpuzor J. Histopathologic studies of aqueous extracts of five selected local edible vegetables in isoproterenol-induced myocardial infarction in male Wistar albino rats. Planta Med. 2014;80(01):2–39.
30. Thomford NE, Awortwe C, Dzobo K, Adu F, Chopera D, Wonkam A, et al. Inhibition of CYP2B6 by medicinal plant extracts: implication for use of efavirenz and nevirapine based highly active antiretroviral therapy (HAART) in resource-limited settings. Molecules. 2016;21(221):1–15.
31. Shaikh JR and Patil M. Qualitative tests for preliminary phytochemical screening: An overview. Int J Chem Stud. 2020; 8(2):603–608.
32. McCue P, Kwon YI, Shetty K. Anti-amylase, anti-glucosidase and anti-angiotensin i-converting enzyme potential of selected foods. J Food Biochem. 2005;29(3):278-294.
33. Abebe W, Zhang W, Zhang S, Xie G. Chemical composition and antimicrobial activity of essential oil from Justiciaschimperiana. J Pharmacogn Natural Prod. 2018;04(02):2–4.
34. Lawal AM, Lawan MM, Apampa SA. Phytochemical analysis and thin layer chromatography profiling of crude extracts from GuieraSenegalensis (Leaves). J Biotechnol Biomed Sci. 2019;3(3):7–12.
35. Barua CC, Begum SA, Pathak DC, Bora RS. Wound healing activity of AlternantherabrasilianaKuntze and its antioxidant profiles in experimentally induced diabetic rats. J Appl Pharm Sci. 2013; 3(10):161-166.
36. Melesie Taye G, Bule M, Alemayehu Gadisa D, Teka F, Abula T.In vivo antidiabetic activity evaluation of aqueous and 80% methanolic extracts of. leaves of Thymus schimperi (Lamiaceae) in alloxan-induced diabetic mice. Diabetes Metab Syndr Obes: Targets Ther. 2020;13(11):3205-3212.
37. Cui G, Lai F, Wang X, Chen X, Xu B. Design, synthesis and biological evaluation of indole-2-carboxylic acid derivatives as IDO1/TDO dual inhibitors. Eur J Med Chem. 2020;188(2):111985
38. Crudele L, Gadaleta RM, Cariello M, Moschetta A. Gut micro- biota in the pathogenesis and therapeutic approaches of diabetes. EBioMedicine. 2023;97:1-13.
39. Fasanmade OA, Dagogo-Jack S. Diabetes care in Nigeria. Ann Glob Health. 2018;81(6):821-829.
40. Padhi S, Nayak AK, Behera A. Type II diabetes mellitus: a review on recent drug based therapeutics. Biomed Pharmacother. 2020; 131(11):110708.
41. Ezedum N. Protection of traditional knowledge and its relevance to national economic growth and development in Nigeria. Nigerian Juridical Rev. 2022;17(7):88-108
42. Safamansouri H, Nikan M, Amin G, et al. α-Amylase inhibitory activity of some traditionally used medicinal species of labiatae. J Diabetes Metab Disord. 2014;13(11):1-5
43. Faloye KO, Famuyiwa SO, Ayoola MD, Ndinteh DT. Isolation and characterization of two new polyphenols from the antidiabetic fraction of pod extract of Caesalpiniapulcherrima Swartz. Eur J Med Plants. 2020;31(20):48-56.
44. Ayele AG, Kumar P, Engidawork E. Antihyperglycemic and hypoglycemic activities of the aqueous leaf extract of RubusErlangeriengl (Rosacea) in mice. Metabolism Open. 2021;11(11):100118.
45. Vallinayaki KN, RajeshkumarShanmugam: Evaluation of Antidiabetic Activity and Cytotoxic Effect of Strontium Nanoparticles Synthesized Using Mimosa Pudica. College and Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India.
46. Sapkota BK, Khadayat K, Sharma K, Raut BK, Aryal D, Thapa BB, et al. Phytochemical analysis and antioxidant and antidiabetic activities of extracts from Bergeniaciliata, Mimosa pudica, and Phyllanthusemblica. Advances in Pharmacological and Pharmaceutical Sciences 2022;2022.